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Comparative effects of direct instruction on the language acquisition of preschool (three to five-year-old) children prenatally exposed to controlled substances (cocaine/crack) or children who were low birth weight but not prenatally exposed

Cochran, Lessie Lue, Ph.D.
The Ohio State University, 1992

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Comparative Effects of Direct Instruction on the Language Acquisition of Preschool (Three to Five Year Old) Children Prenatally Exposed to Controlled Substances (Cocaine/Crack) or Children Who Were Low Birth Weight But Not Prenatally Exposed

DISSERTATION
Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

by

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Lessie Lue Cochran
1992
Dedicated to my parents,
Isaac and Mamie B. Cochran

Did you ever know you are my heroes?
You are everything I wish that I could be.
I can fly higher than an eagle
You are the wind beneath my wings.

I thank God for parents who did everything to provide the "wind" to allow me to "fly" higher than even I thought was possible.
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CHAPTER I
INTRODUCTION

CRACK BABIES !!
COCAINE KIDS !!

These words are becoming well known to the general population as a result the increasing numbers of children being born to mothers who used cocaine or crack during their pregnancies. Often the major concern expressed by the professional community pertains to prevalence and incidence surveys in order to determine the extent of the numbers of children affected (Berger et al., 1990).

Cocaine abuse has developed rapidly in the United States during the past ten years. Traditionally, users sniffed a crystalline form of cocaine and only a few heavy users injected it. However, around 1985 "crack" cocaine was developed, and it has become the most popular form for many cocaine users (Udell, 1989). Crack cocaine, small cream-colored chunks resembling rock salt, leads to a 5- to 15-minute reaction in less than 10 seconds and is far more powerful than powdered cocaine (Bauer, 1991). More women within the ages of 18 to 35 have reported cocaine or crack to be their "drug of choice". The prevalence rate of drug use by pregnant women in the United States has been
shown to range from 7.5 to 11 percent (Adirim & Gupta, 1991).

Cocaine causes the blood vessels to constrict which reduces the flow of oxygen and other nutrients throughout the body. With fetal cells multiplying quickly in the first three months of life, an embryo deprived of the proper blood supply by the mother's early and continuous use of cocaine is being dealt a severe blow. The babies may appear quite normal, but are undersized, underweight, and have unusually smaller head circumferences which is associated with lower IQ scores. Other babies whose mothers used cocaine heavily during the last trimester of pregnancy developed embolisms, or clots, that block blood vessels and result in shriveled arms or legs, missing sections of intestine or kidneys, or other defects. Still others are affected on a neural level through brain chemistry. The neurotransmitters or messengers of the brain are altered and the child is unable to control mood swings and responsiveness. Brain lesions had also been found which affect brain areas governing learning and thinking (Toufexis, 1991).

Three medical tests are currently being used to empirically determine maternal drug use during pregnancy: urine screening, meconium analysis, and hair analysis. Each of these tests has been proven reliable only if done within a limited time period which varies depending on the test used. The urine screen is the test used most often due to its availability at many hospitals, its
less expensive cost, and its use in determining the presence of a wide variety of drugs. This test requires a sample of the mother's or baby's urine which may be screened by radioimmunoassay to detect the presence of various drugs in that urine. Radioimmunoassay (RIA) is a test which identifies a substance through its capacity to act as an antigen (a protein/carbohydrate substance that when introduced into the body stimulates the production of an antibody) and has been radioactivity labeled. By testing for the presence of benzoylecgonine, the major metabolite of cocaine, a drug screen use can be an effective method for determining maternal drug use. The urine drug screen is not a routine procedure for most hospitals without prior knowledge of maternal drug use or suspected drug use at time of delivery. This test involves examining the mother's urine to assess possible drugs in her blood stream and does not provide details of extent or amount of drugs usage. Due to the limited nature of this test, drugs in the mother's system may be detected if drugs were used by the mother up to sixty hours prior to having the urine sample taken. Drugs can be detected in the urine of the newborn for as long as 96 hours after birth. The slower metabolism of the drugs within infants was due to the relatively immature liver of newborns (Bauer, 1991).
The other drug tests (e.g., meconium or hair) may be conducted to reduce the risks of false negatives or false positives for each person. The child's urine may also be tested to determine the mother's usage up to ten hours prior. Meconium is the dark greenish mass that accumulates in the bowel during fetal life and is discharged shortly after birth; it is often referred to as the "first stool". Meconium testing is more expensive to do and requires that the nurse monitoring the baby obtain the first stool samples to send to the lab for testing.

The third method of testing, hair analysis, is not widely accepted by medical personnel (Graham et al., 1989). Maternal hair (or baby's hair) is cut close to the scalp in two or three different areas at the back of the head for the hair analysis. Hair from babies is not always possible since many babies are born without hair or their hair is not long enough to get an adequate sample. After the hair roots are washed to remove any residue, the samples are analyzed by RIA for traces of various drugs including crack cocaine. This test is believed to be less reliable due to the variety of treatments that the mothers use on their hair and the damage these treatments may have on the hair. Since this test may not be possible on some babies, this is normally performed using the mothers' hair, if done at all. Drug testing and reports of these findings are done at the individual doctors' discretion.
Frank et al. (1988) listed various facts concerning the prevalence rate of maternal drug use and characteristic correlates of those women tested. This study found that cocaine users were significantly likely to be married, Hispanic, or black born outside of the United States and were less well nourished than nonusers. Users reported significantly more sexually transmitted diseases, previously had low birth weight infants, spontaneous and elective abortions, and reported greater use of alcohol, cigarettes, marijuana, opiates, and other illicit drugs during pregnancy. Drug use is not just an urban problem identified in public hospitals; but also can be found in populations in the rural and suburban areas.

Although it may appear that drug use has reached an alarming level only among minorities and the urban poor populations, a study by Chasnoff (1989) showed that the prevalence of drug use does not vary significantly among pregnant women by race or socioeconomic status, but that physicians tend to overtest some groups. From a study of 380 women, 14.1% of the 199 black women and 15.4% of 499 white women had positive urine toxicology; 16.3% of the women received health care in public clinics and 13.1% in the private health sector. Both of these sets of figures indicated similar rates of positive drug use for blacks and whites, and for public and private clinics. Another report (NAPARE, 1988) said that one out of every ten newborns in
the United States (375,000 a year) is exposed in the womb to one or more illicit drugs. The most frequent ingredient in the mix is cocaine.

In a 1991 survey of the fifty states and the District of Columbia (Adirim & Gupta, 1991), no state had enacted legislation regarding testing. Thirteen states had mandatory reporting policies for drug-exposed newborns. Eleven of these states required reporting to social service agencies, at least three states routinely reported to criminal justice agencies, and ten required that reports be filed as child abuse or neglect. Many states without mandatory reporting statutes indicated that reports are made to social service agencies at the discretion of the health care provider (Adirim & Gupta, 1991). During fiscal year 1990, only twenty-two states specifically allocated funds for programs that address prenatal substance use.

In a report compiled by the Juniper Gardens Children's Project (1991) concerning infant drug exposure, national figures of the prevalence of prenatal exposure in utero indicated that "the most commonly cited estimates of drug-exposed births range from 100 thousand for cocaine alone [Office of National Drug Control Policy, 1988] to 375 thousand for cocaine and other illicit drugs (NAPARE, 1988). . . ." (p. 1). Fifteen percent of women aged 15-44 are substance abusers: 34 million consume alcohol, more than 18 million smoke cigarettes, and 6 million admit use
of illegal drugs [NIDA, 1989]. Experts caution that incidence reports of maternal drug use and infant drug exposure may be grossly underestimated.

Medical research indicates that children prenatally exposed to controlled substances may be characterized by a variety of behavioral deficiencies (Toufexis, 1991). Many behaviors common in an assortment of identified physiological disorders may be displayed by the children prenatally exposed; and yet other exposed children demonstrate few or no special characteristics. Factors such as time (trimester of maternal drug use) and duration (how often drugs were used) are being analyzed to assess the possible effects to the child's initial and later academic, physical, and psychological development. Children of mothers using drugs during first trimester of pregnancy often exhibit different characteristics than those children whose mothers used drugs during the last trimester. Children of mothers who used drugs throughout the major term of their pregnancy are often more involved medically than those children whose mothers were only occasionally users.

The cost to the public for dealing with these drug-exposed children is escalating: initially through increased medical costs for treatment of high risk infants, increased social service costs for foster care, nutritional funds, and maternal aid, and later through increased educational costs for school programs,
teachers, and administrative planning (Behrmann, 1990; Kelker, 1990; Rosen & Johnson, 1989; Saylor, 1991; Schydlower, 1989; Thompson, 1990). Many drug-exposed babies, of low birth weight, stay in the hospital almost five times as long as normal newborns (nine days versus two days) and their care is 13 times as expensive ($6,900 versus $522). The need and cost for foster care for these babies have stretched many cities' financial budgets. In New York City annual placements of drug-affected babies run to 3,500, compared with 750 before the spread of crack. The city's foster-care tab went from $320 million in 1985 to about $795 million in 1991. The increased placement of these children in special education programs will tax currently strapped educational systems. New York City plans to spend $765 million over the next ten years on special education for children exposed to cocaine. Boston expects a year of special education for one drug-exposed child to cost $13,000 compared with $5,000 for a child in a regular school (Toufexis, 1991).

Recently educational systems in both public and higher education arenas have been investigating possible effects that these children will have on existing programs. Many assume that the problems exemplified by some of these children will automatically place them within the reigns of existing special education programs that are currently defined in Public Law 94-142. Educational arenas have even less information than that
obtained by medical research due to the multitude of theories about the possible needs of these children and the various characteristics observed by different scientific branches. Schools and other educational institutions recently began to investigate programming options and strategies which might ameliorate the deficiencies that some of these children exhibit. Many of these strategies are merely more stringent versions of the programming techniques currently used: smaller teacher-to-student ratios, fewer transitions, and less interruptions. Few attempts have been made to research programming options to determine their success or to develop variations needed for the differing characteristics displayed by these prenatally drug-exposed children.

Several research studies have shown that babies prenatally exposed to drugs often display delayed language characteristics (Schneider, Griffith, & Chasnoff, 1989; Smart, 1991). Some children prenatally exposed are unwilling to permit bodily contact with others, including mothers and other family members. These children interact less with those individuals who are most likely to influence their language development; and therefore they speak less frequently and use less descriptive terms or positional terminology. Similar characteristics have been attached to children who were low birth weight, but rarely have
environmental causes for the language delays been found and prematurity is often labeled as the associated factor.

According to estimates (Pound, 1987), incidence of premature births in the United States ranges from six to eight percent of all births; approximately 250,000-300,000 infants whose gestational ages are less than thirty-seven weeks and birth weights are below 2,500 grams are born annually. While most of the premature infants exhibit normal development by age three, as many as twenty percent may continue to display difficulties ranging from mild forms of learning disabilities, muscular incoordination to severe forms of cerebral palsy, mental retardation, and sensory deficits.

Various risk factors may be associated with premature labor and delivery. Among these risks are maternal complications such as high blood pressure, placental problems, and cervical and uterine abnormalities. Other contributing factors of the mother include low socioeconomic status, poor nutrition, and drug and alcohol abuse. Due to the immaturity of the infants' organ systems, premature infants are particularly vulnerable to traumas during the prenatal and postnatal periods. Respiratory difficulties are common and pose a serious threat to the premature baby, since a diminished supply of oxygen to the brain tissue is a prime cause of brain injury and neurological impairment. Approximately thirty-five percent of all preterm
infants born in the United States each year suffer from respiratory distress syndrome (RDS) which leads to collapsed lungs.

Another potential problem for preterm infants is brain bleeding (Pound, 1987). Brain bleeding or intraventricular hemorrhage (IVH) occurs in approximately thirty percent of neonates under 1,500 grams. Premature infants between twenty-four and thirty-four weeks of gestation are particularly susceptible to IVH due to the immaturity and lack of protection of the blood vessels surrounding the ventricular system. Brain bleeds are classified from Grade I to Grade IV, depending upon their severity and extent; Grade IV bleeds are the most severe and are usually associated with serious neurological problems. Babies who had IVH may experience problems such as hydrocephalus, cerebral palsy, mental retardation, and hearing or visual impairment.

Premature infants are usually developmentally evaluated after age two for a more accurate score. When trying to determine the premature child's developmental level, one must subtract the number of weeks that the baby was premature from the chronological age. This means that a 6-month-old infant born at 32 weeks of gestation would more closely resemble a full-term baby at 4 months of age than a full-term baby at 6 months. The development of premature infants is similar to full-term
infants but at a slower rate. In general, the complications surrounding the birth of premature infants appear more likely than birth weight or gestational age to influence their development at 24 months of age. After two years, environmental variables (i.e., socioeconomic status, parent education levels, and quality of caregiver-infant interaction) have a significant impact upon the preterm infant’s development. Specific factors that were associated with the prediction of cognitive, language, and motor delays in preterm infants include lower SES, lower educational level of parents, and degree of prematurity.

The major developmental milestones of language for children with correction for degree of prematurity are listed below:

- Coos, squeals, and gurgles 3 months
- Babbles 6 months
- Imitates sounds in response to caretaker 7 months
- Recognizes name 8 months
- Appears to understand the meaning of "no" 11 months
- May have a 2-5 word vocabulary 12 months

In one report (Pound, 1987), 54% of all of the very low birth weight infants required special education or remedial services at school age. A higher percentage of premature children from lower SES families received special education placement.
Some medical personnel (personal conversations with Dr. James Mulick and Dr. Robert Arendt) have said that some drug-using mothers may deliberately take cocaine to induce early labors and that the effects their children exemplify are indicative of prematurity, not drug exposure (Hawdon, Hey, Kolvin, & Fundudis, 1990). Some drug-using mothers do have their children prematurely, but a larger percentage of drug-using mothers are able to carry their babies full-term. To research the possibility that the children exposed to drug prenatally resemble those children who had low birth weight but not drug exposed, a group of children who had low birth weight, but without prenatal drug exposure, will be compared with children prenatally exposed to drugs but not of low birth weight in the hope that we might identify interrelations, if any, between the language development for the two groups of children. Using the criteria provided by Dr. Blackman (1983) and/or mothers' self reports, students in this study: children who were of low birth weight but not prenatally exposed and children who were born prenatally exposed but not of low birth weight will be selected to participate as two comparison groups.

**Purpose of Study**

The purpose of this study is to assess and compare the effects of direct instructional strategies on the language acquisition behaviors of preschool children prenatally exposed to
controlled substances (cocaine/crack) and children who had low birth weight without histories of prenatal exposure to controlled substances. Language acquisition skills were selected because these and motor skills are most often identified as areas of deficiencies characterized in a majority of drug-exposed children. By assessing children who had low birth weight but without drug-exposure, we can compare the language acquisition skills of these children with those children prenatally drug exposed.

**Research Questions**

**Question One:** What are the effects of direct instruction on the improvement in language knowledge and usage for word categories such as: position words, size words, quality words, quantity words, and other identified words of children prenatally exposed to controlled substances or of low birth weight but not prenatally exposed to controlled substances?

**Question Two:** How does direct instruction effect the language development of children prenatally exposed to controlled substances in comparison with the language development of children who had low birth weight but not prenatally exposed to controlled substances?

**Question Three:** What are the reactions to direct instructional strategies for language development (social validity measurement) by
a) the students who were prenatally exposed to controlled substances and those not prenatally exposed but of low birth weight,

b) the teachers of those children prenatally exposed to controlled substances and those not exposed but of low birth weight, and

c) the parents of those children prenatally exposed to controlled substances and those not exposed but of low birth weight?

Terminology

All special terms used in this study are defined below.

**Children prenatally exposed to controlled substances:** children whose mothers ate, inhaled/snorted, smoked, or injected controlled substances (cocaine/crack) during the months prior to, during, and immediately after their pregnancy gestation months. These children will be selected from mothers' self reports of drug use during pregnancy.

**Cocaine/Crack:** white powder extracted from the paste prepared from the leaf of the coca bush; crack is an impure, inexpensive, free-base product made from cocaine (Pinel, 1990).

**Children of low birth weight but not prenatally exposed to controlled substances:** children whose birth weight was less than 2,500 grams (five pounds) and/or whose period of gestation was less than thirty-seven weeks. The size of the children is due to
incomplete development (Blackman, 1983). These children will be selected from mothers' self reports and medical documentation of birth weight.

**Language acquisition**: the behavior of getting/learning a code whereby ideas about the world are represented through a conventional system of arbitrary signals for communication (Bloom & Lahey, 1978). This code includes both expressive and receptive language dimensions such as phonology, morphology, syntax (form), semantics (content), and pragmatics (usage).

**Direct instruction**: the four defining characteristics of direct instruction are (a) complex skills should be task analyzed then systematically taught in small approximations to a specified mastery level; (b) student responses should be active rather than passive; (c) students should receive immediate feedback on the accuracy of their performance; and (d) the student and the teacher should have frequent direct interactions (Rosenshine, 1976).
CHAPTER II
REVIEW OF LITERATURE

This chapter reviews the literature on the medical and educational information concerning the characteristics of children prenatally exposed to controlled substances, specifically cocaine and crack, and children who had low birth weight but not prenatally exposed. Also included are educational research studies which focused on the language acquisition and development of the normal child who was not prenatally exposed nor low birth weight. The final section contains literature related to direct instructional strategies and how these connect to language development of children between birth and age four.

Issues Related to Children Who Were Low Birth Weight But Not Prenatally Exposed

First the definition of children born premature must be differentiated from that of low birth weight children. According to Blackman (1983), prematurity is determined by the gestation period of the infant. Any baby born with a period of gestation less than thirty-seven weeks is labeled premature; while low birth weight is determined by the weight of the child at birth. Infants of less than five pound or 2,500 grams at birth are judged
to be low birth weight (less than 1,500 grams are very low birth weight). The size of the children is due to the fetus's incomplete development in the womb (Blackman, 1983). Various factors may be given to account for the lack of normal development of the fetus (i.e., poor maternal nutrition, smoking by the mother during pregnancy, drug or alcohol use by the mother, and others) but in many cases one direct cause can not be proven. To select children whose birth weight is less than 2,500 grams (five pounds) is simpler than using the gestation of less than thirty-seven weeks. Often the gestation age is more difficult to obtain since many (drug-using or drug-free) mothers are unlikely to provide accurate conceptual information required to determine gestation.

Demographics. Due to significant advances in prenatal care, more very low-birth-weight infants are surviving than in the past. These infants are not without their problems; many have neurodevelopmental impairments. Most research reports only ten to eighteen percent of these children have severe neurological and/or intellectual handicaps whereas over fifty percent of them exhibited problems in the past (Teplin et al., 1991). A study (Hack et al., 1991) which targeted children with low birth weights attempted to assess the effects of low birth weight and subnormal head size on the cognitive abilities of these children at school age. All of the children involved in this study were eight to nine years of age and had birth weights of less than 1,500 grams and subnormal head sizes. A structured interview
was administered to the parents, usually the mothers, concerning the family demographics; and periodic physical examinations were made on the children to determine body weight and head circumference growth. Of the 249 student sample, six percent were mentally retarded, nineteen percent had borderline IQ scores (70 to 84), and seventy-four percent had normal intelligence (IQ of 85 or higher). Forty-eight of the children had major neurosensory abnormalities, cerebral palsy, Tourette's syndrome, or severe hearing loss. Thirty of the children with very low birth weights had subnormal head circumferences at birth due to intrauterine brain growth failure. The study showed that there was no association between head growth and the demographic characteristics provided by the mothers. Children whose head circumference at eight months was subnormal had significantly lower verbal and performance intelligence scores at eight years of age than those with normal head size at the same age. Even after controlling for demographic differences and physical abnormalities, the children with small head circumferences had a significant effect on verbal and performance IQ scores, receptive language skills, and speech, reading, and spelling aptitudes. Head circumference has been found to correlate with brain volume and weight during infancy and early childhood. This study also mentioned that the overwhelming effect of disadvantaged socioeconomic status may suggest that environmental enrichment
may have a role in improving future outcomes of these children once they enter school.

In Japan, a research study (Sugimoto et al., 1990) was done to determine which of various factors (i.e., weeks of gestation, birth weight, head circumference) might influence whether an infant would be mental retarded. The terminology for low birth weight infants in Japan is "small-for-date" infants, and includes those infants whose gestation age is less than thirty-seven weeks and birth-weight is less than 2,000 grams. Over two hundred babies were longitudinally assessed on mental development at eight different ages: 4, 16, 28, and 40 weeks, one year, 18 months, 2 years, and 3 years. The babies ranged in birth weights from 1050 to 3200 grams, and gestational ages from 29 to 42 weeks. The results showed "the apparent retardation of mental development would be defined with the ADQ [average development quotient] below 80 (pp. 243 )." The development quotient is a numeral representing the developmental performance age of the infants. The average development quotient is the mean level of performance obtained for each infant after totalling the scores from five of the assessments given before age two. Infants with gestational ages less than 31 weeks, birth-weights less than 1,500 grams, and body lengths at birth less than 40 cm have a higher probability of being retarded. (Petersen et al., 1990)
Medical Research. In a study done in Denmark (Petersen et al., 1990), three groups of children were selected for evaluation. The first group included children whose birth weight was equal to or less than 1,500 grams (VLBW), the second group of children's birth weights were between 2,300 and 1,501 grams (LBW), and the third group of children were normal birth weight (NBW) (greater than 2,500 grams). All children were given physical examinations, visual tests, neurological examinations and psychological tests by a psychologist and a pediatrician. The findings showed the VLBW children were shorter in stature and weighed less, and they were also more likely to have significant clinical abnormalities (i.e., cerebral palsy, blindness, hearing loss, retardation, and congenital diseases) than the other two groups. The VLBW children scored lower than the LBW and NBW children in motor functions. On the McCarthy test, the most affected scales were perceptual performance and motor with a higher percentage (95%) of the VLBW scoring lower than the LBW (89%) or the NBW group (82%). General cognitive tests, motor developmental phase, and pegboard were the three fields which showed the most score differences. Very low birth weight, poor parental sensitivity, and male sex were the variables which were associated with the outcome measures found in this study. Birth weight increases the "risk for major neurological and motor deficits, visual-motor integration and mental deficits, physical
problems, and emotional and social difficulties at four years of age” (Petersen et al., 1990, pp.552).

Characteristics. In a recent study, children born premature (2,300 grams or less) from Wisconsin were compared with children born premature (1,500 grams or less) from Copenhagen to determine the relation between prenatal conditions and developmental outcome (Ellison et al., 1991). In this study the demographic information about the children's parents was obtained for comparison with the information of the children's developmental measures. Several assessments, McCarthy and Vineland scales were used with the children after birth. Children were eliminated from the study if they had cerebral palsy or mental retardation, later several children displayed differences which were attributed to respiratory difficulties at birth. The results of the study showed that the differences between the two groups were not directly comparable since several medical practices in the treatment and delivery of premature newborns may affect the children's outcomes. Copenhagen had an increased use of the respirator and more frequent Cesarean sections with small, young infants than in Wisconsin. The Copenhagen children who were given more aggressive respiratory therapy during infancy were associated with better verbal skills on later assessments. While there was also a correlation between degree of prematurity and verbal skills in the Wisconsin children; the younger, low birth weight infants had better verbal skills.
Parental education appeared to have a greater impact on outcome in the Wisconsin children, even though the education in years of both groups of parents was quite similar. The final conclusions reached in this study were that premature babies do better when they are in good condition at birth and that prevention of prematurity or lengthening of gestation remains the key to the prevention of neurodevelopmental deficits.

In a study by Hawdon and his colleagues (1990), low birth-weight (referred to as "light-for-dates") children were assessed at the ages of ten and eleven to determine if they had reduced school performance and/or are associated with widespread impairments. The setting for this study was Newcastle, England and the students were all males who were in the highest risk group due to very low birth weights. A matched group was used to control for socioeconomic status, age, and single parenthood. Assessments were made with each of the children, and with their mothers and teachers who completed temperament or behavioral questionnaires. Since all students were from low SES families, environmental factors were not demonstrated to have any significance between the groups. Biological factors which did have a significant impact on the children's birth weight were maternal smoking during pregnancy, maternal height, fetal distress and obstetric intervention during labor. The authors found few differences between the groups relative to intelligence and school performance; but did note that the lower the birth
weight, the more probable the chance for decreased school performance. Lower verbal and full-scale IQs were reported for the low birth weight students, but the scores seemed to correlate with socio-economic factors and therefore were not significant. Finally the low birth-weight children appeared to have more reported hyperactivity as determined by parental and teacher evaluations. One reason given for the lack of significant differences in the intellectual outcomes of the low birth weight children may be due to improvements in prenatal care in the recent years. This is true overall, but low SES mothers are still more likely not to receive improved prenatal care.

**Educational Implications.** One study was conducted with children who had been admitted to the neonatal intensive care unit of a hospital specializing in infants and children (Breslau, Klein, & Allen, 1988). These children, born with a birth weight of less than 1,500 grams, were studied from birth to five years of age. At age five the very low birth weight (VLBW) children were matched with a comparison group of full-term classmates on a behavioral assessment. The findings of this study showed that VLBW males manifested more behavioral disturbance and poorer social competence than matched full-term males; while VLBW females were indistinguishable from full-term females. Academically, the VLBW students scored lower on intelligence and visual motor tests than the full-term students. These results were qualified by the authors as possibly reflecting the lower
social class of the VLBW children and not the VLBW, per se. There was also evidence (Breslau, Klein, & Allen, 1988) that LBW children are more likely than other children to be over-protected by parents, a tendency that might retard the children’s social development. As far as the sex differences are concerned, the authors suggested that VLBW males have an increased risk for behavior problems as a result of their higher rate of prenatal complications, particularly those complications that cause neurologic abnormalities. Finally, the authors pointed to research indicating that the cognitive development of premature children was more affected by environmental factors than that of full-term children. This evidence might suggest that first, VLBW children might be more susceptible than other children to hazardous social environments; and second, the reverse that VLBW children’s potential for improvement in response to beneficial environments. Early interventions might seem to be the answer.

In a study by Klein, Hack, & Breslau, (1989) VLBW infants, who were neurologically intact and had normal IQs, were selected for a comparison of their cognitive abilities and visual-motor functions with those of their matched full-term classmates. At age five all of the children were given several assessments including Slosson Intelligence Test, Woodcock-Johnson Psycho-Educational Battery Preschool Scale, and Beery Developmental Test of Visual-Motor Integration. The results of the Slosson
showed the two groups did not differ significantly on intelligence scores. While there were significant differences on the Spatial Relations sub-test of the Woodcock-Johnson which showed that VLBW children had difficulties in identifying part-whole relationships by matching parts of figures that comprise the whole. The Beery Test also revealed significantly poorer visual-motor functions by VLBW children than their control classmates. An important conclusion of this study was that even those VLBW children with normal intelligence and no overt neurologic abnormality are functioning significantly less well on visual-motor and visual-perceptual measures at preschool when compared with matched classmates. The problems identified in this study also served to highlight the need for early intervention programs to monitor children who were preterm infants into the early grades.

Another study (Teplin et al., 1991) reported similar findings using extremely low birth weight (ELBW) infants assessed at age four and again at age six. The children's parents and teachers were also questioned concerning the children's behaviors at home and school, attention span, academic performance in school. The findings indicate that more ELBW had moderate to severe neurologic problems compared to the full-term controls. Some of the ELBW infants had lower mean scores on the Kaufman Mental Processing Composite; but this was related closer to the mothers' educational levels than to the children's birth weights. Similar
findings were true for children's lower scores on visual-motor function, visual-perceptual abilities, and attention span. A significant number of ELBW children had no severe disabilities, but many had dysfunctions likely to affect learning and behavior in school.

Two studies by Klein and her colleagues were done with children who were very low-birth-weight (VLBW) (Klein et al., 1985; Klein et al., 1989). In the first study, children who were under 1,500 grams at birth were selected at age five and neurologically assessed. The Stanford-Binet indicated that most (N=65) of the children had normal IQs (greater than or equal to 85) while the rest of the children (N=15) were neurologically abnormal or below 85 IQ. Only forty-six of the "normal" children were matched with full-term, normal weight classmate controls who were age five, single births, and enrolled in preschool. The children were also matched by race, sex, and family backgrounds. Various assessments such as the Slosson Intelligence Test, the Woodcock-Johnson Psycho-Educational Battery, and the Beery Developmental Test of Visual-Motor Integration were used with both groups of children. No significant differences were found between the VLBW children and the controls on IQ, however VLBW children performed significantly less well on the Spatial Relations subtests of two the tests. The conclusions given in this study referred to similar findings in other studies with VLBW children. Ocular abnormalities were not found to cause the
visual-motor deficits showed in the assessments; minimal brain damage due to disturbed brain cell growth were postulated to cause the visual-perceptual difficulties in children who were preterm infants.

In the second study (Klein et al., 1989), 65 VLBW children were matched with 65 children of normal birth weight for race, sex, age, and social class. Both groups of children were assessed on measures of IQ, cognitive, visual-motor and fine motor abilities, and academic achievement at age nine. Using the WISC, Bender-Gestalt, Purdue Pegboard, subtests of the Woodcock Johnson Cognitive Abilities Battery, and reading and mathematics achievement, all of the children were tested. This study resulted in three major findings when compared with the full-term children: 1) the VLBW children scored significantly lower on those tests measuring general intelligence, 2) the VLBW children scored significantly lower on tests of academic achievement, and 3) the deficits in math achievement for the VLBW children were not a function of IQ. The VLBW children scored lower on tests that involved visual or spatial skills, whereas tests that required auditory rather than visually mediated skills showed slight, but not significant differences between the VLBW and control children. In the academic assessments, VLBW children had greater differences in mathematics than reading than their controls. VLBW was associated with a significant lag in math achievement only, and only slight, non-significant differences in
the reading domain. The math achievement lag was found to be independent of the VLBW children's IQ scores.

These findings were consistent with those reported previously, indicating that VLBW is associated with deficits in a wide range of abilities. Information gained from both parents and teachers of VLBW children report than these children are more likely to repeat a grade level. It was revealed that the most common descriptions of school problems were inadequate skills and behaviors such as impulsivity, difficulty attending to tasks, following directions, and concentrating. These types of behaviors have been reported previously to be associated with learning disabilities and school failure. Because both of these studies matched the VLBW children with normal weight controls on social class, the concern that the observed cognitive deficits in VLBW children are a function of social class was not demonstrated. The performance of the VLBW children was deficient to controls regardless of their parental social status.

**Educational Programming.** Specific educational programs have not been advocated for children who were born premature or had low birth weight. The programs that have been utilized with this population are the same as those used with children of normal birth weight. The need for early intervention programs, especially to provide information and support for parents, have been suggested by researchers in this field (Petersen et al., 1990; Ellison et al., 1991). Parental sensitivity was an overriding
factor which was found to influence outcome measures of low birth weight infants. Many LBW children are often placed in classes for children with learning disabilities. Motor and language development delays are just a few of the problems which are possible in LBW children. The deficiencies suggest that the LD program might provide the individual instruction needed by children at risk due to low birth weight (Klein et al.; 1985; Klein et al., 1989). Early intervention strategies include infant stimulation which should be both home-based and school-based. Parental involvement as much as possible is suggested to provide stability and consistency throughout the child's day. Support groups initiated in the schools also allow the parents a chance for peer counseling and practice in developing coping skills (Pound, 1987).

Behavior management strategies useful with children having behavioral problems have been suggested. LBW children, especially males, exhibit behaviors such as attention deficit disorder (i.e., distractibility, poor attention, and high activity) and hyperactivity (Breslau et al., 1988; Hawdon et al., 1990). More structured activities may provide the restrictions necessary to allow learning to occur. Remedial education and supportive environments during the early years have the potential to minimize the children's long-term deficiencies resulting from low birth weight.
Summary. Very low-birth-weight infants, due to modern medical technology, are now school-aged children who have been found to be at risk for learning and behavior problems in addition to neurodevelopmental delay. These school-related problems are manifested as subtle motor, visual-motor, perceptual, language, and reading difficulties often accompanied by inappropriate classroom behavior. School performance outcomes may have been influenced by the predominantly lower socioeconomic status of many VLBW populations.

Educational programming focuses on enriching children's language and perceptual experiences to provide for academic growth and physical maturity. Some of the procedures which have been advocated have been successful with populations of children who had low birth weight. The language and motor difficulties which characterize some children prenatally exposed may resemble those children born premature.

Issues Related to Children Prenatally Exposed to Controlled Substances

Children prenatally exposed to drugs do not fit any one profile. The short and long-term effects on the children will vary according to the circumstances of each child's pre- and postnatal experience (Carta et al., 1991; Tabor et al., 1990; Weston et al., 1989). The medical research concerning babies born to mothers who used cocaine during part or all of their pregnancies is usually discussed "ex post facto." Experimental research with this
population is not ethically, morally or legally an option, so most information has come from research with children already exposed and based on mothers' self reports of drug use during the pregnancies.

**Demographics.** The Committee on Substance Abuse (1990) published a statement which outlined several implications for the pediatrician, and for health care personnel in general. A list of recommendations were given which, if followed, would assign various responsibilities to different medical professionals and child care agencies for identifying and treating both the mothers and the children. A few of the recommendations listed included a) community-based social or child protective service systems to provide essential services for drug-abusing women and their children; b) comprehensive medical and psycho-social history, including maternal drug use as a part of every newborn evaluation; c) multidisciplinary treatment and support for the affected mother, child, and family when a drug-exposed infant or drug-abusing mother is identified; d) ongoing care for children who demonstrate no adverse effects of drug exposure at birth but may have potential long-term consequences later; and e) allocation of funds for research, prevention, and treatment to address issues of drug-exposed infants. The second part of this paper, the comprehensive medical history, is related to the issue of demographics. Often medical personnel are lackadaisical about administering drug screening tests to pregnant females and may
not have complete maternal histories on which to diagnose possible drug use. The need for more comprehensive information of all mother-to-be must be made a legal requirement to assure accurate estimates of the amount of children possibly affected.

In a paper by Feig (1990), demographic figures were collected and reported. The typical cocaine-using mothers were not young, teen females, rather they were older women, between eighteen and thirty-five. In Massachusetts, for example, 72% of pregnant addicts were not first time mothers and their average age was 24 years old. Income or economic status and racial characteristics are not excluding factors. The women are from all social economic groups and include all racial and ethnic groups. The females who tested positive for drug use in a Florida study, 15.4% were white and 14.1 were black, regardless of socio-economic status. The following data were the 1989 estimates of pregnant women who tested positive for drug use at the time of birth: San Francisco 7% (85% of these were crack) Philadelphia 16% Milwaukee 10-15% Washington, D.C. 7.5%

These numbers are based mainly on public hospital records which are more accessible to study, although drug treatment centers are reporting increasing numbers of women coming from private hospital referrals.
Medical Research. Although a limited amount of research has been done on non-human subjects, doctors have shown that maternal use of cocaine can have different effects on the developing fetus. In their study with rats, Hutchings, Fico, & Dow-Edwards (1989) found that female rats (dams) who were administered cocaine during the last two weeks of gestation had offspring which showed significantly lower birth weights and heightened motor activity than non-treated controls. The cocaine administered dams decreased the amount of food and water intake and had a corresponding decrease in weight gain; their infants as a result had lower birth weights.

Several studies have been done which report the effects of prenatal exposure of cocaine/crack on children showing, retarded brain growth (Little & Snell, 1991); intestinal disorders (Porat & Brodsky, 1989); congenital anomalies (Hannig & Phillips, 1991); and various other adverse effects (Smart, 1991; Arendt et al.; in press). Little and Snell (1991) reported less fetal growth among infants born to mothers who used cocaine during pregnancy. In this study the authors had three groups: (a) infants born to mothers who used cocaine, (b) infants born to mothers who used neither alcohol nor cocaine during pregnancy, and (c) infants born to mothers who used alcohol but not cocaine during pregnancy. They found that there was a significant difference in the head size between those infants exposed to drugs and those not exposed; but no difference between the drug exposed and the
alcohol exposed infants. This suggests that cocaine-exposed infants may be characterized as having asymmetrical growth retardation similar to alcohol-exposed infants.

Porat and Brodsky (1999) found that maternal cocaine use lead to increased abdominal distention, bloody stools, vomiting, or residuals. They noted that prematurity was the most significant risk factor occurring in 90% of the infants. Hannig and Phillips' (1991) research was a case study of a 29-year-old white woman who delivered a boy with defects of the upper limbs, a small head circumference, and low birth weight. Since the maternal family history was negative for any of these birth defects, a diagnosis was made that the maternal cocaine use was the most probable cause.

Lester et al. (unpublished report) studied 80 cocaine exposed and 80 control infants who were similarly stratified on maternal demographic characteristics and maternal substance use. The results demonstrated that excitable cry characteristics were related to the direct effects of cocaine while depressed cry characteristics were related to the indirect effects of cocaine secondary to low birth weight. The cocaine exposed infants cried for longer duration, with a "higher fundamental frequency, higher . . . and more variability" in the frequency of crying (p. 12). These infants also cried with a longer latency, fewer utterances, lower amplitude and more dysphonation (defective use of the voice). Consistent with other research findings, these cocaine exposed
infants had a lower birth weight, shorter length and smaller head circumference than the unexposed controls (Lester et al., unpublished report).

Dominguez et al. (1991) found brain and ocular abnormalities in ten infants with prenatal exposure to cocaine and other street drugs in their study. All of these infants were found to have been exposed to the drugs during the first trimester of gestation while four of the infants were exposed throughout most of the pregnancy. While the brain is normally developing, the introduction of drugs into the mother's body results in lesions in the fetus' brain. These lesions then lead to various vision problems (i.e., inadequate visual fixation, exotropia, esotropia, absent upgaze, and blindness) when the child is born. The findings suggest that brain abnormalities observed in these infants are consistent with the known developmental patterns of drug-free infants. As the fetus is developing, the drugs introduced in the mother alters the normal growth patterns in the fetal brain.

Dr. Leandro Cordero and Marcia Custard (unpublished paper) reported that "it is well documented that maternal cocaine exposure can result in fetal loss, preterm labor and delivery, abruptio placenta and intrauterine growth retardation. (p. 2)" The authors also mention that "other complications affecting these infants include congenital malformations, seizures, behavioral disorders and an increased incidence of sudden infant death syndrome. (p. 2)" In this report, the authors sought to record
infant outcomes based on maternal drug histories and demographic characteristics. Associated high risk factors present in the cocaine abusing women suggested that cigarette smoking, obesity/underweight, and alcohol use are the major factors which increase the risk of adverse fetal outcomes. The 68 infants born to these mothers had intrauterine growth retardation at a significantly higher rate (prematurity was also noted but found not to be significant) than normally occurring in the 66 infant sample of general population. A one year follow-up of the identified infants found that only 39 original children could be located, and only five of these were developmentally delayed, three died of SIDS, and 31 were healthy. The rather low rate of adversely effected children may partially be the result of the prenatal medical care that all of the targeted mothers received through this study. Prenatal medical care is not normally characteristic of mothers currently using cocaine and other drugs.

Chasnoff and his colleagues (1987; 1989) found that there were differences among children exposed prenatally to cocaine. In the first study, Chasnoff and associates (1987) recorded the results of two groups of infants: (a) those born to women who either intranasally, intravenously, or by freebasing used cocaine in the first trimester or throughout the pregnancies, and (b) a comparison group born to women addicted to heroin but on low-dose methadone maintenance for at least the last two trimesters
of their pregnancies. The results showed high incidence of infectious disease complications, especially hepatitis and venereal disease, which increased the complications of labor and delivery in the cocaine-using women as compared to the heroin/methadone-addicted women. The infants of these cocaine-using women showed a significantly increased degree of irritability, tremulousness, and state lability than did the infants delivered to methadone-maintained women. These characteristics of the cocaine-exposed infants interfere with the ability of the infant to interact with or respond to the caregiver. The caregiver then becomes more passive in attempts at interaction, and thus a cycle of increasing passivity by both infant and caregiver escalates. The cocaine-exposed infants also exhibited increased incidence of physical malformations such as prune belly syndrome, groin hernias, and cryptorchidism (failure of one or both testes to fall) than the methadone-maintained group.

In their second study, Chasnoff et al. (1989) identified a population of infants whose mothers used cocaine and another group of infants whose mothers were heroin addicts, but now used low-dose methadone maintenance therapy during the first and second trimester. The focus of this study was to assess respiratory pattern abnormalities which might increase the infants' risk for Sudden Infant Death Syndrome (SIDS). This research found that "prenatal cocaine exposure appears to be
associated with an increased frequency of cardiorespiratory pattern abnormalities" (pp. 586), more so than infants with mothers who were heroin addicted, and now methadone maintained.

A similar study by Oro and Dixon (1987) identified infants whose mothers screened positive for cocaine, methamphetamine, and cocaine plus methamphetamine, and infants of drug-free mothers. Each of the infants was tested to determine any adverse prenatal outcomes resulting from drug exposure. The research findings showed an increased rate of early spontaneous abortion, hypertension, and vasoconstriction in infants with all three drug exposures. Intrauterine growth retardation and smaller head circumferences were evidenced in more significant amount for the three drug exposed groups than drug-free infants. Research (Frank et al., 1990) which supports the findings by Oro and Dixon (1987) found that cocaine use by pregnant women "alters nutrient transfer to the fetus and fetal metabolism" (pp. 625). The intrauterine growth retardation and smaller head circumference may be the result of the fetus not getting the necessary nutrients in vitro and/or the fetus not processing the nutrients required to stimulate growth of body fat.

Perhaps the most alarming results were reported in an article by Dixon and Bejar (1989) who used cranial ultrasonography to contrast cocaine-exposed and drug-free yet clinically ill children. The type, location, and distribution of
lesions in cocaine-exposed children indicated that symptoms suggesting neural damage may not be clinically evident in infancy or early childhood; but may become evident only after the first few years when more complex visual-motor and social cognition tasks are required of the preschool and school-age child. They stated that even among the drug-exposed "normal" neonates, there is the possibility for abnormal neurologic, cognitive, and behavioral development as the children approach school age.

The Center for Early Education and Development published a Fact Find sheet (1990) which listed several possible damaging effects for each early developmental stage for drug exposed children. Cocaine can be more damaging to unborn babies than it is to their mothers. For the mother, there is a brief high and the drug effects are over within about 48 hours. However, the drug may remain in a concentrated form in the fluid surrounding the fetus for sometimes four or five days; thus continually exposing organs and body systems to the drug throughout the baby's development. The damage is most severe during the first trimester when the organs are just developing. There is increased probability for effects such as blood vessels in the brain bursting thus causing prenatal strokes, malformed kidneys and limbs, digestive and nervous system damage, and deformed hearts and lungs.

**Relative Effects.** Bauer (1991) mentioned several characteristics of cocaine-exposed infants and children that she
found in the literature. First, the most frequently reported characteristic is low birth weight or prenatal growth retardation. Several studies have reported similar findings concerning the growth patterns of these children and their related problems of delayed cognitive, motor, and perceptual performance through three to seven years of age. Neurobehavioral abnormalities such as explained "jitteriness" was seen in approximately 10% of the children prenatally exposed (Chasnoff, 1989; Hadeed & Siegel, 1989). Physical abnormalities such as microcephaly (Hadeed & Siegel, 1989) and malformation of the limbs (Bingol et al., 1987). Limb defects such as absence of arms below the elbow, missing digits, or missing forearm bones was observed in 7 of the 10 infants in one study (Hoyme et al., 1990).

Smart (1991) provided tables which listed various research studies concerning the frequency of crack use, adverse reactions by drug users to crack, and adverse reactions to crack in the offspring of the drug users. The four studies about the offspring of users were detailed which provided the diagnosis and symptoms of these children. In the first study, the children exhibited drowsiness, unsteady gait, and seizures. Tremulousness, irritability, and muscular rigidity were symptoms which characterized the children in the second study. Crack-using mothers, in the third study, more often had early deliveries and their infants had growth retardation, smaller head circumference, and ruptured membranes than those mothers who
did not use drugs. Finally in the last study, three children died due to battering by crack-using adults (presumably family members). Each of these studies plus others address the medical concerns for these prenatally exposed children.

**Characteristics.** At present, there is no clear set of guidelines to characterize children prenatally exposed to cocaine/crack. Prenatal factors that may contribute to the adverse effects of prenatal drug exposure include genetic characteristics of the mother and child, poor maternal nutrition, inadequate prenatal care, and the amount of cocaine the mothers used, the pregnancy trimester during which the mothers used drugs, the length of time during the pregnancy that the mothers used drugs, and the multiple drugs and other toxic substances such as nicotine that the mothers ingested. Several reports have been written based on research and observations outlining these characteristics (Howard et al., 1989; Cordero & Custard, unpublished report; The Juniper Gardens Children's Project, 1991; NASDSE Action Seminar, 1989). Many of these reports are founded on maternal self-reports, since empirical research is impossible using experimental manipulation of drug use as a factor in detecting fetal effects.

During the first years of life, cocaine increases the infants' susceptibility to weakened immune system and abnormal respiratory system causing chronic colds and infections, increased probability for Sudden Infant Death Syndrome, impaired
muscle development, disfigurements such as missing fingers or limbs, and infections from mother's sexually transmitted diseases. Social and emotional problems can also be evidenced. Many infants are irritable and jittery; they scream and are inconsolable one moment and fall asleep the next. Since these babies must be left alone if they are to remain calm, yet alert, they lose learning opportunities with their caregivers who are often afraid to engage the children in any activity which might upset the unstable, emotional states of the child.

Adler (1991) cited research by Lester and colleagues (unpublished report) where it was observed that normal-weight cocaine-exposed infants "had cries that were longer in duration with higher frequency and more variation" while low birth-weight cocaine-exposed infants "had longer time between stimulus and cry, fewer cry utterances and lower amplitude" (pp. 8). The possible reasons why the babies had different cry patterns became more significant than the differences in cry patterns. The normal-weight babies' crying was probably due to increased respiratory effort, and tension and constriction in their upper airways, direct effects of the cocaine. Whereas the low birth-weight babies' crying was associated with depressed behavior, indirect effects of the cocaine reducing the amount of blood and oxygen moving through and to the fetus. Lester explained his comments by saying that "whether a cocaine-exposed child is affected directly or indirectly, and to what
degree depends on the mother's usage patterns. (p. 8)" Some children may experience severe effects of the mother's drug usage and others may appear fine with characteristics that are transient in nature.

The Juniper Gardens Children's Project reported recent research findings which were compiled by the United States House of Representatives (1989) that suggest that children exposed to cocaine in utero are at greater risk. During the prenatal stage, the fetus may have intrauterine growth retardation and reduced brain growth, anomalies and malformations of the heart and urinary tract, strokes and cerebral infarctions, and exposure to sexually transmitted diseases including HIV infection. While during the infancy stage, the child may experience irritability, movement and sleep disorders, altered state regulation, fine motor deficits, emotional lability, poor attachment to caregiver, distractibility, and mortality in infancy. Inability/unwillingness in responding to mothers, difficulties in engaging or consoling cocaine-exposed infants, and unpredictable fluctuations in emotional responses were also by Chasnoff (1989) in his research. The effects of cocaine can not be assumed to only be observed in the young infant and then disappear once the child reaches school age. The long term effects on prenatal exposure must now be studied to determine how they will impact our schools.
**Educational Implications.** Researchers recently have begun to determine what effects, if any, these medical problems will have on the academic abilities and the existing educational programs for these children. Once these children reach preschool and early school years, the effects of cocaine exposure is demonstrated through negative interactions with peers and teachers, and other school problems. These children are often hostile, aggressive, and non-communicative with other children. They have memory, attention, and perception problems. They are easily distracted and frustrated, hyperactive, and have organization difficulties. Drug-exposed children score lower on structured developmental tests (Howard et al., 1989; Rees-Potter; 1991). Significantly lower scores have been recorded in research studies involving free play situations (Howard et al., 1989).

Some researchers have proposed a theory which states that drug exposed children currently have been identified and labeled as behaviorally disordered (Bauer, 1991), learning disabled, and attention deficit/hyperactive disordered (Fox & Forbing; 1991). In the Bauer article, the author reviewed the literature on children prenatally exposed to drugs and presented the implications for programing those children identified as behaviorally disordered. The impact of drugs on the children is seen as two-fold. First, the neurological damage of the infants exposed to drugs in utero can manifest as congenital
abnormalities, growth retardation, neurobehavioral abnormalities, and chemical dependence. Second, the children are forced to survive in an often chaotic family environment, either with their biological families or in a series of foster care situations. The effects of drug environment on children have been listed as lacking normal patterns of interactions between parent and child, dealing with abusive parents or other caregivers, living unprotected within the violent lifestyles of drug users, and learning to discriminate the inconsistencies of maternal behavior if mothers are still using drugs.

In the Juniper Gardens Children's Project report, children prenatally exposed to cocaine are at risk by preschool age to continued irritability, poor impulse control, less goal-directed behavior, insecure attachment to caregiver, distractibility, low tolerance for frustration, difficulties with expressive language, impaired play skills, poor self-regulation, and learning difficulties. This report also contained a rationale to account for the range of effects (profound to nearly nonexistent) on the drug exposed child. It is believed that early research (Jones & Lopez, 1988; NASDSE Action Seminar, 1989) explained the effects on the children as the result of a continuum of maternal factors which included: (a) the educational and health status, as well as the lifestyle variables, of the mother before, during, and after pregnancy; (b) frequency of use, dosage, and type of drug(s) prior to conception; (c) drug-induced complications during labor and
delivery; and (d) transmission of drugs to the fetus and later to the infant during breastfeeding. These possible causes may produce varying degree of effects on the infants; but the more important area for research is what can be done to effect a change in predicted outcomes for these children. Jones & Lopez (1988) reported that although researchers and clinicians have observed differences between drug-exposed and non-exposed children, they have trouble describing these differences. Standardized measures for identifying these traits is proving to be ineffective with this population, since children prenatally exposed may have problems with organizational processing or may know answers at one testing session and not another. Additional tools need to be developed to standardize recordings of the neurobehavioral effects now observed, but not reported.

Disorganization in interacting with environments was noted by Howard (1989). The researchers observed that these children demonstrated low average scores on developmental scales, especially in the areas of unstructured free play situations which require self-organization, self-initiation, and independent follow-through. The children showed significantly less representational play, instead they scatter, bat, pick up and put down toys in a haphazard fashion. How can this information be actualized into programming for these children? Will school systems have to develop new educational strategies and behavior management plans to deal with the list of possible disabilities of
these children? These are but a few of the questions being asked and that researchers are beginning to study. The task now is to use the information known and to determine what can be done with it.

**Educational Programming.** How does this information translate to educational programs? Several authors have written responses to this question. Van Dyke and Fox (1990) suggest that with the increasing numbers of crack, cocaine, and polydrug use, there will be a significant increase in the number of children with behavioral problems, learning problems, and attention deficit disorders. The educational systems must begin to anticipate the additional services these children may need. Rist (1990a & 1990b) maintains school districts must develop early identification strategies in collaboration with hospitals, and child-protective service agencies. She also suggests that administrator plan for lower teacher-child ratios, more stable and secure learning environments, and teacher-child assignments for more than one year. Teachers may need to change from tradition and foster warm, strong relationships to assist these children in forming attachments.

In the article by Fox and Forbing (1991), the authors listed several overlapping characteristics and symptoms of drug using children and children with learning disabilities, as well as characteristics of children prenatally exposed to controlled substances. Those behaviors which exemplified drug use and
those of learning handicaps were noted. The authors proposed that the similarities between the two groups have caused several students to misdiagnosed and also that these characteristics are similar to those observed in children prenatally exposed to various drugs. In addition, children prenatally exposed to drugs may have a greater risk for later substance abuse. It is not possible to determine which of the behaviors are due to the children's prenatal exposure and how much to their home drug environments. Preventive measures that should be taken were the major focus of this article, and several strategies and programs were suggested. Support groups, peer counselors, relaxation and stress management were a few of the options presented. Accurate assessments of the children's behavioral and medical histories, including drug use by parents and child, and trained, qualified personnel were advocated for these children. "It is predicted that when these children reach school age, many will exhibit learning and behavioral problems. . . [and] the implications for diagnosis and remediation need to be examined (pp. 26)." The authors' discussion concerning the possible misdiagnosis of children prenatally exposed to controlled substances may have major implications on the education systems who must serve the children's needs. The question of placement for children prenatally exposed may be influenced by factors which have similar outcomes, but different beginnings. Is the children's behavior due to their drug use or their mother's? One of these
may be remediated through rehabilitation and other drug programs while the other may require compensatory and specialized programs (Ohio Task Force, 1990).

Similar suggestions are given by Chasnoff (NAPARE Conference, 1991) who points out that "the drug-exposed children will require a structured learning environment and patient, one-to-one attention from teachers and caregivers in order to achieve their maximum learning potential. We foresee that many of these children will end up in special education because the standard classroom will not provide the environment they need."

Differences also have been noted in test-taking behavior (Griffith, 1989). These children were found to "perform adequately on highly structured tests, but poorly on tasks that require them to ignore stimuli. (p. 14)" The standardized tests administered to cocaine-exposed children often show no difference from drug-free children; but in a recent study comparing normal children with cocaine-exposed children, Chasnoff and Griffith (1992) noted two differences. Cocaine-exposed children had difficulties on the items that measured beginning language development and the ability to sustain an activity in the face of distractions. Griffith stated that "in terms of intervention, the cocaine-exposed children responded well to the same sort of help that other children would receive for similar developmental problems. . . It's not a new breed of child" (Adler, 1991, pp.8).
Several school systems and agencies have begun to address the possible implications that children prenatally exposed may have on educational programs. Although there was a scarcity of empirical research on which these publications are based, the information provided does give classroom teachers a resource for strategies being tried in various parts of the United States. The papers summarized below include procedures commonly used in many general and special education programs.

Los Angeles Unified School District published "Today's Challenge: Teaching Strategies for Working with Young Children Pre-Natally Exposed to Drugs/Alcohol" (July, 1989). This publication provides a list of protective factors which should be built into a classroom for these at-risk children. The list included concerns such as (a) respect for the children by nurturing adults who do not make unrealistic demands and who are a constant presence; (b) routines and rituals in classroom schedules and staff; (c) observations and assessments continuously throughout the school day to allow for better understanding of how the child interacts with peers, adults, and activities; (d) flexible room environment in which materials and equipment can be altered to reduce stimuli or to enrich the activity; (e) transition time plans which are considered part of the day's schedule and therefore should be prepared to instruct the child to prepare for and cope with changes; and (f) the adult:child ratio which is small enough to allow for plenty of
individual attention, and yet large enough to promote interactions with others. Specifically, each of these areas provided strategies which should be incorporated into teacher training programs to prepare teachers to adapt existing programs and strategies for the children prenatally exposed. Teaching strategies were organized into five basic subjects: learning, play, social/emotional, communication, and motor. Each of these subject areas was then divided into three columns. The first column listed those behaviors that characterize the "normal" child's development, while the second column had those behaviors characteristic of the at-risk child. The final column contained various teaching strategies which could be employed to ameliorate the discrepancies between the first two columns.

Hillsborough County Public Schools prepared "Strategies for Teaching Young Children Prenatally Exposed to Drugs" (1991) which had only three major strategy categories. The first part addressed the physical environment of the classroom while the second dealt with the daily schedules and routines of the classroom. The physical environment of the class may require some changes to accommodate the needs of children prenatally exposed to drugs. Some of the suggestions presented in this paper were the same as in the earlier paper such as movable classroom materials and equipment to reduce stimuli or enrich activities; structured, organized activities, and consistency and stability of classroom personnel and students. Additional
strategies were included such as using masking tape to designate individual student's place during circle time, at tables, and on the chalkboard; placing some items on shelves easily assessable to the students; making signs to direct student travel patterns and to label instructional areas; and providing for personal spaces for students who may need a denoted area to work. Several suggestions given about the classroom schedule were based on the Los Angeles paper; but others clarified using specific examples: starting with small steps and small groups of students, then introducing small changes only after several prompts are given that changes are coming; and using illustrations to demonstrate steps, to serve as reminders and to cue transitions. This paper also included various ideas and activities which have been developed based on the strategies listed previously. Ideas such as area sign designs, material labels, procedure cards were pictorially presented to the reader. The third and final part of the paper listed suggestions of how to help children make transitions. Transitions include arrival and departure times, snack or lunch, recess and restroom breaks, as well as changes from activity to activity and from room to room. Transitions should be viewed as additional opportunities for instruction and can be sources for generality measures of trained skills.

In a final paper discussed here, "Children of Cocaine: Facing the Issues" (1990) released by the Center for Early Education and
Development. Global statements concerning the country's need for education were listed. The society in general must be made aware of the damaging effects of cocaine use not only by pregnant women but also by all other people; social services must gear-up to provide for the needs of these prenatally exposed children and their families; and the health system costs will rise to meet the escalating financial responsibility of caring for those children having physical and emotional problems. The school systems were directed to increase their special services. The educational costs will also rise; estimations are that these prenatally exposed children may cost the school systems about twice as much as general education students. The hostile, aggressive behaviors exhibited by some of these exposed children have lead many people to believe that they should be placed in the classes for the behavior disordered. In her article, Bauer (1991) supplied several implications for programming in behavioral disorders when working with prenatally exposed children. Early identification through an interdisciplinary collaboration with child protective service agencies, health personnel, and school systems will allow the children to get the necessary services. School administrators would anticipate lower teacher-child ratio and assign experienced teachers to work with these children for more than one year. Teachers may need to develop nurturing relationships with those students lacking emotional attachments with family members or peers. Speech and language specialists
may have earlier roles in the educational programs for children prenatally exposed and having articulation and learning problems. Bauer also advocated a mandatory teacher preparation curricula for preservice and inservice teachers which should address the issue of substance abuse and its effect of children and their families.

Summary. This section introduced data and research which raised more questions than they answered. The most obvious questions raised are: how many pregnant females are using controlled substances?, what effects will the babies, and children, have which can be contributed to maternal drug use?, how many prenatally exposed children will enter the educational arena each year?, how will the school handle these children?, and what new or existing educational program(s) will be the appropriate placement for these children?

The incidence of women using drugs can only be estimated but the accuracy of these numbers may never be determined. Due to the current laws concerning child abuse and endangerment, many women choose not to seek medical attention for the drug use or the pregnancy fearing prosecution or loss of their children. The demographic information is faulted since poor, minority women are more likely to be tested than middle and upper-class white women. The testing must be uniformly done to all women to assure the incidence reports accuracy.
The effects of maternal drug use on the children are not definitely known. Empirical research can not be legally conducted and existing information is sketchy and inconclusive. Some of the children have physical abnormalities, emotional problems, and intellectual disorders, while others have no identified handicaps, as yet. The continuum of effects is believed to result from the variations in the mothers’ drug histories. The amount of drugs that the mother used, the time during the pregnancy when the drugs were introduced into the developing fetus, the type and combination of drugs that the mother tried all effect the children in different ways. Medical research has been done for several years and still the facts are few. Educational research currently is being conducted and therefore even less is known.

School systems do not know how many children already in the schools are prenatally exposed or what to do with them once they are identified. The strategies that are being used with special populations have been applied with these children and appear to be having some positive effects. More reports are written which give approximate numbers of children prenatally exposed to drugs that may be entering the schools now, and these are believed to be low estimates of the true numbers. The special programs that are currently being considered as possible sites for these children can not hope to provide for all the needs of these children. The strategies that work in these special programs have been more highly structured to provide the stimuli
and activities which will not over-stimulate the children, and yet encourage their educational growth. Direct instructional models and increased opportunities to respond have affected improvement in the performance of many low birth weight children, and may be possible strategies for the children prenatally exposed.

**Language Acquisition and Development**

It is widely agreed that long delays in acquiring a first language may lead to impoverishment of word production and sentence comprehension. The lack of attachment which children prenatally exposed to drugs often exhibit translates to less verbal and physical interactions with families. The typical children develop their language skills by listening, imitating, and modeling those around them. If this connection is lacking, then the language development is retarded (McDonough, 1989). To determine what possible effects this has on children, one must first know about the theories and models of speech and language development for the typical child of the same age.

**Typical Children, Ages 0-4.** There are two basic versions of speech training models generally advocated which apparently originated from the linguistic theory or the Piagetian Stage Theory (Stark, 1991). One is a top-down approach which emphasized the linguistic and phonetic characteristics; while the other approach is a down-top method which analyzed the acoustic and motor characteristics of vocalization. Both approaches
proposed similar stages including phonation, cooing, expansion, babbling, pre-words, and first words. These models are not regarded highly by those in the field today since they both rely on cognitive structures for explanations or causes.

A second language model is based on the work of Thelen (Stark, 1991) which uses the coordinative structure of a group of muscles and joints the function as a unit in generating movements. The verbal sounds made by the infants are the result of the interdependence of the muscles of respiration, phonation, and articulatory movement. Stages of growth which occur in spurts and plateaus depend on the interface between linguistic, cognitive, and social development. This model is more accepted by other researchers and the basis of this article's author's approach.

The major landmarks of speech development in infancy appear at junctures where anatomic and physiologic changes occur in one or more motor speech subsystems (respiration, phonation, and articulation) and the patterns of behavior from the interactions between at least two of the domains (cognitive, social, and linguistic) in speech. The landmarks initiate four developmental periods which are early social interaction, activity, intentional communication, and early grammatical development.

The early social interaction landmark is based on the belief that the speech antecedents are present at birth and
demonstrated through the crying and other involuntary sounds of infants of seven to eight weeks of age. The cooing and crying can be differentiated according to the affective states of the infants. The kicking movements, arousal level, and the affective states of the babies influenced the vocal sounds made by the infants. These vocal-verbal sounds are seen as precursors to vowel-like and consonant-like sounds which develop later.

The landmark of activity includes the canonical babbling (production of series of consonant-vowel syllables) of six- to ten-month-old infants is associated with motor activities. As the baby interacts with his/her environment through crawling, cruising, and grasping and manipulating objects, babbling emerges. This is compared with the erratic and stereotypic movements of the child's limbs which occurs during these ages. The pattern of this babbling is more complex than the earlier cooing due to the maturing respiratory system, auditory feedback system, and tactile stimulation.

Intentional communication, the third landmark, occurs between ten and twelve months of age. The infant begins to express wants and needs directly through vocalization efforts. Initial utterances of single consonant-vowel syllables accompanied with physical gestures are given meaning by attending adults. Again these vocalizations are more complex and intentionally made by the children as they continue to mature physically.
The final landmark, early grammatic development, begins toward the end of the second year and the beginning of the third year. This is when the infants have not acquired language morphology and merely speak one and two word utterances which have the stress and intonation patterns of the language spoken in their environment. Later when the morphologic structure is acquired, the children begin to use more adult-like patterns of speech. All infants do not go through exactly the same developmental sequences in a lock-step fashion, there is considerable variability among children's language stages. Some children move through the stages quicker than others, some skip stages progressing from early social interaction to intentional utterances with brief periods of activity.

The Ohio Handbook for the Identification, Evaluation, and Placement of Children with Language Problems (1991) provides another version of the language developmental milestones for children from age one to adulthood. The behaviors expected by children for each age level (0 to 4) are listed below:

<table>
<thead>
<tr>
<th>Age</th>
<th>Language Behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 yr</td>
<td>recognizes his/her name</td>
</tr>
<tr>
<td></td>
<td>understands simple instructions</td>
</tr>
<tr>
<td></td>
<td>initiates familiar words, gestures, and sounds</td>
</tr>
<tr>
<td></td>
<td>uses &quot;mama,&quot; &quot;dada&quot;, &amp; other common nouns</td>
</tr>
<tr>
<td>1 1/2 yr</td>
<td>uses 10-20 words, including names</td>
</tr>
<tr>
<td></td>
<td>recognizes pictures of familiar persons &amp; objects</td>
</tr>
</tbody>
</table>
combines two words (i.e., "all gone")
uses words to make wants known (i.e., "more,"up")
gestures to call attention to event & to show wants
follows simple commands
imitates simple actions
hums, may sing simple tunes
distinguishes print from non-print

2 yrs
understands simple questions and commands
identifies body parts
carries on conversation with self & dolls
asks "what" and "where"
has sentence length of 2-3 words
refers to self by name
names pictures
uses 2-word negative phrases (i.e., "no want")
forms some plurals by adding "s"
has about a 300-word vocabulary
asks for food & drink
stays with one activity for 6-7 minutes
knows how to interact with books
(right side up, left to right page turning)

2 1/2 yrs
has about a 450-word vocabulary
gives first name
uses past tense & plurals; combines noun & verb
understands simple time concepts (i.e., "last night")
refers to self as "me" rather than name
tries to get adult attention with "watch me"
likes to hear same story repeated
uses "no" or "not" in speech
answers "where" questions
uses short sentences (i.e., "me do it")
holds up fingers to tell age
talks to other children & adults
plays with sounds of language

3 yrs matches primary colors; names one color
knows night and day
begins to understand prepositional phrases
(i.e., "put the block under the chair")
practices by talking to self
knows last name, sex, street name, & several nursery rhymes
tells a story or relays an idea
has sentence length of 3-4 words
has vocabulary of nearly 1,000 words
consistently uses m, n, ng, p, f, h, and w
draws circle and vertical line
sings songs
stays with one activity for 8-9 minutes
asks "what" questions

4 yrs points to red, blue, yellow, and green
identifies cross, triangle, circle, and square
knows "next month," "next year," and "noon"
has sentence length of 4-5 words
asks "who" and "why"
begins to use complex sentences
correctly uses m, n, ng, p, f, h, w, y, k, b, d, and g
stays with one activity for 11-12 minutes
plays with language (e.g., word substitutions)

All of these common language-related behaviors provide a basic reference point for age levels at which these behaviors are typically observed. This is merely a guide to normal language development intended to provide a basis for evaluation, for decisions on educational placements, and for planning intervention. When a teacher compares a student's current level of functioning to these stages, she can identify students who may have different (not necessarily abnormal) language development, who may be delayed in language acquisition, or who may demonstrate language disorders. Many language problems noted during infancy and childhood may be indicative of later listening, speaking, reading, or writing problems, or they may be overcome with classroom instruction and interaction. Other language differences may resolve themselves with time and experience. There will always be a certain range of language behaviors that can be considered "normal."
A language delay is diagnosed when the observed language behavior fits the normal patterns but falls significantly below or behind the age range normally expected for that language skill or content. The delay must be such that intervention is required to prevent cumulative deficits from causing later, more severe language and/or learning problems. The intervention is designed to stimulate, enhance, and supplement the student's language experience.

Language disorders are labeled when the observed linguistic behavior also deviates from expected patterns or forms. The deviations are characterized by problematic development or poor utilization of modalities for processing and/or producing language (listening, speaking, reading, and writing) or incomplete mastery or absence of specific rules related to the content, form, or use of language. Content is the meaning or words, phrases, clauses, and sentences used for communication (semantics); form includes the structure of syllables, words, phrases, clauses, and sentences used for communication (syntax, morphology, and phonology); and use is the purpose of language as it relates to knowing why to communicate, what to say, how to say it, when to say it, and to whom to say it (pragmatics).

Children, Low Birth Weight But Not Prenatally Exposed to Controlled Substances. Ages 0-4. Previous research have suggested a high incidence of speech and language problems among VLBW children. In a review of literature, Aram and
Colleagues (1991) listed fifteen research studies with VLBW (1,500 grams or less) children as subjects. All of these studies assess the speech and language measures of preschool and early school-age children. In some of these studies matched controls were used to compare the effects of birth weight and parental social class on language. Most of the studies recorded follow-up assessments at later ages, but still within preschool and early school-age levels. The general findings of each of these studies resulted in similar statements: VLBW children have delayed speech sound development, immature vocabulary and poor receptive and expressive abilities, delayed language development.

In one study (Aram et al., 1991) 256 students from an original population of 490 VLBW children were followed from birth to age eight. This sample was compared to a randomly selected control group of normal-birth-weight children. The demographic information of the mothers included 1) either black or other racial composition; 2) either high, medium, or low median family incomes; 3) less than, equivalent, or more than a high school education; and 4) age means. Factors such as type of delivery, single or multiple births, Apgar scores, and maternal age were recorded to assess possible risks to speech and language outcomes. Seven measures, two speech and five language, were selected to assess multiple aspects of comprehension and production. They included The Peabody Picture Vocabulary Test-Revised (PPVT-R), Rapid Automatized Naming
Task (RAN), and The Photo Articulation Test (PAT). On all the language measures except two, the VLBW children performed statistically more poorly than did the control children. All IQ indices (WISC-R), also, were significantly lower for VLBW children than control children.

The study also sought to assess whether or not VLBW children present a greater frequency of specific language impairments (SLI) than do controls. SLI was defined a discrepancy of greater than 1, and later 2, standard deviations between WISC-R performance intelligence quotients and any of the five language comprehension or production measures, provided the child also had normal intelligence, normal hearing in at least one ear, and no major neurological deficits. The results showed no significant different between the VLBW and control children. Although none of the prenatal risk factors was found to be associated with SLI, race was the only demographic factor weakly associated with SLI. The findings of this study were similar to those found in earlier studies: children whose birth weight was less than 1,500 grams had statistically significant poorer mean language comprehension, language production, and speech abilities than normal birth weight controls. VLBW children did not appear to be at greater risk for SLI, but they are at higher risk for more pervasive developmental problems that include language.

In a study of receptive and expressive language (Hubatch et al., 1985), the language development of children born premature
were used. Ten children were matched with full-term controls and assessed on the single-word stage of language. The children were not matched on age therefore the mean age in months for the premature students was 23.2 months and for the control students 19.2 months. There were also slight differences in sex and race between the two groups but this was found not to be significant. Three measures, specifically designed for this study, the Receptive Vocabulary Test, the Linguistic Concept Assessment, and a parent-child language sample were used for comparison. Eleven dependent variables (i.e., child utterances, imitated utterances, novel words, action words, modifiers, function words) probed for qualitative differences between the two groups. The results showed that the control students demonstrated superior performance on all receptive language and child verbosity (utterance) measures despite their younger age.

In a study (Craig et al., 1991) with thirty premature children with low birth weights, Craig and associates found that the deficiencies observed in the language development were long-term and that normal language development may be a likely outcome for many of these children. They also found that some subgroups of infants born premature with low birth weights may be at risk for specific long-term difficulties.

Children Prenatally Exposed to Controlled Substances, Ages 0-4. Drug exposed infants often have the immediate problems of prematurity and/or low birth weight, but currently there is
limited information related to the language development of children prenatally exposed to controlled substances. Empirical research is still in the early stages and not yet published. The findings of a report (Schneider, Griffith, & Chasnoff, 1989) which focused on medical research results suggested that two areas of concern are an increased likelihood for educational delays in motor and language development. Several school districts and agencies have published strategies that have been found to be effective with children prenatally exposed. Los Angeles Unified School District published "Today's Challenge: Teaching Strategies for Working with Young Children Pre-Natally Exposed to Drugs/Alcohol" (July, 1989); Hillsborough County Public Schools prepared "Strategies for Teaching Young Children Prenatally Exposed to Drugs" (1991); and the Center for Early Education and Development released "Children of Cocaine: Facing the Issues (1990)." Each publications provided various strategies which may be used to ameliorate deficiencies observed in children prenatally exposed that are being served in these areas of the country.

Assessments of Language Development, Ages 0-4

The Ohio Handbook (1991) presented the advantages and disadvantages of five different types of assessments applicable with preschool and school-age children. Norm-referenced language tests (i.e., Bracken Basic Concept Scale, 1984) are designed to diagnose language problems, to allow for comparison with age or grade peer group, and to facilitate comparisons
across several domains for assessing discrepancies and broad strengths/weaknesses. Norm-referenced tests are not designed for identifying specific intervention objectives and the representative norm sample may not be similar enough to targeted students' backgrounds.

Criterion-referenced tests assess regularities in a student's performance against a set of criteria and are useful for designing interventions, relating with curriculum objectives, and describing individual students along a continuum of skills. These tests should not be used for making program placement or eligibility decisions. These tests can be developed by teachers or other professionals rather than using commercially designed assessments.

Teacher checklists, a third assessment option, are practical and easy to administer. They can give a broad evaluation in areas judged important and address crucial academic skills on which referrals are often based. Checklists are not designed to evaluate peer or age-group levels. Sample checklists can be developed using the scope and sequence provided in most educational language publications. The next option, the structured observations, occur on-site and are based on actual student performance. Observers can focus on several language aspects at once and the structure permits guided evaluations of communication in context. Observations can be time consuming and the presence of an observer can alter the normal patterns of
language behavior. The final assessment option is Psychoeducational Batteries. These batteries may focus on one or more language areas targeted in the sub-sections of the norm-referenced tests.

Modifications to existing assessment techniques are provided by Blennerhassett (1987). Five important features were listed which relate to all language assessments done with children. The first was to engage the children in conversations as an informal method to record average sentence length and concept organization and flow. Second, listen to children's responses to verbal behavior initiated by peers and other adults, and understand these are attempts to communicate. Third, recognize that testing is not enough; observing classroom interactions is important. Fourth, language should be recognized as functional to the young child; taught language may not be a basis of comparison. Finally, allow for developmental stages; children do not move from no language to perfect performance. The child and the assessor must alternate roles from speaker to listener to share known and unknown information.

Summary

To determine the effects of prenatal drug exposure and premature birth on the language development of children, one must research the language development of "normal" children. By comparing the areas of deficiency recorded for children labelled "at-risk" to the normal patterns of development, the teacher can
then design an instructional program which will provide for remediation of language skills. The theoretical basis of language will determine which approach and method of instruction should be tried. The landmarks or milestones of language development can be a source for curriculum development.

The assessment and training of children must focus on determining the current level of vocal functioning and develop training procedures which provide for practice on those areas lacking in the development process. More research is needed to develop assessment instruments which are sensitive enough to detect the semantic, syntactic, and morphologic capabilities of spoken language in either comprehension or production.

**Direct Instruction**

The Direct Instruction model is defined by the components common to all its materials: "a) explicit teaching of rules and strategies, b) example selection, c) example sequencing, and d) convertization" (Kinder & Carnine, 1991). Initially during instruction, rules and strategies are explicitly stated and overtly demonstrated by the teacher. Later to insure that the student can apply the steps in learning situations, guided practice is also necessary. A series of examples used in guided practice will provide a wide variety of situations that illustrate the various characteristics that the rules are applicable to are practiced. Both the range of examples and matched non-examples are presented to aid the students in distinguishing those
characteristics necessary to match the rule to the situation. By presenting the examples and non-examples together the students have an opportunity to attend to small changes while other features remain constant. Finally to teach the students to independently apply the rules to new situations, the overt steps are gradually faded so that the students apply the strategies without prompts.

Along with this carefully designed instruction, the associated delivery principles include brisk pacing of questions and specific correction procedures (Engelmann & Carnine, 1982). Brisk pacing helps keep students interested during instruction and allows more material to be covered in a fixed amount of time. It is important that students receive consistent, immediate academically-oriented feedback. Lack of information or misapplication of a general-case strategy can cause errors which can be remediated by teachers providing additional information or by prompting the students to use the learned steps in novel situations as in the previously instructed situations.

Direct Instruction has been shown to produce higher academic gains that other forms of instruction (Kinder & Carnine, 1991). Studies have indicated the effectiveness of Direct Instruction on math, reading, and language for low-income Follow Through students in primary grades (Becker, 1977; Becker & Carnine, 1980; Becker & Gersten, 1982). The Follow Through Project was a national, longitudinal-evaluation study of over 20
different approaches to teaching economically disadvantaged students in kindergarten through third grade. The results of this study demonstrated the effectiveness of direct instruction. The performance of students entering kindergarten scored at the 50 percentile on the language sub-test on the Metropolitan Achievement Test, which was significantly higher than any of the other approaches in the study. The Direct Instruction students were close to or at national norms.

Even with special education populations, Direct Instruction has been shown to be effective (Gersten, 1985; Horner & Albin, 1988; White, 1988). The success of the Direct Instruction materials in Follow Through lead to studies with students in special education programs. Students with moderate to severe retardation were randomly assigned to Direct Instruction or to instruction using the Peabody Language Development Kit. After 24 months of instruction, the Direct Instruction group scored significantly higher on the Stanford-Binet and produced gains that approximated normal growth. In another study, a group of elementary-school students with learning disabilities were randomly assigned to one of three classes, two of which utilized Direct Instruction and the other was the traditional instruction. After eight months of instruction, student achievement was assessed using the Wide Range Achievement Test, Gilmore Oral Reading Test, and the Slossen Intelligence Test. Results
indicated statistically significant differences between the two groups on all three tests (Kinder & Carnine, 1991).

Shapiro (1988) noted direct instruction to be one of the most effective of more than five different instructional interventions aimed at preventing academic failure. The results of Project Follow Through were mentioned to illustrate the positive effects of Direct Instruction; and the subsequent evaluation conducted by Abt Associates in 1977 substantiated the claims. The results of the Abt report showed that the Direct Instruction model ranked first across cognitive, affective, and basic skills measures. Two positive points in favor of Direct Instruction given by Shapiro were that it is designed to be preventive in nature and that it is most valuable when concentrated on the development of basic academic skills in younger children.

The direct instruction strategy utilized in this study is based on that described by Rosenshine (1976) as having four defining characteristics: (a) complex skills should be task analyzed then systematically taught in small approximations to a specified mastery level; (b) student responses should be active rather than passive; (c) students should receive immediate feedback on the accuracy of their performance; and (d) the student and the teacher should have frequent direct interactions. The complex language skill was analyzed and small tasks were systematically taught to the students (i.e., colors, shapes, and
direction/position words). The students were actively engaged in providing verbal responses when directed by the teacher upon presentation of picture cards. Immediate and corrective feedback was provided to each student when incorrect responses were said; and positive reinforcement statements for correct responses. During each instructional session, time was scheduled for the students and the teacher to engage in verbal interactions both of a formal and informal nature.

**Summary**

This study will not be a replication of any other findings since this is a novel area of research. Children exposed to drugs are currently entering the educational system as preschoolers in increasing numbers. A large percentage of women within child-bearing age have used various drugs during their pregnancies and their children are of an age that schools must be concerned about the prospective demands these children will place on existing academic programs. Educational programming is currently being analyzed and developed by many school administrators, supervisors, and teachers anticipating the future needs of these children. Various strategies, currently used with children having other handicapping conditions, are being assessed to determine if they might improve deficiencies or delays experienced by the children exposed to drugs. The question of determining if the language deficiencies exemplified by children born premature are
similar to those of children prenatally exposed to controlled substances has yet to be answered.

Several instructional techniques have been adapted to compensate for the problems that are now being observed in children in preschool programs. More highly structured schedules with few transitions and interruptions, which are used in programs for children with special needs, have evidenced some effect on these children, who may experience rapid mood swings and high distractibility. Environmental alterations, such as using various wall colors and lighting hues, have been shown to effect the concentration and emotional levels of many children in the general population and may be even more important to children at risk due to drug exposure.

Direct instructional procedures have been utilized with various populations and generally found to be effective. The strategy used in this study provided for each student's needs and allowed for language expressions from the individual students.
CHAPTER III

METHOD

This chapter describes the methods used to conduct the study. It was divided into the following sections: students, settings, experimenter and observers, definition and measurement of dependent variables, reliability of data, materials, experimental design, and procedures.

Subjects

This study involved eight students: four of the students were 3- to 5-year old children who were prenatally exposed to drugs (PE) and the remaining four students were a matching group of 3- to 4-year-old children who had low birth weight but not prenatally exposed to drugs (LBW). The students were identified through the office of Special Education in the Columbus Public Schools and the Women's Abuse of Substance Intervention Tactics Program (W.A.I.T.) in Columbus, Ohio. See Tables 1 and 2 for demographic information.

Low Birth Weight Children. The students who were low birth weight were selected from classes in the Preschool/Early Childhood Program of the Columbus Public Schools. Birth weight was based on maternal reports of low birth weight on school
records. The mothers were contacted by the experimenter to ascertain absence of prenatal drug exposure. Students who had low birth weights without drug exposure were designated as the comparison group and had the following characteristics: a) ages, 3 to 5 years old; and b) medical evidence of being born less than 32 weeks gestation with birth weights under 2,500 grams or 5 pounds. Verification of the comparison group of students were made by mothers' self-reports and medical records of the children's birth weights and gestation periods indicative of prematurity. All of the children attended a public school program for preschool children with special needs. Two of the children lived with both of their natural parents and the other two children lived in single-parent homes with their mothers.

**Prenatally Exposed Children.** Children whose medical or personal histories indicated the possibility of prenatal drug exposure were identified. Potential candidates were those children between the ages of three and five years whose parents explicitly reported drug use, whose families had a history of illegal drug use, or whose personal/medical profile was suggestive of previous drug exposure. One potential source for students prenatally exposed to drugs was the Women's Abuse of Substance Intervention Tactics Program (W.A.I.T.). WAIT is a non-profit, state-funded, cultural specific, residential, half-way, transitional service. It is designed to educate and house African-American women who have
alcohol or other substance abuse problems and who have children from 0 to 12 years old. Any woman 18 years old or older, with a sincere desire to remain alcohol and/or drug free, and a willingness to participate actively in a structured four-phase recovery program was eligible to join the WAIT program. Referrals to WAIT were made from physicians, hospitals, treatment programs, community social service agencies, clergy, probation departments and/or direct requests from the client. Half of the students used in this study were selected from those children whose mothers reported drug use during their pregnancies and were currently participating in the WAIT program.

Students prenatally exposed to drugs (Cocaine/Crack) were designated as the experimental group and had the following characteristics: a) ages, 3 to 5 years old; and b) reported by mother or medically proven to be prenatally exposed to cocaine/crack. Verification of the experimental group of students was made from self-reports of drug usage by mothers during pregnancy (see Appendices A and B for parent information forms) and available hospital/medical records. One of the students attended the public school program for preschool special needs children, and the other three attended a public daycare program. Two of the children lived in the WAIT program's residential house with their natural mother, a single-parent;
another student was placed in the care of foster parents due to his mother's incarceration for drug use; and the fourth student lived with his natural mother, who had remarried.

From these procedures, approximately twenty potential candidates were identified for each category of prenatal drug exposure and low birth weight with no prenatal exposure. The parents of these candidates were contacted individually to determine the parents' willingness to have their child(ren) participate in this study. A sample permission form sent to parents/guardians is provided in Appendix A. In cases where there was no response to the initial parental contacts; letters, and/or phone calls, the experimenter made home visits to obtain signed parental permission forms. Once permission was obtained the children were screened further through (a) preliminary parental interviews, (b) hospital records (with parent permission), and (c) teacher interviews to identify students that most accurately met the criteria for the two designated categories of this study. Hospital/medical records were obtained for only three of the students.

A final study sample of four students prenatally exposed to controlled substances and four matched students who had low birth weight but without prenatal exposure were selected to receive the prescribed intervention. The children were matched across groups, as closely as possible, according to sex, age, and
ethnic group. All students selected were in families from low socioeconomic status. (See Tables 1 and 2.)

**Parental Interviews.** An individual interview was conducted with each mother to complete the Parent Interview Form (see Appendix B). During the interview, the interviewer first engaged the mother in a brief get-acquainted discussion and then determined the mother's willingness to have her child(ren) participate in the study. After the purpose and procedures of the study had been explained, the mother was requested to sign a parental permission form. Next, the investigator completed the Parent Interview Form by asking the mother about her personal, medical, and drug history during the gestation period of the targeted pregnancy.

**Hospital Records.** Parent permission was obtained to give the experimenter limited access to the targeted child's hospital records. From a review of the child's and mother's medical histories, abnormalities (physical or genetic disorders) in either mother or child at time of delivery, the child's birth weight and results of both the mother's and child's urine drug screen (if taken) were noted as possible indicators of drug exposure. Other indicators which might have included atrophied finger growth, facial abnormalities, or heart disorders were documented. The child's birth weight at 32 weeks gestation should be over 2,500 grams or 5 pounds in order not to be considered low. Subsequent
Table 1. Demographic Information, Children Who Were Low Birth Weight

<table>
<thead>
<tr>
<th>Students</th>
<th>Birthdate</th>
<th>Age</th>
<th>Sex</th>
<th>Birth Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>06/25/87</td>
<td>4 y 9 m</td>
<td>Male</td>
<td>3 lbs 5 oz</td>
</tr>
<tr>
<td>2</td>
<td>06/18/88</td>
<td>3 y 8 m</td>
<td>Male</td>
<td>4 lbs 1 oz</td>
</tr>
<tr>
<td>3</td>
<td>05/01/88</td>
<td>3 y10 m</td>
<td>Male</td>
<td>3 lbs 12 oz</td>
</tr>
<tr>
<td>4</td>
<td>01/01/88</td>
<td>4 y 2 m</td>
<td>Male</td>
<td>4 lbs 7 oz</td>
</tr>
</tbody>
</table>
Table 2. Demographic Information, Children Prenatally Exposed

<table>
<thead>
<tr>
<th>Students</th>
<th>Birthdate</th>
<th>Age</th>
<th>Sex</th>
<th>Birth Weight</th>
<th>Drug of Choice &amp; Frequency of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>12/18/88</td>
<td>3 y 2 m</td>
<td>Male</td>
<td>5 lbs 2 oz</td>
<td>Cocaine (IV) Alcohol Unknown</td>
</tr>
<tr>
<td>6</td>
<td>12/10/86</td>
<td>5 y 1 m</td>
<td>Female</td>
<td>6 lbs 2 oz</td>
<td>Cocaine (frbs) 1-2x/mon</td>
</tr>
<tr>
<td>7</td>
<td>07/18/88</td>
<td>3 y 4 m</td>
<td>Male</td>
<td>5 lbs 5 oz</td>
<td>Cocaine (frbs) 3-4 d/wk</td>
</tr>
<tr>
<td>8</td>
<td>08/19/87</td>
<td>4 y 5 m</td>
<td>Male</td>
<td>6 lbs 0 oz</td>
<td>Cocaine (smk) Unknown</td>
</tr>
</tbody>
</table>

smk = smoke frbs = freebase IV = intravenous
body weights for the child obtainable from routine pediatric examinations can rule out low birth weight due to maternal malnutrition as a cause for any initial diagnosis of prematurity. Low birth weight is a medical term for children who weigh less than five pounds at birth and fail to thrive during infancy.

Since this study involved children beyond the age of three and there are no medical tests which can be taken at that age to prove maternal drug use during the pregnancies, prenatal drug exposure was based on mother's self-reports during the parental interview. For those students whose mothers were in the W.A.I.T. Program, medical records listing drug histories were available to ascertain the extent of the mother's involvement with drugs during the child's gestation period.

Teacher Interviews. Any teachers currently instructing the targeted children were interviewed prior to the study to determine if any observed behaviors or reports existed suggestive of maternal drug use during pregnancy. Suspicious behaviors included persistent failure to attend during instruction, sudden changes in behavior patterns, avoidance or complaints about lighting or temperature changes in the room, refusal to play with other students, playing inappropriately with toys in the room, avoiding being touched by teacher or others, and crying easily for extended periods of time for no apparent reason. Information about the experimenter's research questions
concerning the targeted child(ren) was not explained to the teacher(s) prior to this interview.

**Settings**

Two experimental sites were utilized in this study with each room containing a table and at least three chairs. The public school, Broadleigh Elementary School, was the first site and was selected by the principal investigator based on the number of identified students classified as prenatally drug-exposed and/or low birth weight (See Figure 1). A large storage room in the school building was used for testing, instruction, and data collection. The room was a ten feet by 15 feet room located near the students' classroom. The classroom teacher had a bachelor's degree in education, five years of teaching experience in elementary education, and two years in preschool special education. She also had at least one full-time aide.

The second site was situated in a ten feet by ten feet room in the lower level of the 1st Church of God which housed the daycare facilities utilized by the mothers in the W.A.I.T program (See Figure 1). This room was separated in an enclosed room with three chairs and a table, away from the daycare area. This public daycare program has at least four full-time personnel who have limited professional experience with the preschool population.
Figure 1. Instructional settings at Sites 1 and 2.
Experimenter and Observers

A research team consisting of one faculty member, one doctoral candidate, and two first-year doctoral students from The Ohio State University conducted the study. The principal investigator was a third-year doctoral student majoring in special education with an emphasis in applied behavior analysis at The Ohio State University. She had fourteen years experience teaching junior high (seventh to ninth grade) students with developmental handicaps before entering the doctoral program.

The two other doctoral students in special education served as the secondary observers. The first observer was a first year doctoral student majoring in special education and school administration. She had over eight years of experience teaching and two years as an administrator in the Florida school systems. The second observer was also a first year doctoral student majoring in special education with an emphasis in severe behavior disabilities. Before receiving her Masters' Degree at The Ohio State University last year, she had six years as a teacher and later three years as a school counselor in Taiwan.

The principal investigator provided the instruction during this research project and identified as the teacher during the instructional procedures. The research team was responsible for conducting all assessments, instruction, supervision, and monitoring of the students' activities. A faculty member of The
Ohio State University supervised all activities of the research team.

**Definition and Measurement of Dependent Variables**

Four dependent variables were measured: (1) number of learning trials for each word presented during the sessions, (2) measurement of student response during instruction, (3) maintenance of learned words, and (4) reactions of the students, teachers, and parents to the direct instructional strategy used in the study.

**Number of Learning Trials.** A learning trial was defined as the teacher's presentation of a question or statement, the student's response to the question or statement, and the teacher's delivery of either praise for a correct response or corrective feedback for an incorrect response. For example, first word - Teacher: "Point to the picture of the dog in **front** of the building?" Student: "This one!" (student points to correct picture) Teacher: "That's right! This is the picture of the dog in **front** of the building."  

Second word - Teacher: "Point to the picture of the dog in **back** of the building?" Student: "This one!" (student points to correct picture) Teacher: "That's right! This is the picture of the dog in **back** of the building."

Each time the above sequence occurred, the observers noted it on the recording form as one learning trial. The total number of learning trials presented during an instructional session was
obtained by counting the number of learning trials marked by the observers on the data sheet. Four to five words were presented to each student during the sessions and were designated as a word set. Each word set was considered mastered when the student correctly identified all words for two consecutive sessions. All word sets were determined for each individual student from those words identified incorrectly by the student during both preassessments.

**Measurement of Student Response.** The observers recorded a student response during the instructional sessions as correct if the student’s response matched the corresponding answer on a previously prepared sheet (See Appendix C for sample recording sheet). Student responses were reported as the percentage of correct responses. Each word set was considered mastered when the student correctly identified all words for two consecutive sessions.

**Maintenance of Word Pairs.** The observers recorded a student response taken during the maintenance probes (after the instructional sessions for that word set had been terminated at least a week) as correct if the student’s response continue to match the corresponding answer. The same recording sheet from the instructional sessions was used (see Appendix C for sample recording sheet).
Student responses were reported the same as during the instructional sessions that is the percentage of correct responses. Observers marked both the correct and incorrect responses of the students on the data sheets.

Reactions of Participants. Students' opinions regarding the direct instructional strategies and the activities used during the study was obtained through individual interviews following the last condition of the study (see Appendix H, I, and J). Each questionnaire statement was read orally to each student who was then asked to circle or mark a happy, neutral, or sad face. Student responses for each question were tape-recorded to allow for independent checks by the observers as to the accuracy of the questionnaire administration.

Parents and teachers of the student participants also were interviewed to determine their opinions about the strategies and activities used in the study. Each parent and teacher was provided with a questionnaire which required both yes/no responses as well as short-answers to at least five questions related to the student's behavior before, during, and after the instructional sessions. Their views of the instructional strategies used in this study and their expectations for participating in future studies were solicited in this questionnaire. Parents were given the option of completing the
questionnaire on their own or having the questionnaire read to them by the researcher.

**Interobserver Agreement**

Each independent observer was trained and instructed to use the same recording sheet (see Appendix C) for collecting data on word trials presented, accuracy and retention of student responses. Interobserver agreement scores were obtained on at least 50% of all sessions. The observer sat near the student to have an unobstructed view of the presented material and to hear the students' responses. The formula used to establish the percentage of agreement among observers was the number of agreements divided by the total number of agreements plus the number of disagreements multiplied by 100.

\[
\frac{\text{Agreements}}{\text{Agreements} + \text{Disagreements}} \times 100 = \% \text{ of Agreement}
\]

Each observer had a recording sheet with the targeted words and a pencil. A tape recording of the sessions was made so that other members of the research team could also record researcher-student interaction data (IOAs) independent of the instructional sessions.

**Training of Instructor/Observer**

The training of the observers was under the direction of the principal investigator and occurred during the first month of this
study. Each training session lasted approximately twenty minutes daily for a period of one week. The entire instructional session was scripted by the investigator (See Appendix F) and discussed with each observer trainee before and during training. In training, the investigator explained each step and then modeled possible responses that might be given based on the students' responses. Sample reinforcing or directive statements (i.e., "Good, the number is four", "Correct red is the color", "Right, the dog is on the bed") were given and trainees were cued as to when these statements should be made. Additional children not selected for this study were assembled for each trainee to have an opportunity to practice the programmed steps. Once the trainees were able to follow the script without error, omission, or inclusion for three consecutive trials, mastery was achieved. Procedural reliability checks were made to assure that once the study started no alterations to the script were needed. Researchers were trained, supervised, and monitored by the principal investigator, who was supervised by her major academic advisor.

**Materials**

Two assessments were administered; a standardized comprehensive language measurement survey/scale, Bracken Basic Concept Scale (BBCS), (1984), and one specific criterion-
referenced probe (see Appendix D and E for samples of both assessment instruments).

**Bracken Basic Concept Scale.** The BBCS is divided into two separate instruments: (a) two alternate forms of the screening test which can be used to assess the language development of small groups or classes of children and (b) the diagnostic full scale instrument which provides a more detailed measure of individual children targeted in the screening tests or identified by the experimenter as having language deficiencies. The diagnostic scale allowed for an in-depth assessment of an individual child's knowledge of eleven basic language verbal concepts:

- **Colors:** primary colors such as red, blue, & yellow.
- **Letter Identification:** upper- and lowercase letters.
- **Numbers/Counting:** number recognition and counting of objects (e.g., zero through nine).
- **Comparisons:** comparisons such as same, different, equal.
- **Shapes:** one-, two-, and three-dimensional shapes such as line, square, and cube.
- **Direction/Position:** relationships about, among, or between objects (e.g., an open book, a ball under a table, open/closed doors).
Social/Emotional: terms describing gender (e.g., boy, girl), relative ages (e.g., young, old), social appropriateness (e.g., right, wrong), and emotions (angry, friendly).

Size: dimensional terms like big, tall, and thick.

Texture/Material: terms describing an object such as smooth, clear, rough, wood, glass, and metal.

Quantity: amounts such as full, none, pair, and half.

Time/sequence: items about temporal events such as new, old, late, and over.

The diagnostic scale is comprised of three components: an Examiner's Manual, a Stimulus Manual in easel format which contained all test picture stimuli, and a Record Form which listed all verbal stimuli which corresponded to the test picture stimuli. For a sample of verbal stimuli, see Appendix D.

This scale was appropriate for "preschool and primary children, two and a half through seven years eleven months to determine a child's school readiness and knowledge of basic English language verbal concepts. The BBCS tests can be used easily with almost all children regardless of ethnic heritage, exceptionality, or handicap (Bracken, 1984; Naglieri & Bardos, 1989-90).

Standardization of the diagnostic scale was conducted by its authors according to a format which would allow for the selection of children across the United States closely
representative of the 1980 U.S. Census. The variables used in selecting children for the standardization sample were age, sex, ethnic group, geographic region, community size, and socio-economic status. A sample of 1,109 males and females were selected and of this total, 78 (7%) were African-American males and 92 (8.3%) were African-American females. Approximately 33.7% (374) students represented the North Central regions of the United States, three cities within Ohio were part of this sample (Bracken, 1984).

After a thorough review of preschool and primary psycho-educational assessment instruments and curricula, over 330 basic concepts were identified and grouped into the eleven distinct conceptual categories or subtests. The first half of the diagnostic scale (subtests I through V) make up those conceptual skills identified as necessary for school readiness. Since vocabulary is one of the best overall correlates with general intelligence and basic concepts represent the most rudimentary functional vocabulary terms, assessing and teaching these basic concepts helps put all children on an equal conceptual level.

**Validity.** A test was considered valid if it measured what the author purported it to measure. To demonstrate that a test was measuring what it was intended to measure, an author should (1) demonstrate that the content assessed by the instrument was representative of the construct domain being
sampled [content validity], (2) demonstrate that the test correlates with and produces scores of a similar magnitude to other tests measuring the same or similar abilities or traits, and (3) show that individuals known to possess lesser or greater skill in the abilities assessed by the instrument do indeed score lower or higher on the test than a matched group of normals (Bracken, 1984).

Content validity was assessed with the Bracken Basic Concept Scale and at least five other instruments: Boehm Test of Basic Concepts (1971) for basic concepts, Peabody Picture Vocabulary Test-Revised (1981) for receptive language, Stanford-Binet Intelligence Scale, Form L-M (1973), Wechsler Preschool and Primary Scale of Intelligence (1967), and Wide Range Achievement Test (1978) for preschool readiness. Each test was inspected to identify basic concepts used in either the test directions or individual test items. The author of the Bracken Scale considered a list of influences to each item construction such as (a) minimizing the requirement of verbal expression and allowing for either short verbal or motoric (pointing) responses; (b) having at least three opposite distractors and only one correct response to reduce the probability of guessing; (c) using simple, concise, and brief language in each item stem; (d) organizing items to be consistent and grouped categorically to minimize confusion; (e) grouping
item hierarchically by difficulty levels; and (f) including pictorial, non-stereotypical representations of both sexes and various ethnic groups (Bracken, 1984).

**Reliability.** A major concern in the evaluation of the technical adequacy of an instrument was the issue of internal consistency. Internal consistency is a measure of how reliably the instrument measures a given trait or ability throughout the scale. The diagnostic scale was determined to be reliable utilizing three measures. The initial test-retest reliability results taken during standardization were tentative due to the small sample size (N=27), but subsequent studies using larger samples reported high correlations (N=60 with .73 and .87; N=46 with .86).

Using the split-half method with correction using the Spearman-Brown prophecy formula to determine internal consistency reliability, the author indicated that the scale has good reliability. Their data suggested that the overall BBCS Total Test score is the most reliable score with the subtests generally having good reliability, depending on the group characteristics of the group being assessed. The standard error of measurement (SEM) is important because it has the most direct influence on the interpretation of any test. The scale SEM scores ranged from 1.7 to 3.4 for the Total Test and 0.6 to 2.2 for the subtests (smaller SEMs means more reliability). The
diagnostic scale was more reliable due to its large number of items. (Bracken, 1984)

**Criterion Referenced Probe.** The development of the criterion referenced probe was accomplished by the principal investigator after analyzing the results of the BBCS for each child. (Sample of the Probe Script was given in Appendix E)

A panel of experts consisting of university personnel knowledgeable in language development and preschool special needs programs, was consulted to verify the content validity of the criterion-referenced measure. They were given a copy of a student's Record Form from the Bracken Basic Concept Scale to review. After studying this, each expert was then given a sample criterion-referenced probe developed for that child, and asked to evaluate its effectiveness based on the demonstrated deficiencies evidenced on the Bracken Scale. When the experts were assured that the content displayed in the test was valid for the child's needs, each child was tested individually by the investigator/researcher.

**Social Validity Questionnaire.** Social validity questionnaires were given at the end of the intervention to assess the subjective views of participating students, classroom teachers, and parents. All students were asked to circle or mark a happy, neutral, or sad face to evaluate their feelings about being asked to be in this study, about activities performed in this study, and
about knowledge gained from this study. Questions posed to the teachers and parents involved their awareness of any language improvements from the child, any knowledge they have about the instructional methods used in this study, any additional comments about the child's expressive and/or receptive language as a result of this study, and any additional positive/negative statements about this study.

Experimental Design

A multiple baseline design was used in this study. In this design, the number of behaviors was identified and measured over time to provide baselines against which changes could be evaluated. Once the baseline was established, an intervention was applied to one of the behaviors and changes in performance noted while maintaining baseline measures of the other behaviors (Cooper, Heron, & Heward, 1987). The two preassessment scores from the Bracken Scale and the criterion-referenced probe serve as the preassessment and baseline for the student. The intervention and maintenance scores recorded for each word set (two to four word pairs) permitted each student to act as his/her own control for prediction, verification, and replication purposes. This design was selected because it was highly flexible and did not require the withdrawal of the treatment in order to prove a functional relationship between the intervention and the targeted behaviors. Each set of targeted
words for each individual student was recorded and displayed on a graphic design in accordance with multiple baseline experimental design.

**Procedures**

The principal investigator served as the teacher in all sessions for this study. **Assessment - Bracken.** A comprehensive measure, Bracken Basic Concept Scale, was used to determine the major areas of weakness demonstrated by each student. Each assessment was administered individually to each student on a pre- and posttest basis by a member of the instructional team. The researcher escorted the student into the testing/instructional setting and placed him/her in a designated chair. Then the researcher discussed with the student any events currently engaged in the class, at home, or elsewhere. This general conversation with the child was designed to put the child at ease and to encourage verbal discourse with the researcher. After two to three minutes of conversation, the researcher introduced the diagnostic scale stimulus manual, and explained to the student generally what was to be done. Sample demonstrations were provided which did not involve the scale such as asking the student to point to his shoe, the door to the room, and his nose. Next the student was told that the researcher would be showing him several pictures, and that he was to point to one of them.
he did not know which one to point to when asked, he should guess and point to any picture, as required by the Bracken Basic Concept Scale. If he pointed to more than one picture, the student was told he could only point to one and asked to point again to only that picture which illustrated the targeted term/word. The researcher would not provide the student with any reinforcement for any responses, other than to point at the same picture that the child pointed to, for purposes of response verification. When each subscale of the diagnostic scale was completed or when the session was almost complete, the researcher would put away the testing material and engage the student in general conversation again. Sample comments included telling the student how nice he looked, how good his sweater/shirt looked on him, or asking the student what he would do when he returned to class, and what was planned when he returned home after school. Finally the researcher returned the student to the class.

Two weeks were allocated for testing in order to keep all administration times brief with no more than a half hour daily for each student per assessment. Since the Bracken Scale was not a timed instrument, each student had ample time to complete each sub-test. By spreading out the administration time over a period of days, each child was assured of the administrator's complete attention as well as brief, non-tiring examinations.
Assessment - CR. A criterion referenced probe, based on those specific areas of deficiencies identified from the standardized test, was developed and administered by the principal investigator. This probe targeted those areas identified as the skills needing instruction. The researcher administered the probe using a prepared script developed by the principal investigator (See Appendix E for samples of the script and probe). Each researcher was trained to use the criterion-referenced probe during the training sessions outlined above. Students not included in the study were used to provide training for the researcher. Each student, after engaging in general conversation similar to that in Assessment - Bracken sessions with the researcher, was presented with picture cards illustrating targeted items. The researcher asked the student to name the picture which was shown. Again no reinforcement was provided by the researcher during these probe sessions, but the researcher repeated the student's response for verification. Each student was probed on approximately a hundred fifty-five terms/words derived from those items answered incorrectly on the Bracken Scale (See Appendix E for assessment items). At the end of the session the researcher engaged the student in general conversation (i.e., the student was asked what he/she was having for lunch, what they plan to do when returning home, what activities they would play when returning to class) before
returning the student to his/her classroom. Using those words answered incorrectly on both the Bracken and the CR probe, the researcher made a bank of approximately fifty items to be included in the instructional sessions. The administration of the criterion-referenced probe also was untimed for the same reasons given above.

**Instruction.** Teaching was conducted according to the principles of direct instruction. Direct instruction components were (a) complex skills should be task analyzed then systematically taught in small approximations to a specified mastery level; (b) student responses should be active rather than passive; (c) students should receive immediate feedback on the accuracy of their performance; and (d) the student and the teacher should have frequent direct interactions (Rosenshine, 1976). Rules and strategies were explicitly stated and overtly demonstrated by the teacher. The delivery principles of direct instruction model included brisk pacing of questions and specific correction procedures (Engelmann & Carnine, 1982). Brisk pacing kept the student actively engaged in learning and allowed for more opportunities to respond in shorter time periods. The students received consistent, immediate academically-oriented feedback to reduce errors and to provide prompts for next word presentations.
The teacher began each session by establishing rapport with the student about things that happened earlier that day or the previous day for about two/three minutes. The teacher modeled the initial instructional procedure for each targeted word by saying the word and pointing to the picture. The student then was asked to imitate the teacher's responses (e.g., "This is the color - BLUE. Say BLUE."). Second, the teacher asked the student to point to and say each of the targeted items (e.g., "Point to the color - BLUE. And say BLUE."). Finally the teacher asked the student to select and say the targeted term or word for each picture ("Which is the color - BLUE."). At least four or eight targeted words were used during each session (e.g., colors: BLUE, YELLOW, RED, GREEN). The teacher provided corrective feedback or reinforcement to the student throughout each step of instruction. At the end of each session, the teacher presented each pictorial item to the student to assess all terms/words taught that session. No feedback or reinforcement was given to the student during the assessment. Basic details of the teaching script included the following steps:

1. Teacher brought the student to the instructional setting and engaged in general conversation with the student for 2-3 minutes.
2. Teacher started tape recorder.
3. Teacher recorded information about session (date, time, and student's name).
4. Teacher presented four-eight instructional cards with pictures to student.
5. Teacher said and pointed to one picture illustrated. (e.g. This tree is TALL. This tree is SHORT. This color is BLUE. This color is RED.) The word was identified as belonging to one of the concepts: colors, numbers, letters, shapes, direction/position. Sentence prompts were on the back of all sheets except the color, number, letter, and shape cards. See Appendix G for sentences prompts.
6. Teacher asked the student to point to and say the word for one picture. Teacher repeats this step for the other terms. (e.g., "Point to the TALL tree? Say TALL." "Point to the SHORT tree? Say SHORT." "Point to the color BLUE? Say BLUE." "Point to the color RED? Say RED").
7. Teacher asked the student to tell which of the words illustrated a picture and say the word. Teacher repeated this step for the other terms (e.g., "Which tree is TALL? Say TALL." "Which tree is SHORT? Say SHORT." "Which color is BLUE? Say BLUE." Which color is RED? Say RED.").
8. If the student was unable initially to provide any answer requested, the researcher asked the student to "Try again". 
9. If the student was still unable to provide an answer, the researcher provided the answer and repeated the step. ("This is the TALL tree. Which tree is TALL?" "This is the color BLUE. Which color is BLUE?")

10. Teacher continued to repeat Steps 4 through 9 until each word targeted or the time period for that session was completed.

* If the student was unwilling or unable to complete the session, the researcher recorded the words completed, marked those words not done, completed the assessment (Step 11) with the words taught and turned off the tape recorder.

11. Teacher presented all word pairs to the student individually and asked the student to say the targeted word illustrated in the pictures (e.g., "Which color is this? Where is the airplane? Describe the tree?) Sentence prompts were on the back of all cards except the number, letter, color, and shape cards. See Appendix G for sentence prompts.

12. Teacher provided stickers for the student to place on a public posting chart. The number of stickers given to the student was based on the number of total learning trials made by the student during the session (i.e., four trials =
four stickers). Bonus stickers were given when the students achieved mastery on a word set.

13. Teacher finalized the session by engaging the student in general conversation about any activities that were scheduled for the rest of the student's day and returned the student to the classroom. (Copy of instruction script, see Appendix F.)

Four or six words were demonstrated each session. All words in each set met the mastery level for two consecutive sessions before the introduction of the next set. Mastery was recorded by the researcher when the student was able to score 100% correct on the word set during two consecutive assessments.

The instruction occurred four days per week for a period of eight weeks with each student. Ten weeks of instruction were scheduled to allow for absences and any other unforeseen circumstances.

Maintenance Probes. Periodic maintenance probes were taken on a weekly schedule to assess retention of mastered word sets. The researcher presented those pictures previously learned to the student in the same set as before. The researcher asked the student to name the term which was illustrated in the picture: (e.g., "Describe the tree?" [i.e., tall, short]; "What color is this?" [i.e., blue, yellow]; "Where is the airplane?" [in the middle of the table, on the side of the table]) Each picture was shown once to
the student, and the researcher recorded whether the target word was said or not. These probes were not counted in the thirty minutes allocated for the session but were completed before the regular instructional session or on a day which did not have an instructional session scheduled. The same recording form used during instruction was used to record the scores on the maintenance probes.

**Postassessment - CR.** The researcher again administered the criterion-referenced probe using the same prepared script as in the Preassessment - CR mentioned above. Each student, after engaging in general conversation with the researcher, was presented with picture cards illustrating the targeted words. The researcher asked the student to name the pictures which illustrates the terms. Each student was assessed on the same items using the same procedures in Preassessment - CR.

**Postassessment - Bracken.** The Bracken Basic Concept Scale was administered again individually to each student by a member of the instructional team. The same procedures outlined in the Preassessment - Bracken section above was used. The student was asked to point to one of the items shown on the stimulus manual according to the directions on the pre-printed recording form.

**Data Analysis.** Daily data analysis was done by the principal researcher. Scores were recorded and data points placed on
graphs after each session for the instructional team to
determine what effects, if any, the instruction was having on
each student's learning.

Time Line. The entire study was anticipated to take six months.
Beginning in January the population site and possible students
were selected. Obtaining signed parental permission slips and
conducting pre-assessments also were completed. During
February the students were selected and matched, and the
observers were trained by the principal investigator. Baseline
measurements began in March with the intervention introduced
immediately after. Intervention data continued to be collected
during April and May, and post-assessments were done during the
last few weeks in May. June and July were spent analyzing the
data and writing the final product.
CHAPTER IV

RESULTS

This chapter presented the results of the study comparing the effectiveness of direct instruction procedures on the language development of children either prenatally exposed to controlled substances or who were of low birth weight but not prenatally exposed. The results of pre- and postassessment measures, using the standardized Bracken Basic Language Scale and a teacher-made criterion referenced test, are then presented for each student. Data on the baseline, instructional, and maintenance conditions of the study for each student are provided, as well as graphic representations of those conditions. Next, information is presented concerning the rate of learning trials of the targeted students. A summary of the students' feelings, as well as the opinions of their teachers', parents' or guardian's about the procedures and activities used in the study are provided. The chapter concluded with a description of the interobserver agreement results.

Bracken Basic Concept Scale

The raw scores of the Bracken Scale were converted to standard scores and percentiles for two of the eleven scales,
school readiness and direction/position (See Appendix D for a copy of the Bracken Scale record form). Data were limited to these scales since they were the areas of focus for subsequent criterion-referenced probes and instruction. The school readiness scale contained assessments on colors, shapes, numbers, and letter identification.

**Children of Low Birth Weight.** The pretest raw scores for Students 1, 2, 3, and 4 were 23, 21, 17, and 20; and the posttest raw scores were 37, 23, 26, and 28 respectively for the School Readiness section of the Bracken. All of the students had increased scores during the second administration of this subscale. The majority of the targeted words for instruction were comprised of words and terms from this section of the Bracken Scale. (See Table 3 and Figure 2 for raw scores.)

On the School Readiness section, Student 1 had a standard score of six (9%ile) on the pretest and eight (25%ile) on the posttest. Student 2 scored nine (37%ile) on the pretest and 10 (50%ile) on the posttest. Scores of nine (37%ile) on the pretest and eight (25%ile) on the posttest were recorded for Student 3. A standard score of seven (16%ile) was recorded for Student 4 on the pretest and eight (25%ile) on the posttest. A graphic display of the standard scores for this subscale can be found on Figure 3.

The pretest raw scores for Students 1, 2, 3, and 4 were 7, 9, 5, and 10; and the posttest raw scores were 7, 8, 9, and 7 respectively for the Direction/Position section. The raw scores
Figure 2. The raw scores on the School Readiness and Direction/Position subscales of the Bracken Basic Concept Scale for students of low birth weight (LBW) and prenatally exposed (PE).
Table 3. Raw scores, standard scores and percentiles for Students 1, 2, 3, and 4 [low birth weight] on the School Readiness and Direction/Position subscales of the Bracken Basic Concept Scale.

<table>
<thead>
<tr>
<th>Students</th>
<th>School Readiness</th>
<th></th>
<th></th>
<th></th>
<th>Direction/Position</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre SS (%ile)</td>
<td>Post SS (%ile)</td>
<td>Pre SS (%ile)</td>
<td>Post SS (%ile)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>23 6 (9)</td>
<td>37 8 (25)</td>
<td>7 5 (5)</td>
<td>5 4 (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>21 9 (37)</td>
<td>23 10 (50)</td>
<td>9 6 (9)</td>
<td>8 6 (9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>17 9 (37)</td>
<td>26 8 (25)</td>
<td>5 5 (5)</td>
<td>9 6 (9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>20 7 (16)</td>
<td>28 8 (25)</td>
<td>10 6 (9)</td>
<td>7 5 (5)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
for two of the students decreased during the second administration of this subscale, while the scores for one student (Student 1) remained the same and only one student's (Student 3) score increased. (See Table 3 and Figure 2.)

On the Direction/Position section, Student 1 had a standard score of five (5%ile) on the pretest and four (2%ile) on the posttest. Student 2 scored six (9%ile) on the pretest and six (9%ile) on the posttest. Scores of five (5%ile) on the pretest and six (9%ile) on the posttest were recorded for Student 3. A standard score of six (9%ile) was recorded for Student 4 on the pretest and five (5%ile) on the posttest. Individual standard scores are on Figure 4.

Overall, the children who were low birth weight had minimum increases and decreases in the number of words and terms known from the first and second administrations of the School Readiness and Direction/Position subscales of the Bracken Basic Concept Scale.

Children Prenatally Exposed. The pretest raw scores for Students 5, 6, 7, and 8 were 32, 25, 12, and 22; and the posttest raw scores were 40, 41, 20, and 28 respectively for the School Readiness section. All four students had increases in the raw scores. On the School Readiness section, Student 5 had a standard score of 13 (84%ile) on the pretest and 14 (91%ile) on the posttest. Student 6 scored six (9%ile) on the pretest and eight (25%ile) on the posttest. Scores of eight (25%ile) on the
Figure 3. Pre- and posttest standard scores on the School Readiness subscale of the Bracken Basic Concept Scale for students of low birth weight (LBW) and prenatally exposed (PE).
Figure 4. Pre- and posttest standard scores on the Direction/Position subscale of the Bracken Basic Concept Scale for students of low birth weight (LBW) and prenatally exposed (PE).
pretest and 11 (63%ile) on the posttest were recorded for Student 7. A standard score of seven (16%ile) was recorded for Student 8 on the pretest and eight (25%ile) on the posttest. (See Table 4 and Figure 2 for scores.)

The pretest raw scores for Students 5, 6, 7, and 8 were 7, 7, 7, and 4; and the posttest raw scores were 7, 13, 10, and 4 respectively for the Direction/Position section. Two of these students (Students 6 and 7) had increased scores, while the other two students' scores remained the same. On the Direction/Position section, Student 5 had a standard score of seven (16%ile) on the pretest and seven (16%ile) on the posttest. Student 6 scored two (.4%ile) on the pretest and four (2%ile) on the posttest. Scores of seven (16%ile) on the pretest and seven (16%ile) on the posttest were recorded for Student 7. A standard score of five (5%ile) was recorded for Student 8 on the pretest and five (5%ile) on the posttest. (See Table 4 and Figure 2 for scores.)

When determining the standard scores, the current age of the student must be used. Since the students were administered the Bracken Scale twice with a time difference of several months between the two administrations, different scales were used to figure the standard scores. Although their raw scores changed, the standard scores of some students (i.e., Students 2, 7, and 8's Direction/Position and Student 4's School Readiness)
Table 4. Raw scores, standard scores and percentiles for Students 5, 6, 7, and 8 [prenatally exposed] on two subscales of the Bracken Basic Concept Scale.

<table>
<thead>
<tr>
<th>Students</th>
<th>School Readiness</th>
<th>Direction/Position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Students</td>
<td>RS</td>
<td>SS (%ile)</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>13 (84)</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>6 (9)</td>
</tr>
<tr>
<td>7</td>
<td>12</td>
<td>8 (25)</td>
</tr>
<tr>
<td>8</td>
<td>22</td>
<td>7 (16)</td>
</tr>
</tbody>
</table>
appeared to not reflect those changes. With the different scales, the students were compared with their same-age peers.

**Bracken Scale: Groups.** On the Bracken Basic Concept Scale, the two groups' scores differed slightly. Three of the four students who were low birth weight (Students 1, 2, and 4) had higher percentile ranks on the postassessment than on the preassessment of the School Readiness subscale. All four students prenatally exposed to controlled substances had higher percentile ranks on the postassessment of this subscale than the preassessment. The highest and lowest scores for both administrations of this subscale were attained by two of the students in the prenatally exposed group (See Figure 3).

The Direction/Position subscale revealed minimal changes on the pre and post administrations. Four of the students (Students 2, 5, 7, and 8) received the same score at both times, while only two students (Students 3 and 6) increased their scores. The other two students (Students 1 and 4) decreased in the number of words/terms known (See Figure 4).

**Criterion-Referenced Probe**

Five areas were probed: (a) eleven colors, (b) eight shapes, (c) ten numerals, (d) 52 letters (26 capital letters and 26 small letters), and (e) 74 direction/position words (See Appendix E for a sample probe sheet). The criterion-referenced (cr) language probe was an attempt to develop a measurement instrument that reflected and complimented the Bracken Scale but provided more
instructionally relevant information. Furthermore, the measures are more sensitive to small gains. The Bracken Scale required the student to respond by pointing which is a receptive skill while the criterion probe required the student to vocalize the response which is an expressive skill. The same words and terms found on the Bracken Scale were incorporated into the probe designed by the researcher.

Children of Low Birth Weight. Student 1 scored 8 correct responses on the colors pretest and 11 correct responses on the posttest for an increase of three. He had only one correct response on the shapes pretest and seven on the posttest, for an increase of six. Correct responses on the number pretest was two and on the posttest six, which was an increase of four numbers. Of the 52 letters, Student 1 knew 15 on the pretest and 18 on the posttest, for an increase of three letters. Of the direction/position terms, he knew only six words on the pretest and achieved an increase of 11 words to 17 correct responses on the posttest. The total number of terms known by Student 1 during the criterion-referenced pretests was 32 and during the posttests 59, a positive change of 27. See Table 5 for pre and posttest scores of Students 1, 2, 3, and 4.

Student 2 scored 7 correct responses on the colors pretest and 8 on the posttest for an increase of one. He had no correct responses on the shapes pretest and only one on the posttest for an increase of one. Correct responses on the numbers pretest
Table 5. Scores for Students 1, 2, 3, and 4 [low birth weight] on the criterion-referenced language probe.

<table>
<thead>
<tr>
<th></th>
<th>Colors</th>
<th>Shapes</th>
<th>Numbers</th>
<th>Letters</th>
<th>Direction</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>11</td>
<td>7</td>
<td>8</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>7</td>
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</tr>
<tr>
<td>3</td>
<td>2</td>
<td>6</td>
<td>0</td>
<td>2</td>
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<td>4</td>
<td>15</td>
<td>18</td>
<td>6</td>
<td>11</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>17</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>59</td>
<td>18</td>
<td>28</td>
<td>8</td>
<td>22</td>
</tr>
</tbody>
</table>

TOTAL 9 23
was zero and on the posttest two, which was an increase of two numbers. Of the 52 letters, Student 2 knew six on the pretest and 11 on the posttest, for an increase of nine letters. Of the direction/position terms, he knew only five words on the pretest and increased 1 to six words on the posttest. The total number of terms known by Student 2 during the criterion-referenced pretests was 18 and during the posttests 28, a positive change of 10.

Student 3 scored three correct responses on the colors pretest and 9 responses on the posttest for an increase of six colors. He had no correct responses on the shapes pretest and two on the posttest for an increase of two shapes. Correct responses on the numbers pretest was zero and on the posttest two, which was an increase of two numbers. Of the 52 letters, Student 3 did not know any letters on the pretest and knew four on the posttest, for an increase of four. Of the direction/position terms, he knew five words on the pretest and five on the posttest which was no increase. The total number of terms known by Student 3 during the criterion-referenced pretests was 8 and during the posttests 22, for a positive change of 14.

Student 4 scored three correct responses on the colors pretest and 9 on the posttest for an increase of six colors. He had no correct responses on the shapes pretest and five on the posttest for an increase of five shapes. Correct responses on the
Table 6. Scores for Students 5, 6, 7, and 8 [prenatally exposed] on the criterion-referenced language probe.

<table>
<thead>
<tr>
<th>Students</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Colors</td>
<td>7</td>
<td>11</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Shapes</td>
<td>1</td>
<td>8</td>
<td>3</td>
<td>8</td>
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<tr>
<td>Numbers</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>4</td>
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<tr>
<td>Letters</td>
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<td>41</td>
<td>13</td>
<td>23</td>
</tr>
<tr>
<td>Direction</td>
<td>0</td>
<td>8</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>TOTAL</td>
<td>60</td>
<td>75</td>
<td>37</td>
<td>60</td>
</tr>
</tbody>
</table>
numbers pretest were zero and on the posttest one, which was an increase of only one number. Of the 52 letters, Student 4 knew two on the pretest and none on the posttest, which was an decrease of two letters. Of the direction/position terms, he knew only four words on the pretest increasing four words to eight on the posttest. The total number of terms known by Student 4 during the criterion-referenced pretests was 9 and during the posttests 23, for a positive change of 14.

Children Prenatally Exposed. Student 5 scored seven correct responses on the colors pretest and 11 correct responses on the posttest for an increase of four colors. He had only one correct response on the shapes pretest and eight on the posttest for an increase of seven. Correct responses on the numbers pretest was nine and on the posttest seven, which was a decrease of two numbers. Of the 52 letters, Student 5 knew 43 letters on the pretest and 41 on the posttest, a decrease of two. He did not know any direction/position words on the pretest but knew 8 words on the posttest. The total number of terms known by Student 5 during the criterion-referenced pretests was 60 and during the posttests 75, for a positive change of 15. See Table 6 for pre and posttest scores of Students 5, 6, 7, and 8.

Student 6 scored seven correct responses on the colors pretest and 10 correct responses on the posttest for an increase of three. She had three correct responses on the shapes pretest and eight on the posttest for an increase of five shapes. Correct
responses on the numbers pretest was five and on the posttest was four, which was a decrease of one. Of the 52 letters, Student 6 knew 13 letters on the pretest and 23 on the posttest, for an increase of ten letters. Of the direction/position terms, she knew 9 words on the pretest and knew 15 words on the posttest. The total number of terms known by Student 6 during the criterion-referenced pretests was 37 and during the posttests 60, for a positive change of 23.

Student 7 scored 2 correct responses on the colors pretest and 8 responses on the posttest for an increase of six colors. He had only one correct response on the shapes pretest and decreased to zero on the posttest. Correct responses on the numbers pretest was one and decreased to zero on the posttest. Of the 52 letters, Student 7 did not know any letters on either the pretest or the posttest. Of the direction/position terms, he knew only three words on the pretest increased 1 to four words on the posttest. The total number of terms known by Student 7 during the criterion-referenced pretests was 7 and during the posttests 12, for an increase of five.

Student 8 knew six responses on the colors pretest and 10 responses on the posttest for an increase of four colors. He had three correct responses on the shapes pretest and seven on the posttest for an increase of 4 shapes. Correct responses on the numbers pretest and posttest was two both times. Of the 52 letters, Student 8 knew 2 on the pretest and 7 on the posttest,
Figure 5. Pre- and posttest total scores on the criterion-referenced language probe for students of low birth weight (LBW) and prenatally exposed (PE).

- ■ Pretest
- □ Posttest
for an increase of five letters. Of the direction/position terms, he knew only six words on the pretest and increased to thirteen words on the posttest. The total number of terms known by Student 8 during the criterion-referenced pretests was 19 and during the posttests 39, for an increase of 20 terms.

**Criterion-Referenced Probe: Group.** All of the students' scores increased from the pre to post administration of the criterion-referenced language probe (See Figure 5). Students 1, 3, 4, and 8 increased 50% or more with scores improving from 32 to 59, 8 to 22, 9 to 23, and 19 to 39, respectively. The other four students' increases were not as large but still noticeable.

**Individual Student Performance**

From the list of 155 words (cr probe), sets of four or five unknown words were selected for each student. Two weeks before the instructional sessions began, the Bracken Basic Language Scale and the criterion-referenced probe was administered individually to each student. The scores were recorded as preassessment and baseline data, respectively. After the instructional sessions were completed, the previous two assessments were administered again to the students and recorded as postassessment data scores.

**Children of Low Birth Weight.**

**Student 1.** Initially, Student 1 knew only one of the colors on the Bracken preassessment and the cr probe baseline measurement. During the intervention phase of this first set,
Student 1 learned 4 colors, achieved 100% mastery for two consecutive sessions, and maintained mastery of those four colors on two maintenance probes. On the second set, Student 1 scored 0 on the shapes preassessment and 1 on the baseline. He achieved mastery after 11 sessions and maintained a score of 4 shapes for three out of the four probes taken after instruction was terminated. No position/direction terms were recorded as correct during the assessment and baseline for Set 3, and after six sessions Student 1 achieved mastery and maintained it for three later probes. During the fourth set of position/direction terms, Student 1 again did not know any terms, but achieved mastery after nine sessions. Of the total sixteen words introduced to Student 1 during these sessions, two words were known prior to the intervention but he achieved mastery of all sixteen words after thirty-two sessions. (See Figure 6.)

Student 2. Student 2 scored 0 on the Bracken preassessment and 1 on the cr probe baseline for Set 1. During the intervention phase of that first set, Student 2 learned 4 colors, achieved 100% mastery for two consecutive sessions, and maintained mastery of the four words on four maintenance probes. In the second set, which was also made of color words, Student 2 scored 0 on the preassessment and 1 on the baseline measure. He achieved mastery after six sessions and maintained a score of four for six probes taken after instruction was terminated. Only one word was recorded accurate during the
preassessment and baseline of shape words for Student 2, and after nine sessions he was not able to achieve mastery of these words. Of the twelve total words introduced to Student 2, three words were known prior to the intervention and eight words reached the mastery level after twenty-nine sessions. (See Figure 7.)

**Student 3.** Student 3, initially, knew 1 color during the preassessment and baseline measures of Set 1. During the intervention phase of the first set, Student 3 learned four colors, achieved 100% mastery for two consecutive sessions, and maintained mastery of the four colors on one of the two later probes. In the second set of colors, Student 3 scored 0 on the preassessment and 1 on the baseline, and achieved mastery after seven instructional sessions. Of the eight total words introduced to Student 3, two words were known prior to the intervention but eight words were mastered after twenty-one sessions. (See Figure 8.)

**Student 4.** Student 4 knew one color on the preassessment and baseline measures. During the intervention phase of the first set, Student 4 learned four colors, achieved 100% mastery for two consecutive sessions, and maintained mastery of the four colors for only one maintenance probe. On the second set, Student 4 scored 1 on both pre-intervention measures of the color words; he achieved mastery after seven sessions and maintained a score of four for one maintenance probe. He scored
0 on the preassessment and 1 on the baseline of Set 3's color words, and after four sessions Student 4 achieved mastery and maintained it on the two later probes. During the fourth set, Student 4 scored 0 and 1 on the preassessment and baseline measures of shape words respectively, but did not achieve mastery after five instructional sessions. Of the fifteen total words introduced to Student 4, four words were known prior to the intervention and fourteen words were mastered after twenty-five sessions. (See Figure 9.)

Children Prenatally Exposed.

**Student 5.** Initially, Student 5 scored 0 on the Bracken preassessment and 1 on the criterion-referenced baseline probe for Set 1 color words. During the intervention phase of this first set, Student 5 learned 4 colors, achieved 100% mastery for two consecutive sessions, and maintained mastery of the four words on three later maintenance probes. In the second set which was shape words, Student 5 scored 0 on the preassessment and 1 on the baseline probe. He was able to achieve mastery after five sessions and maintained a score of 4 for two probes. No words were recorded correct for Student 5 during the preassessment and baseline of Set 3's shape words, however after seven sessions, he achieved mastery and maintained it in two later probes. During the fourth set, Student 5 again scored zero on the two direction/position measures taken before the instruction began, but achieved mastery of the four words after 11 sessions.
Figure 6. The preassessment (Pr), baseline (BL), instruction (Instr), maintenance probes (MP), and postassessment (Po) of Student 1 [premature].

△ Bracken  ○ CR Probe  ▲ Aim
Figure 7. The preassessment (Pr), baseline (BL), instruction (Instr), maintenance probes (MP), and postassessment (Po) of Student 2 [premature].

△ Bracken  ○ CR Probe  ▽ Aim
Figure 8. The preassessment (Pr), baseline (BL), instruction (Instr), maintenance probes (MP), and postassessment (Po) of Student 3 [premature].
Figure 9. The preassessment (Pr), baseline (BL), instruction (Instr), maintenance probes (MP), and postassessment (Po) of Student 4 [premature].

△ Bracken  ● CR Probe  ⊕ Aim
On the fifth set with position/direction terms, no words were recorded known by Student 5 and mastery was not achieved. Of the twenty total words introduced to Student 5 during the study, two words were known prior to the intervention and sixteen words were mastered after forty-one sessions. (See Figure 10.)

**Student 6.** Student 6 scored 0 on the preassessment and the baseline measures of color words in Set 1. During the intervention phase of the first set, Student 6 learned five colors, achieved 100% mastery for two consecutive sessions, and maintained mastery of the five words on three maintenance probes. On Set 2's shape words, Student 6 scored 0 on the preassessment and baseline. She achieved mastery after 11 sessions and maintained a score of five for a later probe. No words were recorded correct during the preassessment and baseline for the third set of position/direction terms, but after two sessions Student 6 achieved mastery and maintained it on one later probe. Of the fourteen total words introduced to Student 6, no words were known prior to the intervention and fourteen words were mastered after twenty-two sessions. (See Figure 11.)

**Student 7.** Initially, Student 7 scored 0 on the preassessment and the baseline measures of Set 1's color words. During the intervention phase of this first set, Student 7 learned 4 colors, achieved 100% mastery for two consecutive sessions, and maintained mastery of the four words on seven maintenance
probes. In the second set, Student 7 scored 0 on both measures taken before instruction began, but did not achieved mastery even after 12 sessions. Of the seven total words introduced to Student 7, no words were known prior to the intervention and only four words were mastered after twenty sessions. (See Figure 12.)

**Student 8.** Initially, Student 8 scored 0 on both the preassessment and the baseline of the color words in Set 1. During the intervention phase of the first set, Student 8 learned 4 colors, achieved 100% mastery for two consecutive sessions, and maintained mastery of the four words on three maintenance probes. In the second set of color words, Student 8 scored 0 on the preassessments, achieved mastery after six sessions, and maintained a score of four for two later probes. No words were recorded correct during the preassessment and baseline of shape words in Set 3, and after fourteen sessions Student 8 was not able to achieve mastery. Of the twelve total words introduced to Student 8, no words were known prior to the intervention, and eight words were mastered after twenty-nine sessions. (See Figure 13.)

**Targeted Words**

A list of words was targeted for instruction from those words/terms recorded as incorrect during the Bracken preassessment and/or the criterion-referenced probe. The students were taught these targeted words using the
Figure 10. The preassessment (Pr), baseline (BL), instruction (Instr), maintenance probes (MP), and postassessment (Po) of Student 5 [prenatally exposed].

△ Bracken   ○ CR Probe   +/- Aim
Figure 11. The preassessment (Pr), baseline (BL), instruction (Instr), maintenance probes (MP), and postassessment (Po) of Student 6 [prenatally exposed].

△ Bracken  ○ CR Probe  ▶ Aim
Figure 12. The preassessment (Pr), baseline (BL), instruction (Instr), maintenance probes (MP), and postassessment (Po) of Student 7 [prenatally exposed].

△ Bracken  ○ CR Probe  ▼ Aim
Figure 13. The preassessment (Pr), baseline (BL), instruction (Instr), maintenance probes (MP), and postassessment (Po) of Student 8 [prenatally exposed].

△ Bracken  ○ CR Probe  + Aim
instructional steps outlined in the study's procedures. Later the students were assessed again with the same two instruments. The differences between these scores were recorded to determine the actual learning that might be attributed to the instructional procedures.

Children of Low Birth Weight. Of the sixteen words targeted for instruction from the Bracken Scale, Student 1 scored no correct responses during the preassessment and scored fifteen on the postassessment. Student 2 had one correct response on the preassessment and six out of twelve on the postassessment. Of the 8 words targeted for instruction from the Bracken Scale, Student 3 scored no correct responses during the preassessment and scored 7 on the postassessment. Student 4 had one correct response out of 15 on the preassessment and ten on the postassessment (See Figure 14). Of the sixteen words targeted for instruction from the criterion-referenced probe, Student 1 scored two correct responses during the preassessment and scored 14 on the postassessment. Student 2 had two correct responses on the preassessment and seven out of the twelve targeted words correct for the postassessment. Of the 8 words targeted for instruction from the criterion-referenced probe, Student 3 scored two correct responses during the preassessment and scored 7 on the postassessment. Student 4 had three correct responses on the preassessment and eleven out of 15 targeted words for the postassessment (See Figure 14).
Student 1 scored four correct color words on both measures of Set 1 which was an increase of four on the Bracken and an increase of three on the cr probe. Four shape words on the Bracken and three on the cr probe of Set 2 were known compared to the 0 and 1 on the earlier measures which was an increase of four on the Bracken and an increase of only two on the cr probe. Student 1 scored three correct shape words on the Bracken and four on the cr probe for Set 3 which was an increase of three and four respectively. Three position/direction words on the Bracken and four on the cr probe for Set 4 were compared to the zero on the two prior measures which was an increase of four on the Bracken and four of the cr probe (See Tables 7 and 8).

Student 2 scored four correct color words on Bracken and three correct words on the cr probe of Set 1 which was an increase of four on the Bracken and an increase of two on the cr probe. Two shape words on the Bracken and three on the cr probe of Set 2 were known compared to the 0 and 1 on the earlier measures. This represented an increase of only two on the Bracken and an increase of three on the cr probe. Student 2 scored no correct shape words on the Bracken and only one on the cr probe for Set 3 which was a decrease of one and an increase of one respectively (See Tables 7 and 8).

Student 3 scored four correct color words on the Bracken Scale and three correct words on the cr probe of Set 1 which was an increase of four on the Bracken and an increase of two on the
Figure 14. The number of correct responses pre and post on the Bracken Basic Concept Scale and on the criterion-referenced probe for students of low birth weight (LBW) and prenatally exposed (PE).
Table 7. The number of correct responses pre and post on the Bracken Basic Concept Scale targeted for instruction for students of low birth weight (LBW) and students prenatally exposed (PE).

<table>
<thead>
<tr>
<th>Students</th>
<th>Total</th>
<th>Pre</th>
<th>Post</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBW 1</td>
<td>16</td>
<td>0</td>
<td>15</td>
<td>+ 15</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>1</td>
<td>6</td>
<td>+ 5</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>0</td>
<td>7</td>
<td>+ 7</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>1</td>
<td>10</td>
<td>+ 9</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>2</td>
<td>38</td>
<td>+ 36</td>
</tr>
<tr>
<td>PE 5</td>
<td>20</td>
<td>0</td>
<td>18</td>
<td>+ 18</td>
</tr>
<tr>
<td>6</td>
<td>14</td>
<td>0</td>
<td>10</td>
<td>+ 10</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>0</td>
<td>6</td>
<td>+ 6</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>0</td>
<td>9</td>
<td>+ 9</td>
</tr>
<tr>
<td>Total</td>
<td>54</td>
<td>0</td>
<td>43</td>
<td>+ 43</td>
</tr>
</tbody>
</table>
Table 8. The number of correct responses pre and post on the criterion-referenced probe targeted for instruction for students of low birth weight (LBW) and students prenatally exposed (PE).

<table>
<thead>
<tr>
<th>Students</th>
<th>Total</th>
<th>Pre</th>
<th>Post</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>16</td>
<td>2</td>
<td>14</td>
<td>+ 12</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>2</td>
<td>7</td>
<td>+ 5</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>2</td>
<td>7</td>
<td>+ 5</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>3</td>
<td>11</td>
<td>+ 8</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>9</td>
<td>39</td>
<td>+ 30</td>
</tr>
<tr>
<td>PE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>2</td>
<td>18</td>
<td>+ 16</td>
</tr>
<tr>
<td>6</td>
<td>14</td>
<td>0</td>
<td>14</td>
<td>+ 14</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>0</td>
<td>6</td>
<td>+ 6</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>0</td>
<td>10</td>
<td>+ 10</td>
</tr>
<tr>
<td>Total</td>
<td>54</td>
<td>2</td>
<td>48</td>
<td>+ 46</td>
</tr>
</tbody>
</table>
cr probe. Three color words on the Bracken and four on the cr probe of Set 2 were known compared to the 0 and 1 on the earlier measures which was an increase of three on the Bracken and an increase of three on the cr probe (See Tables 7 and 8).

Student 4 scored four correct color words on the Bracken and three on the cr probe of Set 1 which was an increase of four on the first measure and an increase of two on the second probe. Two color words on the Bracken and three on the cr probe of Set 2 were known compared to the 0 and 1 on the earlier measures which was an increase of two on the Bracken and the cr probe. Student 4 scored only one correct color words on the Bracken and three on the cr probe for Set 3 which was an increase of one and two respectively. Three shape words on the Bracken and two on the cr probe for Set 4 were compared to the one and zero on the two respective measures which was an increase of two on the Bracken and only one on the cr probe (See Tables 7 and 8).

Children Prenatally Exposed. Of the twenty words targeted for instruction from the Bracken Scale, Student 5 scored no correct responses during the preassessment and scored eighteen on the postassessment. Student 6 had no correct response in fourteen words on the preassessment and ten at the postassessment. Of the 8 words targeted for instruction from the Bracken Scale, Student 7 scored no correct responses during the preassessment and scored six on the postassessment. Student 8 had no correct response of twelve words on the preassessment and nine at the
postassessment (See Figure 14). Of the twenty words targeted for instruction from the criterion-referenced probe, Student 5 scored two correct responses during the preassessment and scored eighteen on the postassessment. Student 6 had no correct response on the preassessment and fourteen out of 14 targeted for the postassessment. Of the 8 words targeted for instruction from the criterion-referenced probe, Student 7 scored no correct response during the preassessment and scored six on the postassessment. Student 8 had no correct responses on the preassessment and ten out of 15 targeted for the postassessment (See Figure 14).

Student 5 scored four correct color words on both measures of Set 1 which was an increase of four on the Bracken and an increase of three on the cr probe. Four shape words on the Bracken and the cr probe of Set 2 were known compared to the 0 and 1 on the earlier measures which was an increase of four on the Bracken and an increase of three on the cr probe. Student 5 scored four correct shape words on the Bracken and the cr probe for Set 3 which was an increase of four for each measure. Four position/direction words on the Bracken and the cr probe for Set 4 were compared to the zeroes on the two prior measures which was an increase of four on the Bracken and the cr probe. Only two position/direction words on the Bracken and the cr probe of Set 5 were known compared to the zeroes on the earlier
measures which was an increase of two on both the Bracken and the cr probe (See Tables 7 and 8).

Student 6 scored four correct color words on the Bracken Scale and five words on the cr probe of Set 1 which was an increase of four on the Bracken and an increase of five on the cr probe. Two shape words on the Bracken and five on the cr probe of Set 2 were known compared to the zeroes on the earlier measures which was an increase of only one on the Bracken and an increase of five on the cr probe. Student 6 scored four correct position/direction words on the Bracken and the cr probe for Set 3 which was an increase of four for both measures (See Tables 7 and 8).

Student 7 scored four correct color words on both measures of Set 1 which was an increase of four on the Bracken and the cr probe. Two color words on the Bracken and the cr probe of Set 2 were known compared to the zeroes on the earlier measures which was an increase of only two on the Bracken and the cr probe (See Tables 7 and 8).

Student 8 scored three correct color words on the Bracken and four on the cr probe of Set 1 which was an increase of three on the first measure and an increase of four on the second. Two color words on the Bracken and three on the cr probe of Set 2 were known while none were known on the earlier measures for an increase of only two on the Bracken and an increase of three on the cr probe. Student 8 scored four correct shape words on
the Bracken and three on the cr probe for Set 3 which was an increase of four and three respectively (See Tables 7 and 8).

**Groups.** During the pretest of the Bracken Scale, Student 1 received 0%, Student 2 received 0.86%, Student 3 received 0%, and Student 4 received 0.86%; while Students 5, 6, 7, and 8 all received 0%. For the posttest, Student 1 increased to 12.9%, Student 2 advanced to 5.2%, Student 3 increased to 6%, and Student 4 advanced to 8.6%. On the posttest, Student 5 increased to 15.5%, Student 6 advanced to 8.6%, Student 7 increased to 5.2%, and Student 8 advanced to 7.8% (See Figure 15). During the pretest of the criterion-referenced probe, Students 1, 2, and 3 scored 1.3%, while Student 4 received 1.9%; while Student 5 scored 1.3% and Students 6, 7, and 8 received 0%. For the posttest, Student 1 increased to 9%, Students 2 and 3 advanced to 4.5% each, and Student 4 advanced to 7.1%. On the posttest, Student 5 increased to 11.6%, Student 6 advanced to 9%, Student 7 increased to 3.9%, and Student 8 advanced to 6.5% (See Figure 15).

Six of the eight students did not receive any correct responses on the Bracken reassessment while the other two students only had one incorrect response each. The number of words learned by the group of children prenatally exposed to controlled substances was slightly higher than those of the group of children who were low birth weight, 43 and 36 increased words (See Figure 16). On both pretests, the number of words
known by the group of children who were low birth weight was higher than those known by the group of children who were prenatally exposed. Two words on the Bracken and nine words on the cr probe were known by the LBW group compared to zero on the Bracken and two on the cr probe by the prenatally exposed group. On the two posttests, the numbers were reversed. The prenatally exposed group had 43 known words on the Bracken and 48 on the cr probe while the LBW group had 38 on the Bracken and 39 on the cr probe.

Each group of students made gains in the number of words learned when comparing the pre and post scores of the Bracken Basic Concept Scale and the criterion-referenced probe. Although most of the students knew few, if any, of the words during the two pre-instructional measures, they were able to master many of the words during the instructional sessions and maintained high mastery levels for the two post-instruction assessments. The number of instructional sessions required by each student to obtain mastery of the words also varied and might have affected the number of words mastered. The two students with only two word sets attended fewer than thirty sessions while the student with the four sets had more than forty sessions. The variability of the data points observed in the instructional sessions might have contributed to the often high number of sessions needed for mastery. Some of the students were able to master the word
Figure 15. The percentage of words correct pre and post on the Bracken Basic Concept Scale and the criterion-referenced probe for students of low birth weight (LBW) and prenatally exposed (PE).
Figure 16. The pre and post scores for the targeted words on the Bracken Basic Concept Scale and the criterion-referenced probe.

- **Subjects**
  - 1-4 Low birth weight
  - 5-8 Prenatally exposed

<table>
<thead>
<tr>
<th></th>
<th>Bracken Pre</th>
<th>Bracken Post</th>
<th>CR Probe Pre</th>
<th>CR Probe Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Correct Responses</td>
<td>2</td>
<td>43</td>
<td>9</td>
<td>48</td>
</tr>
</tbody>
</table>
sets in as little as three sessions while other word sets required fifteen sessions and still mastery was not achieved.

The number of word sets introduced was also another point to note. Two students were introduced to only two sets (Students 3 and 7), three students had three sets (Student 2, 6, and 8), while two students were presented with four sets (Students 1 and 4), and only one student achieved mastery of four sets and started learning a fifth set (Student 5). The more word sets introduced to the students often meant that they mastered more words. Occasionally a student who was introduced to several word sets, yet failed to master all of the targeted words. Student 5 who mastered the most (16) words of all students also was introduced to the most (5) word sets, although Student 8 had three word sets, he was able to master only eight words.

Learning Trials

Children of Low Birth Weight. The mean number of learning trials for children who were low birth weight was 4.11 to mastery. Student 1's learning trials ranged from 3 to 10 with an average of 4.6 trials to mastery with 79.69% of the trials correct. Student 2 averaged 3.5 trials to mastery with a range of 2 to 7 trials and had 78.84% trials correct. Student 3's learning trials ranged from 2 to 6 with an average of 3.8 trials to mastery with 77.78% of the trials correct. Student 4 averaged 4.53 trials to
mastery with a range of 3 to 7 trials and had 78.09% trials correct. (See Table 9.)

**Children Prenatally Exposed.** The mean number of learning trials for children prenatally exposed to controlled substances was 3.92 to mastery. Student 5’s learning trials ranged from 2 to 8 with an average of 3.85 trials to mastery and had 72.8% trials correct. Student 6 averaged 3.65 trials to mastery with a range of 2 to 6 trials with 94.9% of the trials correct. Student 7’s learning trials ranged from 2 to 6 with an average of 4.0 trials to mastery and had 59.25% trials correct. Student 8 averaged 4.16 trials to mastery with a range of 2 to 7 trials with 83.13% of the trials correct. (See Table 9.)

Overall, the children prenatally exposed to controlled substances had fewer mean learning trials than the children of low birth weights (3.915 and 4.11 mean trials respectively). The group’s mean numbers of learning trials demonstrated that the prenatally exposed students were able to master and maintain approximately the same number of words as the LBW group and yet had less learning trials to mastery. This translated to less time necessary during instruction for similar gains.

The percentage of trials correct for both groups was 78.6% for those children who were low birth weight and 77.52% for the children prenatally exposed. These scores represent the mean percentage of trials correct by each of the groups, and there was a slight difference in the percentage of correct responses which
Table 9. Range, mean, and percentage of learning trials correct for students of low birth weight (LBW) and students prenatally exposed (PE).

<table>
<thead>
<tr>
<th>Students</th>
<th>Range of Trials</th>
<th>Mean # of Trials</th>
<th>% of Trials Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBW 1</td>
<td>3 - 10</td>
<td>4.6</td>
<td>87.77</td>
</tr>
<tr>
<td>2</td>
<td>2 - 7</td>
<td>3.5</td>
<td>43.47</td>
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<tr>
<td>3</td>
<td>2 - 6</td>
<td>3.8</td>
<td>72.3</td>
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<tr>
<td>4</td>
<td>3 - 7</td>
<td>4.53</td>
<td>67.13</td>
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<tr>
<td></td>
<td></td>
<td>4.11</td>
<td>67.67</td>
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<tr>
<td>PE 5</td>
<td>2 - 8</td>
<td>3.83</td>
<td>80.49</td>
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<tr>
<td>6</td>
<td>2 - 6</td>
<td>3.65</td>
<td>90.99</td>
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<tr>
<td>7</td>
<td>2 - 6</td>
<td>4.0</td>
<td>55.7</td>
</tr>
<tr>
<td>8</td>
<td>2 - 7</td>
<td>4.16</td>
<td>80.97</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.915</td>
<td>77.04</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>4.01</td>
<td>72.36</td>
</tr>
</tbody>
</table>
favored the LBW group when compared with the prenatally exposed group.

**Interobserver Agreement**

Data were collected on the students' assessment and instructional performance with interobserver agreement scores taken on 55% to 83% of the data collected. Percentage of agreements was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100%. The overall interobserver agreement score for both groups was 97.92%, with 97.58% agreement score for the group of 4 students who were low birth weight and 98.25% for the group of 4 students prenatally exposed to controlled substances. Interobserver agreement scores can be found in Table 10.

For Student 1, the range of agreement scores was 93.75 to 100%, the mean score was 98.56%, while Student 2 had a mean score of 97.7% with a range of 87.5 to 100%. For Student 3, the agreement score ranged from 87.5 to 100%, with a mean of 96.3%, and Student 4 had a mean score of 97.78% with a range of 87.5 to 100%. For Student 5, the range of agreement score was 87.5 to 100%, the mean score was 97.75%, and Student 6 had a mean score of 98.56% with a range of 90.6 to 100%. For Student 7, the range of agreement score was 89.58 to 100%, the mean score was 97.36%, while Student 8 had a mean score of 99.34% with a range of 95.83 to 100%.
Table 10. Range and mean percentage of interobserver agreement scores for students of low birth weight (LBW) and students prenatally exposed (PE).

<table>
<thead>
<tr>
<th>Students</th>
<th>Range of Scores</th>
<th>Mean Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBW 1</td>
<td>93.75% - 100%</td>
<td>98.56%</td>
</tr>
<tr>
<td>2</td>
<td>87.5% - 100%</td>
<td>97.7</td>
</tr>
<tr>
<td>3</td>
<td>87.5% - 100%</td>
<td>96.3</td>
</tr>
<tr>
<td>4</td>
<td>87.5% - 100%</td>
<td>97.78</td>
</tr>
<tr>
<td>PE 5</td>
<td>87.5% - 100%</td>
<td>97.75%</td>
</tr>
<tr>
<td>6</td>
<td>90.6% - 100%</td>
<td>98.56</td>
</tr>
<tr>
<td>7</td>
<td>89.58% - 100%</td>
<td>97.36</td>
</tr>
<tr>
<td>8</td>
<td>95.83% - 100%</td>
<td>99.34</td>
</tr>
</tbody>
</table>
Social Validity

Questionnaires were completed by the teachers, parents or guardians of the students involved in this study. Each of the students were read the statements on the questionnaire and recorded their responses by circling a happy, neutral, or sad face. The parents/guardian and the teachers answered between 3 and 5 questions by circling either a "Yes" or "No" and writing explanatory comments. The findings of each questionnaire are presented below.

Students. Overall, the students responded positively toward the instructional program. Six statements were read to the students concerning this study. The students were asked to respond to statements about using the cards, practicing, and learning new things. They were questioned about how well they liked the teacher and if they would participate in a similar study again. Finally, the three major concepts that each student covered during the sessions were noted so that the student could mark which area(s) they preferred best. All (8) of the students liked the cards and learning new things, but a few (2) did not like practicing so often. Most (7) of the students liked the teacher and all (8) would like to participate in another study like this again. Of the concepts introduced during tutoring, the majority (5) liked most the pictures of the position/direction terms, with colors and shapes the next preferred (3) concepts. There was no relationship between the responses given and the two groups of
students. The children of low birth weight and the children prenatally exposed did not differentiate when marking their responses. (See Appendix H for a sample of student questionnaire.)

Teachers. The teachers were asked five questions about each student and the effects of the instructional program. They were asked to respond to questions concerning the individual student's behavior, academic and social, prior to this study. All were asked why the student was placed in this class, the teacher was asked to tell what criteria was used to differentiate students into separate classes. Finally, the teachers were asked to note any changes in the student's behavior which might be attributed to this program and if the program fit in with their own class program. Each of these responses were short answers, while some could be answered giving a "Yes" or "No" response with an explanation to clarify.

The teachers of the two instructional settings completed questionnaires for the students in their programs. The preschool teacher answered that she would definitely like to participate in another study similar to this in the future. She said that the study complemented the work that she was doing in the classroom, and by having someone else target those students, that she might consider at-risk, for additional instruction, left more time for her to devote to the other students in the class. The fact that the research team was able to accommodate her
class schedule also meant that she could continue with her
lesson plans with little or no deviations to the routine.
 Academically, the teacher was unable to state that the students
increased their performance. A few of the students would
respond to her questions about what they learned during the
sessions, and two students were observed to be more descriptive
when requested manipulable objects in the room (i.e., blue blocks,
red book). No specific changes in the students' social behaviors
were noted by the teacher, other than the students' willingness
to attend the sessions without delay or disagreement.

The daycare instructor also expressed a desire to have
more research teams use the facilities. She was overjoyed to
have an additional resource person to suggest strategies for
working with her students. The focus of the daycare was not as
academically-oriented so she was unable to give any specific
changes in the students academic performance. She did notice
slight improvements in one students' social behavior since he
started in the study. He showed a willingness to work with other
students when using the puppets, something he had not done
previously. She said the student was talking more and often
would tell her the color of his clothes without prompting. This
was an activity done in the instructional session at the beginning
to note informally if the concepts being taught were functional.

There were no differences between the responses of the
two teachers, other than the more detailed answers given by the
certified teacher at the preschool program. Both teachers observed some academic lags in the performances of the targeted students, and both noted the behavior problems exemplified by the students. Neither teacher felt that the problems were unusual or occurred at a high rate to set these students apart from their peers. (See Appendix I for a sample of teacher questionnaire.)

Parents. Overall, the parents had few comments to make concerning the academic performance of their children. Students 1, 2, 3, and 4 were living with their natural mothers in separate rented housing. All of these students, except Student 3, had older siblings residing in the home. Two of the parents noted that their children targeted for this study were not "like" their other children, but attributed that to their prematurity and low birth weight. They expected lower intellectual performance of these children and were less likely to question school decisions. Student 1's mother said one of her older children had more behavior problems than the child in this study. Student 2's mother was more concerned about the speech difficulties of her child. The mother of Student 3 did not notice any changes that might be due to the study; but did say her son was able to name some of the colors in his crayon box. In the case of Student 4's mother, she was unable to provide any explanations of how the study might have changed her son's academic and social behaviors. The only noticeable difference between the two
groups of students was that these mothers were able to rationalize the problems that their children had as due to low birth weight which was not really their fault. All of the mothers appeared to be willing to make adjustments in their schedules to provide supplementary instruction to increase the probability that their children will have improved skills.

Only one of the children [Student 8] prenatally exposed to controlled substances was living with his natural mother in a separate home, one student [Student 6] was under the Child Protective Services Agency, and the other two students lived with their mother in a group family residence. Student 5 was residing with foster parents who owned their own home, and was the only child under their care at this time. The mother was at home during the day and provided games and activities for this student during vacations and other non-school times. She had noticed the child's perseverative/echolalic speech, but only tried to focus the student's attention on something else to stop it. This was a strategy that the experimenter also used during the instructional sessions which was temporarily effective. Various activities were scheduled by the foster mother to accommodate this student's propensity for continuous movement. For Students 6 and 7, who lived in the residential drug treatment program shelter with their mother, had scheduled times allocated for the family to interact in a structured, yet positive, manner. Daily happenings and any homework assignments were discussed, later
entertainment and leisure activities were planned, and nightly bedtime practices were accomplished. The mother of these two students could not give any answers to the questions asked, since the drug treatment program was her major focus at this time. Student 8's parent was excited about the academic growth that she observed in her son. He was using the color words taught during the instructional sessions and his mother said that this was something new for him. He wanted to drink the red kool-aid or to wear his blue pants. His mother could ask him to get his brown shoes or his black pants. She did not notice any changes in his social behaviors.

Two of the parents of these children were involved directly with the student's performance, academic and social. The other mother was actively engaged in overcoming her drug use and was unable, at this time, to observe any changes in her children. (See Appendix J for sample of parent questionnaire.)
CHAPTER V
DISCUSSION

This chapter provides a discussion of the results relative to the research questions posed at the study's outset by reporting the scores for the two groups of children identified as either prenatally exposed (PE) to controlled substance or as low birth weight but not prenatally exposed (LBW). The results are compared and analyzed to determine the relative effects these direct instructional procedures might have on the language development of these two groups of children. The limitations of the study are also included, as well as several implications for classroom practice and suggestions for additional research.

Question 1. What are the effects of direct instruction on the improvement in language knowledge and usage for word categories of children prenatally exposed to controlled substances or who were low birth weight but not prenatally exposed to controlled substances?

The student response scores demonstrated that students' language acquisition changed during the instruction. All of the students were able to master the first introduced set. Each
student was introduced to at least two sets, one student reached three sets, four achieved four sets, while only one student mastered five sets. The change in language acquisition occurred during the direct instruction. This relationship was replicated at each level in the multiple word set stages.

Student 1 was able to master four sets of words and terms and maintained the learned words over several later probes and the postassessments. He was a slightly built, shy boy who displayed no behavior problems during the instructional sessions. Initially, he required some prompting by the experimenter to encourage him to respond, but after the second set of words he would actively respond to teacher-initiated statements and even initiated some on his own. Student 1 was always ready to begin the sessions and even asked for additional practice on some sets, especially the shapes [Sets 2 and 3]. He required the highest mean number (4.6) of learning trials of all the students but still had a high percentage of those trials correct [79.7%].

Student 2 was able to master two sets of words and terms and maintained the learned words over several later probes and some postassessments. He was unable to achieve mastery on his third set. He was of average size, a volatile boy who displayed several behavior problems in his class and during the instructional sessions. This student was hostile toward the researchers, refusing to speak, lying on the floor, crying and occasionally using profanity. Initially, some teacher prompting
was required to encourage his participation in the study, but after the second session the student was more positive toward attending and learning new things. Student 2 did have a noticeable speech impediment which occasionally required the experimenter to ask him to repeat his responses. He actively practiced the words and even enjoyed joking with the researchers during the initial and final discussion periods of the sessions. The lengthy number of instructional sessions required for mastery of the first set may have been due to Student 2's initial hostility and subsequent playfulness. During the second set of colors, his behavior and number of learning trials seemed to reflect his learning rate if he was cooperative. The multiple maintenance probes of the second set were taken during instruction of the third set to encourage his continued cooperation. At the end of the study, he again displayed some of the same behavior problems as he had at the beginning of the study which might be a reason why he did not master the third set. Although he had several behavior problems observed during some of the sessions, he had a low mean number (3.5) of learning trials and one of the higher percentages [78.84] of trials correct. Additional attempts to motivate this student met with no change in his behavior which was also observed in his class by the classroom teacher and aides. His mother was unable to provide definite reasons for the changes in his behavior pattern but noted that he attended a private daycare program after preschool and
reported that children had begun teasing him about his speech impediment.

Student 3 was able to master only two sets of words and terms but maintained the learned words over later probes and postassessments. He was a slightly built boy who displayed some behavior problems. Initially he required no researcher input to encourage his responding, and after the second session he actively responded to teacher-initiated statements. His major behavior problems were refusing to come to the study site without prompting and then wanting to leave after a few learning trials. A timer was used to motivate him to attend to the cards for at least ten minutes. The length of the session's time for this student was gradually increased from five to fifteen minutes. Student 3 required a multiple number of instructional sessions to achieve mastery of the first set since the sessions were initially for brief time periods. The second set was introduced at the same appropriate time that Student 3 was able to attend for the 15 minute time periods. Mastery of the second set required 7 sessions as opposed to the eleven required for the first set. With a mean number of 3.8 learning trials, his percent of trials correct was one of the lowest [77.78] of all the students.

Student 4 was able to master three of his four sets of words and terms and maintained the learned words at a high level over several later probes and postassessments. He was a
slightly built, extroverted boy who displayed few behavior problems. Student 4 was very friendly and always had a smile for the experimenter when she came to escort him to the instructional sessions. He had a protruded stomach and walked with an unusual gait. This student would respond actively to teacher-initiated statements and even initiated much conversation on his own. Student 4 had a consistent rate of performance in the number of sessions required before he reached mastery. His mean number (4.53) of learning trials was the second highest of the students, partially due to his many attempts to engage the experimenter in unrelated statements about his mother and his home life during the instructional sessions; but he still had 78.09% of those trials correct.

Student 5 was able to master four of his five sets of words and terms and maintained the learned words over several later probes and the postassessments. He was also a slightly built boy who displayed few behavior problems. Student 5 was a very friendly young boy, often speaking to other students and teachers in the hall during the walk to and from the instructional site. He required no teacher input to encourage his responding, but would often engage in perseverative and/or echolalic speech. When he said or heard a word or phrase he "liked", he would continue to repeat it numerous times until directed to focus on some thing else. He was also the most active of all the students, constantly moving around in his chair, getting in and out of the seat, playing
with his hands and clothes. Student 5 was the only student in this study living in the care of foster parents who reported similar behaviors at home. Both of his natural parents used drugs [cocaine] and alcohol which was the reason for his removal from the home. He had a mean number of 3.85 learning trials and 72.8% of those trials correct. Once he mastered a word, he retained it during the later assessments.

Student 6 was able to master three sets of words and terms and maintained them over several later assessments and probes. She appeared to be of average height and built, was very friendly, and displayed few behavior problems. She readily responded to teacher-initiated statements and initiated many conversations on her own. She had a low mean number (3.65) of learning trials which might have been due to the number of times that she interrupted the practice to discuss extraneous topics, but she also had the highest percentage [94.9] of those trials correct. This student was the oldest of all the students and the sister of Student 7. During the prenatal period, it was reported that her mother used drugs (freebased cocaine) less frequently than during her brother's prenatal period. During the study, the older sister of Students 6 and 7 died of a congenital heart disorder which was reported not to be related to maternal drug use [The mother said that she was not using drugs during that pregnancy].
Student 7 was able to master only one of two word sets but maintained the learned words over the later probes and assessments. He was a slightly built boy who displayed several behavior problems. Initially, he wanted to play and talk during the sessions but soon began to respond actively to the teacher-initiated statements. When encouraged to follow directions, he would complete the instructional part of the session and then be allowed to talk about any topic of interest. Student 7 was unable to master the second set of colors, he was hesitant about learning more colors once he had mastered the first set. Multiple maintenance probes of Set 1 were done to encourage Student 7's performance on Set 2. This student had a mean number of 4.0 learning trials with only 59.25% of those trials correct.

Student 8 was able to master two of the three sets of words and terms and maintained them over several later probes and assessments. He was an average built boy who displayed few behavior problems. Initially he was slow to respond to teacher-initiated statements but later he began to actively respond especially when introduced to the novel shapes. He had a high mean number (4.16) of learning trials and a high percentage [83.13] of those trials correct. When interacting with other students during the regular daycare instruction, he was most often the leader, using intimidation and force to "encourage" others to follow his wishes. His mother reported that he was somewhat forceful when interacting with children at home, but
he was an only child, and therefore not provided the opportunities to share with others. During the instructional sessions he did not have other students to interact with and the researcher established clear, concise guidelines to maintain the pace and focus of the instruction. He was observed by the experimenter discussing colors with another student in the daycare who was his best friend. Student 8's mother said that she noticed that he was using the color words at home. He asked for red kool-aid when previously he had merely asked for kool-aid; and he was able to identify his clothes and shoes by color when asked by his mother.

The individual graphs of the students who were low birth weight showed similar patterns as the students who were prenatally exposed. The data points varied across the different sets. Some of the students were able to master a word set after as few as three sessions while others required as many as twelve sessions. There was considerable variability in several students' data. Student 1 went from no correct words to four correct words across two consecutive sessions for Set 1 and from one correct word to four correct words across two consecutive sessions for Set 4. Similar patterns were noted for Student 3 in Set 1, Student 5 in Set 5, and Student 7 in Set 2.

For most of the word sets, the level of performance for each of the students did not change until after the introduction of the instruction. For Student 1, the number of words in Sets 3
and 4 gradually increased only after the instruction began and not before. This was also true for each of the other students for at least one of the word sets. Occasionally, the performance of some students fluctuated during the instructional conditions such as for Students 1, 5, and 7. They recorded high numbers of words correct during one sessions only to reverse to lower numbers in consequent sessions.

Question 2. How does direct instruction effect the language development of children prenatally exposed to controlled substances in comparison with the language development of children who were low birth weight but not prenatally exposed to controlled substances?

The raw scores of the two groups were not noticeably different on the Bracken Basic Concept Scale. All of the students had higher raw scores on the postassessment of the School Readiness subscale. The highest and lowest scores on both administrations of this subscale were received by two of the students prenatally exposed. The Direction/Position subscale revealed minimal changes on the pre and post administrations. Four of the students (Students 2, 5, 7, and 8) received the same score at both times, while only two students (Students 3 and 6) increased their scores. The other two students (Students 1 and 4) decreased in the number of words/terms known (Figure 2). These differences were not unexpected since the literature
suggested that standardized assessment instruments were often not conclusive with children prenatally exposed.

A percentile is the value of a scale of one hundred that indicate the percent of a distribution that is equal to or below it. The percentile scores on the School Readiness section of the Bracken showed that both groups made gains between the pre and post instructional administrations. Two of the students [Students 5 and 7] in the prenatally exposed group received scores which indicated that they scored equal to 63% and 91% of other students of their age. The highest ranking student [Student 2] in the LBW group only received a score equal to 50% of others in his age level. Again the percentiles received by the same two students prenatally exposed were 16% which was higher than any member of the LBW group on the Direction/Position subscale of the Bracken.

Since the focus of the instruction was in the School Readiness subscale, several students did not have ample opportunity to practice the terms in the Direction/Position subscale, therefore these scores reflected that lack of instruction and practice (Tables 3 and 4). All students obtained higher gains on the School Readiness subscale, while half of the students had the same or decreased scores on the Direction/Position subscale. Three of the students prenatally exposed (Students 6, 7, and 8) were able to record gains on the Direction/ Position subscale and only one of the LBW students
(Student 3) had an increased score. It can not be determined if this was due to differences between the two groups or just the probability of chance.

The Bracken Scale required the student to respond by pointing which is a receptive skill; while the criterion-referenced (cr) probe required the student to vocalize the response which is an expressive skill. Several authors (Bauer, 1991; Chasnoff & Griffith, 1992; Griffith, 1989) have advocated the need for an assessment instrument that is more sensitive to small changes in the language performance which may characterize children who were prenatally exposed to controlled substances. If the results of this study can be generalized to the larger population than the instruments currently being used to assess children who were low birth weight might be useful in determining areas of concern for children prenatally exposed. The similarities between the two groups on this test may serve to add more evidence to support the need for different assessments to accurately measure these children's abilities.

The same words and terms found on the Bracken Scale were incorporated into the cr probe designed by the researcher. The cr language probe was an initial attempt by the researcher to develop a measurement instrument which might be paired with a standardized instrument for a complete measure of preschool children's language performance. One hundred fifty-five items were assessed on the cr probe. Five major areas were included:
colors, shapes, numbers, letters, and direction/position words. All of the students' scores increased from the pre to post administration of the cr language probe. With the cr probe the likelihood of accidentally receiving the correct answer is less probable since this is recall not recognition responses. Changes in performance were readily observed on Figure 5 which contained the total scores for all of the students on the cr probe. The three highest scores (32, 60, and 37) were received by Students 1, 5, and 6 respectively on the first administration of the cr probe. On the second administration, Student 5 again received the highest score of 75 and Students 1 and 6 received the next highest scores of 59 and 60.

Small amounts of growth were easier to determine with the cr probe since the students had to know the word before they could say it rather than merely pointing to a picture after hearing a word, as with the Bracken Scale. The chances of accidently pointing to a correct answer were greater (25%) when the student has four options, one of which is definitely correct. With the cr probe, the likelihood of accidently saying the correct answer was less probable since these were recall not recognition responses. These small differences recorded on the Bracken Scale were not unexpected since standardized assessments tend not to be conclusive for children prenatally exposed (Griffith; 1989; Chasnoff & Griffith, 1992). This also appears to be the case for low birth weight children as well. The similarities
between the two groups on this test may serve as additional evidence to support the need for different assessments to accurately measure these children's abilities. Assessment instruments sensitive enough to show minimal changes in a child's performance can provide the teachers with a more complete record of the effects of their instructional practices.

When the two assessments were used to determine the number of words to target for instruction, the LBW students had 51 words and the students prenatally exposed had 54 words. After the instruction was terminated, the changes noted on the Bracken Scale showed an increase of 36 words for the LBW group, and a 43 word increase for the prenatally exposed group. The changes recorded on the cr probe showed an increase of 30 words for the LBW group, and a 46 word increase for the prenatally exposed group. With the small difference in the number of words targeted for the two groups, the post-instruction changes demonstrate greater gains for the prenatally exposed group.

The mean number of learning trials for the group of students with low birth weights was slightly more (4.11) than for the group of students prenatally exposed to controlled substances (3.915). There was no apparent relationship between the number of learning trials and the percent of trials correct. The LBW students averaged fewer trials correct (67.67) than the students prenatally exposed (77.04). This could be interpreted that the LBW students required more learning trials and time to
master the word sets and attained fewer of those trials correct; while the opposite was true of the students prenatally exposed. The students prenatally exposed needed fewer learning trials and had a higher percentage of trials correct. They used less instructional time and yet responded correctly, which translates to more opportunities for learning and responding with better results. Although, suggesting that, as a group, PE children may have had a faster learning rate than the LBW children. A further implication is that prenatal exposure to cocaine may place children at no greater risk than existing at-risk groups (i.e., LBW students), and that technology already in place (i.e., direct instruction), may be adequate for the educational programming of these PE students.

The findings of this study seemed to demonstrate that the children prenatally exposed to controlled substances performed slightly better than those children who were low birth weights. Although small, the gains made by the prenatally exposed group were consistently greater than those attained by LBW students. More comparative studies including typically-developing students are needed before conclusive statements can be made.

Using the developmental levels represented in the Ohio Handbook (1991), all of the students would be placed in the three and four year levels of performance. Most of the students were able to provide personal information about themselves, tell stories, and stay with an activity for 5-10 minutes. A few of the
students seemed to understand concepts such as next week, use at least 4-5 words in a sentence, and stayed with an activity for ten to 15 minutes. Learning was demonstrated by both groups of students, but the prenatally exposed group attained higher overall scores, needed fewer trials, and averaged more trials correct than the comparison group of LBW students. Comparisons to previous research can not be made since the author is not aware of other reported studies with this population.

Question 3a. What are the reactions to direct instructional strategies for language development by the students who were prenatally exposed to controlled substances and not prenatally exposed but who were low birth weight?

All of the students expressed a desire to be in another study like this again. They liked being asked to do something special that other students in their class were not involved in. The fact that the majority of the students liked the picture cards was not surprising since some of the colors and shapes were also part of the regular classroom assignments. The novelty of the pictures motivated them to try harder. It was surprising that more of the students did not respond that they did not like practicing (doing the words over and over again). Occasionally during the instructional sessions, some of the students expressed a desire to stop before the word set was completed, and yet only two marked that they did not like practicing. A questionnaire for this age group required brief stimulus questions/statements and
some manipulable response to help focus their attention. This questionnaire allowed them to circle or color a happy, neutral, or sad face for each of the six sentences. All of the students were able to accomplish this task and several students wanted to draw pictures for me for the same sheet. There were no differences between the responses of the two groups. Most of the children, whether low birth weight or prenatally exposed responded positive toward the total program and its components.

Question 3b. What are the reactions to direct instructional strategies for language development by the teachers of those children who were prenatally exposed to controlled substances and those children not prenatally exposed but who were low birth weight?

Again the program was received positively by both teachers. In the public school program, children were placed in this program if they had a diagnosed language disorder. In the daycare program, the children were divided into classes based on their ages. Although no formal language assessment was done at the daycare, the researcher noted that each student in this study exhibited some language delays and articulation problems. Both teachers reported that this program fit satisfactorily with their schedules, and complimented their own programs. The concepts introduced in the study were similar to those presented in their classes, and served to provide additional instruction to these at-risk students. Individual reports of the students' academic
performance by the teachers showed that all the students were performing below other children of their age levels. The public school students were being served by two speech therapists, one was a general speech therapist for those children needing speech in the elementary school and the other was a speech therapist for those children currently placed in special programs at the school. The daycare students were not receiving any speech therapy as part of their programs. No letter grades were given to any of the students but all received satisfactory marks when final reports were given to their parents.

Behaviorally, four of the five students in the public school required behavior management plans. These students displayed difficulties in attending to teacher direction, staying in their seat, staying on-task for more than five minutes, using appropriate language (profanity), and/or controlling their emotional states. In the day care, the teachers reported that three targeted students displayed similar behavioral characteristics, but no formal behavioral plan was introduced. None of the teachers could state that any changes in the students' behaviors could be attributed to this program. Normally the children were happy to come to the instructional sessions and would report what went on during the sessions to the teacher and/or class; but the information learned in the sessions apparently did not transfer or generalize to their classroom environments.
Question 3c. What are the reactions to direct instructional strategies for language development by the parents of those children who were prenatally exposed to controlled substances and those children not prenatally exposed but who were low birth weight?

The parent questionnaire consisted of only three questions. Parents were asked to describe their child's academic and social behaviors before the study began, and if they notice any changes in these behaviors which might relate to the study. The parents' reports were similar to those of the teachers although not described as concisely. All of the parents had only a high school education so their answers included statements such as "he does not like to share", "he sometimes lets a bad word slip out", and "he is constantly moving around, starting and stopping several activities." Some of the parents recalled hearing their children give the names of colors and shapes of objects in the home. Two mothers said their sons were using more descriptive terms (colors) when he talked about daily happenings. None of the parents noted any behavioral changes which might be attributed directly to the procedures in this study.

Limitations

Since this study was not a replication of any other study and targeted a potential at-risk population, there were several limitations which must be mentioned. The limitations could be divided into six major areas: sample size, time line, baseline
measures, drug effects, assessment instruments, and longitudinal studies.

**Sample Size.** This study had only eight students in the population sample which limits the generality of the results. More students were initially found in the category of prenatal drug exposure but mortality was a problem. Several of the mothers were in treatment programs, however, they were not able to stay in those programs and returned to the drug environment. Unless the mothers are able to survive the structured conditions that most drug treatment programs are built upon, their children may not receive the needed assistance. The sample size did not contain enough students in either group. More children who were low birth weight would have allowed the researcher to determine what effects different birth weights might have on the language development. Extremely low birth weight children may have additional concerns not addressed in this study since all these LBW children were between three pounds five ounces and four pounds seven ounces. Children weighing less than three pounds may have serious medical problems which may translate to reduced academic performances. If nothing else, LBW children often have extended hospital stays either at birth or for later complications, and fail to receive compensatory educational programs.

**Time Line.** The time line for this study was approximately six to eight weeks. The schedule time periods including the
assessments was over ten weeks, but even that period was inadequate for several of the students. Absences, illness, and other reasons resulted in some students not receiving all of the planned instructional sessions. At this age children are more likely to have shorter attention spans, especially those children who were low birth weight or prenatally exposed, and more sessions may be needed to achieve the same results as with lengthier sessions. If the number of sessions and the length of each session had been extended, greater gains might have been recorded. Due to time restraints and the end of the school year, the researcher had to complete this study after several months. **Baseline Measures.** Only one baseline data point was recorded for the students in this study. This was done to reduce the number of words that the students might learn through repeated exposure. Baseline logic required the measurement to continue until steady state responding was demonstrated. Although this study contained only one baseline data point, the pattern of the data points during the intervention clearly indicated steady improvement resulting from the instruction. **Drug Effects.** Additional information about the effects of drugs, especially cocaine, on the developing fetus is needed. This may allow educators to plan more effective strategies for remediation of various deficiencies that children prenatally exposed may exhibit. The researcher had limited knowledge of the medical effects and their translation to academic tasks,
therefore relied on medical professionals to provide some assistance and explanations. With the increasing numbers of children prenatally exposed to controlled substances, educators must be informed about the known effects of drugs on the infants and how the students' skills may be effected. The information provided in the review of literature contained a small amount of the research available on the demographics, characteristics, and related effects of prenatally exposure, and even less about the educational implications and programming for this population.

**Assessment Instruments.** More sensitive assessment instruments are needed to provide accurate measurements of these children's abilities. The Bracken Basic Concept Scale has its own limitations. It required the students to respond by physically pointing to the targeted item or picture and its length may require multiple sessions to complete administration with younger populations. Other assessment instruments might have been used but this scale allowed the researcher to develop the criterion-referenced probe which would assess the student's verbal abilities. Additional assessments might have allowed for a complete evaluation of the students' abilities and recorded any changes in their performance.

**Longitudinal Studies.** Longer follow-up studies are needed with these and other students to allow researchers to continue assessments as the children mature and develop. The differences noted between the two groups were not great enough to
accurately state that the instructional procedures were more effective with one group than another. Periodic probes taken throughout the children's school years might present different results. The growth patterns of one of these groups of children may change in such a way as to demonstrate the need for more or less directed instructional strategies. Children who were low birth weight may begin to escalate beyond the developing skills of the children prenatally exposed. This study was only an assessment of the students' language performance during a limited time period of their lives. A longitudinal study would allow the researcher to develop learning patterns for these children as they mature.

Additional Comparison Group. Another limitation of this study was the lack of a full-term, non-drug exposed group of students. This group would have allowed a direct comparison among the two groups of children prenatally exposed and children of low birth weights but not exposed, and a third group of "typically developing" children. The variability of the data for the students involved in the study may have been similar to that of the drug-free, normal birth weight peers.

Implications for Classroom Practice

More individual attention is needed for those students diagnosed as at-risk. This may involve reducing the teacher-student ratio classes which have an high percentage of children who may be labelled at risk of having learning problems. Even
the small ratios currently legislated for special education classes may need to be changed. The characteristics of the children prenatally exposed may require the teachers to actively engage smaller numbers of students in order to individualize the instructional practices to produce educational gains with these students.

The components of direct instruction that have been shown to be effective with general education, as well as special education, classes should be included in more school systems. The practices advocated by the direct instruction strategy can be utilized, and often is being used, in more subject areas. This and other strategies which have been effective with LBW children and other at-risk populations should be employed with children prenatally exposed to determine what is the most effective strategy.

The preschool child is still new to the public school domain since the passage of Public Law 99-457, The Education of the Handicapped Act Amendments of 1986. More information from and about the parents will be needed for many schools to effectively serve children of this age. More collaboration among parents, child service agencies, educational and medical personnel to disseminate accurate information to all people involved in the education of these children. Recently more conferences are being offered to provide a interdisciplinary approach to decision-making about programs for children
prenatally exposed and their drug-using mothers. Choices should be made by a range of informed individuals rather than merely the finance officers of school systems and service agencies.

**Implications for Additional Research**

This study involved 3-, 4-, and 5-year-old children in a public preschool program or a community daycare program. The children were either prenatally exposed to controlled substances or low birth weight. The population of children who were low birth weight has been studied previously while the population of children prenatally exposed has not been the focus of past research. Future research might look at these two populations as well as drug-free, full-term children. Having three different groups of children will allow for a direct comparison of the acquisition and development of different skills.

The focus of this study was the language development of preschool children. Basic concepts of colors, shapes, letters, numbers, and direction/position words were used to assess the acquisition and retention of language by young children. Additional subject areas, such as motor development, organizational thought processing, and math skills, might be topics for future research. Having a variety of curriculum students will allow the researcher to determine areas of deficiency.

The researcher of this study developed a criterion-referenced probe to supplement the information from the
standardized Bracken Basic Concept Scale. This probe required the students to recall the word names for each of the concepts while the Bracken merely assessed the students' ability to recognize a picture illustrating the words. Using different words and terms, future research might include another series of words that is progressively more difficult to match the maturing students. Additional research should be conducted to develop more sensitive assessment instruments.

Direct instruction has been researched with various populations (Horner & Albin, 1988; White, 1988) and with some of the components eliminated (Engelmann & Carnine, 1982; Kinder & Carmine, 1991); but the recorded gains have not been as substantial as when all components are actively incorporated. Various components of direct instructional procedures were used in this study. Teacher modeling, brisk pacing, and one-to-one instruction comprised each of the instructional sessions. Positive reinforcement, prescriptive and immediate feedback were added to the end of each learning trial and each session. Finally, periodic rule explanation and practicing were done with the students to insure that the procedures would be followed and the sessions would run smoothly. Each of these components was shown to be necessary to augment the learning achieved by the students.

Teacher modeling was the focus of the instructional procedure. The researcher, acting as the teacher during the
sessions, modeled each response before the students were asked to do so. This allowed the students to hear the correct response associated with the pictorial card and to observe the teacher's behavior of looking at the card and immediately saying a word. By continuing to present the card sets at a brisk pace, the students had fewer opportunities to get off-task and also allowed the students to have increased opportunities to respond.

Working with at least one teacher during each session, the students were provided one-to-one instruction. This allowed the teacher to focus on each student totally for approximately thirty minutes and to provide individual instruction to each student. The student was forced to attend to the instruction since extraneous distractions are reduced. The literature (Chasnoff, 1987; Howard et al., 1989) suggested that many of the attending patterns not observed in children prenatally exposed may be due to overstimulating environments. The less distractions in an environment, the more stable the child's behavior.

Positive reinforcement is a major component of the behavioral approach to teaching. Students were motivated to perform the requested behaviors through reinforcement and positive reinforcement is less likely to produce counter measures by the students as negative. For all of the students, stickers were given at the end of each session. Bonus stickers were given to the students who readily and appropriately came to the instructional site, and who appropriately returned to the
classroom. Stickers are excellent motivating tools for this age child, since they can be seen by other students in the classroom and even taken home. The stickers also can serve as reminders to the students to practice the words to receive more stickers.

The positive reinforcement was used with prescriptive and immediate feedback. Students were told whether the response was correct and if not, what the correct word was, immediately following each learning trial. The student then was instructed to say the word after the researcher to reinforce the correspondence between the picture card and the verbally-stated word. The students were not given multiple opportunities to say incorrect responses but told the correct answer after their second incorrect response (Heron & Harris, 1987).

By focusing on attention-maintenance through rule explanation and practice, the students were told what was expected of them and lessened the likelihood that they would come to the sessions to play. All of the students were periodically reminded of the rules and especially since they were young in age, these aided them in developing longer attention spans which are needed as they progress into regular school programs.

This study had a relatively small sample of eight students for a ten week period. Using larger sample sizes over longer time periods, the researchers might acquire more information about what strategies are effective, with what populations, and
what measurement instruments can discern minimal changes in children's performance.

**Summary**

It is not realistic to expect definitive answers to the questions raised in the initial paragraphs of this chapter; however this investigation does provide support for previous observations of these populations. This study brings into question some commonly held beliefs, and provides directions for future studies in this area. Medical personnel who questioned whether children prenatally exposed are educationally different from other children may be justified in saying that these children display characteristics which may be similar to children who were low birth weight. This study presented data which support this possibility. The patterns of student responses showed predicted variability in both groups. There were not clear differences between the two groups on either of the assessments. The standardized measure was not conclusive to show that one group knew more than the other group. The criterion-referenced probes did not effectively separate the prenatally exposed from those who were not. Even the questionnaires could not be used as a source of segregating the two groups.

The information that is known by the medical community is slowly being absorbed by the educational community. The questioning of whether children prenatally exposed are
completely different from the children of drug-free mothers is becoming the focus on local, state, and national education conventions and meetings. The belief that the educational programs which exist now will not be effective with these children has not been proven. More people are observing that strategies and techniques that have been effective with other populations might be instituted with this group to remediate the deficiencies.

Several researchers, studying children of low birth weight, have presented alterations to existing programs which have successfully treated the delays noted with low birth weight children. This study sought to combine these to determine if children prenatally exposed to controlled substances and children who were low birth weight but not prenatally exposed had any observable academic similarities; and if so, would a direct instructional strategy be effective with one or both groups in language development. The results would support this statement but the limitations noted restrict the implications for classroom practices. The two assessment instruments presented similar findings for both groups of students. Even the individual patterns of the students' response graphs had several similarities which support the premise that these two groups of students may display homogeneous characteristics. The limitations of a small sample size, one baseline measure, few follow-up assessments, do not decrease the importance of this study. Since this is a
novel area of research, all issues could not be addressed. The purpose of replications is to further extend the knowledge base from which future facts are determined. This study is only one of many studies needed to verify what effects prenatal exposure to controlled substances might have on children's development.

The points mentioned concerning future research may be the source of complete answers to these and other questions. Using student samples of differing ages and disabilities may allow for greater generalization to the larger preschool and school-age populations of children prenatally exposed. Developing more sophisticated assessment instruments may increase the knowledge of the children's abilities and focus more attention on the needs of at-risk populations. The need for more educational research in this area is further exemplified by the plethora of media articles about the so-called "crack babies" and "cocaine kids". The drugs are not the most relevant issue and therefore should not be descriptors of the children, rather the children should be the first concern.
APPENDIX A
Parent Consent Form
Parent Consent Form

I agree to allow my preschool child to participate in a research study of language development. This study will be conducted in partial fulfillment of the requirements for a doctoral degree from The Ohio State University. The researcher, Lessie L. Cochran, has explained the purpose and possible benefits of the study, which will require approximately 30 minutes per day for about 12 weeks beginning January 1992. I acknowledge that I have the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my satisfaction. Further, I understand that I am free to withdraw my child from the study at any time without prejudice to me or my child.

I agree to allow the researchers to have limited access to all records required to complete a personal, medical, and social history of my child and myself. I understand that my child's identity will not be revealed in any publication, document, recording, video tape, photograph, computer storage, or any other form of report developed from this project. Finally, I acknowledge that I have read and fully understand this consent form. I have signed it freely and voluntarily and understand a copy of the final research report will be available to me upon request.

Name of Student __________________________
Date ______ Relationship to Child ________________
Parent/Guardian Signature ______________________

Lessie L. Cochran, Researcher ____________________
Dr. Gwendolyn Cartledge _________________________
University Advisor _____________________________
Parent Interview Form

<table>
<thead>
<tr>
<th>Family I.D. #</th>
<th>Date</th>
<th>Interviewer</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Child's Birthdate</th>
<th>Child's Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother's Birthdate</td>
<td>Mother's Name</td>
</tr>
<tr>
<td>Father's Birthdate</td>
<td>Father's Name</td>
</tr>
<tr>
<td>Ages of Other Children</td>
<td></td>
</tr>
<tr>
<td>Who are you living with? (Names and Relationship):</td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td></td>
</tr>
<tr>
<td>Who owns the residence where you are currently living?</td>
<td></td>
</tr>
<tr>
<td>Phone</td>
<td>(Name Listed Under)</td>
</tr>
<tr>
<td>Do you have any plans to move in the next few months?</td>
<td></td>
</tr>
<tr>
<td>List your addresses during the last 2-4 years.</td>
<td></td>
</tr>
<tr>
<td>Are you employed outside the home now?</td>
<td>Or plan to be?</td>
</tr>
<tr>
<td>Where?</td>
<td>Phone:</td>
</tr>
<tr>
<td>How long have you worked there?</td>
<td></td>
</tr>
<tr>
<td>Where do you plan to take your child for checkups and medical care?</td>
<td></td>
</tr>
<tr>
<td>Where did you go for prenatal care?</td>
<td></td>
</tr>
<tr>
<td>Do you have medical insurance?</td>
<td>Name of Company?</td>
</tr>
</tbody>
</table>
Personal Data:
1. How tall are you? (feet/inches) _____ _____
2. What was your prepregnancy weight? _____ pounds
3. What was the highest grade in school you completed? ________
4. How tall is the baby's father? (feet/inches) _____ _____
5. What is the father's weight? _____ pounds
6. What was the highest grade in school father completed? ________
7. What is your ethnic background? ____________ Am. Indian Hispanic
8. What is the father's ethnic background? ____________ Asian White
                   African-Am Other
9. Who will your household consist of? ____________________________________________

10. What is the total number of people living in your household 18 years & older? ______
11. What is the total number of people living in your household 17 years & younger? _____
12. Do you belong to a church? _____ Which church? ________________________________
13. What is the main source of income in your household? (Circle one)
    None Employed Husband/boyfriend Employed
    Both Employed Parents and/or family support
    Public assistance (ADC, Welfare, General Assistance)
    Unemployment insurance & Social Security
    Other ________________________________
14. Are you currently receiving medical coupons or Medicaid? ________________________
    (Some information requested on above pages is optional, parents may choose not to answer.)
Medications and Drugs

1. Now I'd like to ask you about the drugs and medicines you've taken during your pregnancy. Have you taken any of the following? About how often?
   Code as follows: 0 - no
   1 - yes, less than 3 times a wk
   2 - yes, 3 times a wk or more, for any month during pregnancy
   aspirin, Tylenol, ibuprofin, etc. ______
   antibiotics ______
   tranquilizers (Valium, Librium, diazepam) ______
   methadone ______
   amphetamines (Ritalin, uppers, crank, meth) ______
   heroin (smack, horse) ______
   hallucinogen (acid, mushrooms) ______
   PCP or angel dust ______
   nonmedical inhalants ______
   medication for seizures, epilepsy (Dilantin, Tranzene, depakene, valproic acid) ______
   other (e.g., retin A) ______

2. Using the calendar, please indicate the following dates:
   a) When you first thought that you might be pregnant? ______ (yr/mon/dy)
   b) When you actually became pregnant? ______
   c) When you had a positive pregnancy test? ______
   d) When did you first see a doctor about your pregnancy? ______
   e) How many times did you visit a doctor/clinic for prenatal care? ______
   f) Date of this child's birth ______
   g) When was this child due? ______ Was this child premature? ______

3. Did the father ever use drugs and/or medicines during your relationship? ______
   Prior to your relationship? ___________________________________________
**Cocaine**

Refer to a calendar with woman to help her remember?

During the last three months of your pregnancy did you ever use cocaine in any form during this time? (e.g., crack, rocks)

<table>
<thead>
<tr>
<th>3rd trim</th>
<th>2nd trim</th>
<th>1st trim</th>
<th>Mon. Prior.</th>
</tr>
</thead>
</table>

1. How do you use cocaine? (Do you ever combine it with another drug?)
   - Don't use
   - Snort (intranasal)
   - I.V.
   - Smoke (freebase)
   - Smoke (with marijuana)
   - Smoke crack or rock
   - Combination of methods, including crack
   - Combination of methods, not including crack

2. About how many days per week did you usually use cocaine? If single use, go to Q. 3.
   - Daily
   - Almost every day
   - 3 or 4 days a week
   - 1 or 2 days a week
   - 2 or 3 days a month
   - About once a month
   - Less than once a month
   - Never
3. On the days that you used cocaine, about how much did you usually use? (___ grams). Determine total grams used in a day, not just at one sitting. Verify by asking: How much did you usually spend on cocaine in a week? When you say you used ___ grams, did you use it all by yourself, or is that an amount that you shared with other people? How many other people? __________

4. Sometimes for a special occasion, party, or weekends, people use more cocaine than usual. Did you ever have days when you used more than ______ grams? No Yes

5. About how much cocaine did you usually use then? __________ grams per day

6. How often did you use this amount? __________ days

7. Between the time you actually got pregnant, and when you first thought you were pregnant, which would best describe your use of cocaine?
   Did not use __________
   More before pregnancy __________
   More during first trimester __________

8. Between the time when you first thought you were pregnant, and the time when you had a positive pregnancy test, which would best describe your use of cocaine?
   Did not use __________
   More before pregnant __________
   More during first trimester __________

9. Do you feel you are "addicted" to cocaine? No Yes

10. Have you done anything to try to get off cocaine? No Yes, Specify __________

11. Have you ever been in treatment for cocaine use? No Yes
12. Have you ever had any of these kinds of problems in relation to your cocaine use:
   a) Have a relationship break up?  Nb  Yes  (e.g., auto accident, lost
   b) Get arrested?  Nb  Yes  contact with family, or unable
   c) Lose a job?  Nb  Yes  to care for your children)
   d) Be hospitalized?  Nb  Yes
   e) Any other? Specify __________

Alcohol
In the last 3 months of your pregnancy did you ever drink alcohol?

Marijuana
During your pregnancy, did you smoke marijuana?

Cigarettes
During your pregnancy, did you smoke cigarettes?
Substance Use Background

1. About how old were you when you first used... 
   alcohol ____  cigarettes ____  marijuana ____  cocaine ____

2. For how long were you (or have you been) a regular user of... 
   alcohol ____  cigarettes ____  marijuana ____  cocaine ____

3. When was the last time you ever used... 
   alcohol ____  cigarettes ____  marijuana ____  cocaine ____

4. Was there ever a time during your pregnancy when you were in the same room with people who were smoking cocaine (when you were not smoking)?

Nutrition

1. During the pregnancy about how many servings a day did you have of: 
   _____ Coffee (do not count de-caff) 
   _____ Tea (do not count herbal tea) 
   _____ Cola and Pepper drinks (only caffeine cola)

2. What did you usually eat for meals and snacks during this pregnancy? Starting with breakfast, go through a typical day when you were not using cocaine.
   _____ Dairy products (milk, cheese, ice-cream, yoghurt) 
   _____ High protein foods (meat, chicken, fish, eggs or soybean products) 
   _____ Fruit and vegetables (include fruit juice, salads, potatoes, beans) 
   _____ Cereals (breads, rolls, rice, hot or cold cereal, noodles, pasta) 
   _____ Junk food (candy, cookies, chips, cake, etc.) 
   _____ Other
APPENDIX C

Recording Form
<table>
<thead>
<tr>
<th>Words</th>
<th>Demo 1</th>
<th>Point 1</th>
<th>Tell 1</th>
<th>Point 2</th>
<th>Tell 2</th>
<th>Point 3</th>
<th>Tell 3</th>
<th>Point 4</th>
<th>Tell 4</th>
<th>Assmt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

+ Correct Response  T Try Again  R Reinforcement  S Say Word
APPENDIX D

Bracken Basic Concept Scale
PLEASE NOTE

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207-210, Appendix D

University Microfilms International
APPENDIX E

Criterion-Referenced Probe
1. The teacher should engage the student in general conversation initially for two-three minutes to allow the student to relax and get acquainted with the teacher before introducing the materials.

2. On each day of assessment using the criterion-referenced probe remind the student that some of these questions may be similar to the others asked previously [Bracken] and that they should please answer as many as possible.

3. Remember to write the student's name, the date, and time of the session at the top of the recording form.

5. Show the student the sample cards with the items/pictures separately, and ask him/her to say the name of the item or the word which is illustrated by the cards.

Teacher: "Describe where the airplane is." "What color is this?" "What shape is this?" "What number is this?"

Student: "Middle of the table." "Red." "Square." "One."

Teacher: "The airplane is on the middle of the table?" "The color is red." "The shape is a square." "The number is a one." (teacher records the correct answer)
6. If the child fails to say the targeted word or gives no reply, the teacher may provide prompts by pointing to the object and asking, "Where is the airplane?", and if still no reply or no targeted word, the teacher continues with the next card.

7. The teacher continues to ask the student to describe the pictures illustrating the position words listed on the recording form until the probe is complete or the session is over (which ever occurs first).

8. If the student begins to fidget, moving around in the seat, or not attend to the pictures, the teacher should encourage him/her to look at the pictures by verbally telling him/her to "look this way" or "look at each picture". Then continue the probe.

9. If the student continues to fidget, move, or not attend, the teacher should mark on the recording form where this occurred and stop the session. If possible, the teacher should try to encourage the student to complete the list of words designated for that session before stopping.

10. The teacher should engage in general conversation with the student for approximately two-three minutes before returning the student to his/her classroom.
<table>
<thead>
<tr>
<th>Name</th>
<th>Assessor</th>
<th>Date</th>
</tr>
</thead>
</table>

**I. Colors**
- Black
- Blue
- Brown
- Gray
- Green
- Pink
- Purple
- Red
- White
- Yellow
- Orange

**II. Letter Identification**
- A
- B
- C
- D
- E
- F
- G
- H
- I
- J
- K
- L
- M
- N
- O
- P
- Q
- R
- S
- T
- U
- V
- W
- X
- Y
- Z

**III. Numbers/Counting**
- one
- two
- three
- four
- five
- six
- seven
- eight
- nine
- zero

**V. Shapes**
- star
- circle
- square
- triangle
- rectangle
- diamond
- oval
- cross

**VI. Directions/Positions/Miscellaneous**
- above
- across from
- around
- away
- back
- backwards
- behind
- below
- beside
- between
- big
- bottom
- center
- closed
- cold
- corner
- down
- dry
- edge
- end
- falling
- forward
- go
- happy
- hear
- high
- hot
- in
- inside
- inside out
- left
- level
- little
- long
- low
- low
- middle
- moving
- near
- next to
- new
- off
- old
- open
- opposite
- out
- out of
- out
- over
- over
- out
- right
- see
- separated
- side
- small
- smell
- still
- stop
- through
- together
- top
- touch(ing)
- up
- upside down
- under
- wet
APPENDIX F

Instruction Script
INSTRUCTION SCRIPT

1. The teacher should engage the student in general conversation initially for two-three minutes to allow the student to relax and get acquainted with the teacher before introducing the instructional materials.

2. On the first day of instruction remind the student that some of these activities will be similar to those used before and to please try to answer as many as he/she can.

3. Start the tape recorder. This should run the entire half-hour session that is targeted for recording.

4. Remember to write the student's name, the date, and time of the session at the top of the recording form.

5. Show the student the instructional cards with the pictures, and tell him/her that this is a picture which shows . . .

Teacher: "This is a picture of an airplane in the middle of the table." (Teacher points to the picture with the airplane in the middle.) "Say middle." (Teacher waits until child repeats the words.) "Good!" (Teacher records the response.)

"This is a picture of an airplane on the side of the table." (Teacher points to the picture with the airplane on the side of the table.) "Say side." (Child repeats the words.) "Great!" (Teacher records the response.)
"Point to the picture with the airplane in the middle of the table." (Teacher waits for the student to point to a picture and records the student's answer.)

If student answers correctly, the teacher says "Good!" and says "Point to the picture with the airplane on the side of the table." If student again points to the correct answer, the teacher says "Great!" (The teacher again records the student's answer.)

"Tell me where the airplane is in this picture."

Student: "In the middle of the table." (child points to correct picture)

Teacher: "Yes the airplane is in the middle of the table."

(the teacher records the student's answer)

Teacher: "Tell me where the airplane is in this picture."

Student: "This one is on the side of the table." (child points to correct picture)

Teacher: "Yes, the airplane is on the side of the table." (the teacher records the student's answer)

6. If the child says an incorrect word the first time, the teacher records the answer and says "Try again".

7. If the child says an incorrect word on the second presentation, the teacher will say the correct word, and then ask the student to repeat the targeted word.
8. The teacher continues to ask the student to say the words illustrating the positions listed on the recording form until the word set is complete or the session is over (which ever occurs first).

9. If the student begins to fidget, moving around in the seat, or not attend to the pictures, the teacher should encourage him/her to look at the pictures by verbally telling him/her to "Look at the pictures". Then continue the session.

10. If the student continues to fidget, move, or not attend, the teacher should mark on the recording form where this occurred and begin the final testing. If possible, the teacher should try to encourage the student to complete the list of words designated for that session before stopping.

11. During the assessment, the teacher will present all word sets practiced during the session to the student and will ask the student to say the targeted words illustrated in the pictures.

Teacher: "Which color is this?" "Where is the airplane?" "Describe the tree?" "What shape is this?" (No reinforcement is given to the student by the teacher during the assessment.)

Student: "Blue." "In the middle of the table." "Tall." "Rectangle." (The targeted word/term must be given by the student on the first response to be counted correct during the assessment.)
12. The teacher should engage in general conversation with the student for approximately two-three minutes before returning the student to his/her classroom.
APPENDIX G
Sentence Prompts
### Sentence Prompts

| This color is "red." | Say "red" | What color is this? |
| This color is "blue." | Say "blue" | What color is this? |
| This number is "one." | Say "one" | What number is this? |
| This number is "two." | Say "two" | What number is this? |
| This letter is "A." | Say "A" | What letter is this? |
| This letter is "B." | Say "B" | What letter is this? |
| This shape is a "circle." | Say "circle" | What shape is this? |
| This shape is a "square." | Say "square" | What shape is this? |

The monkey swings **near** the fire.
Puddles of rain are **separated** on the ground.
All the things are **together** on the table.
The ladybugs are on **top** of the mushrooms.
The book was on the **bottom** shelf.
The boy in the **center** has a striped shirt.
Look at the **opposite** end of the car.
The mouse is looking over the **edge** of the box.
The box and the pail are **upside down**.
Three bears sat **in front** of the teacher.
The mice children sit **behind** the busdriver.
Two red apples are in the **middle** of the tree.
Look **through** the telescope to see the star.
She leaned **forward** to watch television (T.V.).
He jumped **backwards** into the pool.
This is a **low** fence.
The fence is **between** the two house.
He stood at the **end** of the bridge.
The jacket was turned **inside out**.
The girl is sitting **across from** the boy.
The seesaw is **level**.
The airplane is on the **corner** of the table.
She is walking **away** from the water.
He is sitting on the **side** of the bed.
The ball is going **into** the basket. The kite is **high** in the sky.
The fish are **inside** the bowl. It is raining **outside**.
The mouse is **beside** the box. The rabbit is next to the road.
Catsup is running **out of** the bottle. The boy fell off his bike.
The boy is **moving** the blocks. He is falling over the skate.
The cat crawled **under** the fence. The cat climbed **over** the fence.
He is pointing **up** at the sun. Someone is **down** in the barrel.
The mouse is going **in** his house. The mouse is **on** the bike.
He is flying **toward** the moon. She is walking **sideways**.
The snowflake is **above** the mouse. He is sitting **below** the tree.
The balloons are **rising** in the air. A statue stays **still**.
They are **separated** by the river. The two hands are **joined**.
These are **left** hands. These are **right** hands.
This clown is **sad**. This clown is **happy**.
This is an old **bear**. This is a new **bear**.
The elephant is **big**. The mouse is **small**.
This mouse is **little**. This worm is **short**.
This worm is **long**. The umbrella is **open**.
The umbrella is **closed**. This is the **front** of the coat.
This is the **back** of the coat. Snowman is **cold**.
Fire is **hot**. The weather is **dry**.
The weather is **wet**. This direction is **down**.
This direction is **up**. This is a **go** sign.
He is touching the baby chicks. He will **taste** the cheese.
She will **smell** the flowers. He can **see** the farmhouse.
He can **hear** the television (T.V.).
APPENDIX H

Student Questionnaire
Student Questionnaire

1. I [ ] [ ] [ ] the picture cards.

2. I [ ] [ ] [ ] the practicing.

3. I [ ] [ ] [ ] the teacher.

4. I would [ ] [ ] [ ] to do this again.

5. I [ ] [ ] [ ] to learn new things.

6. I [ ] [ ] [ ] the colors.
   [ ] [ ] [ ] the shapes.
   [ ] [ ] [ ] the pictures.
APPENDIX I
Teacher Questionnaire
Teacher Questionnaire  

Student's Name ________________

1. Briefly describe how this student was academically before this program began.

2. Briefly describe how this student was behaviorally before this program began.

3. Briefly tell why this student was placed in your class.

4. Did you notice any change in this student, which you would attribute to this program? Yes No (circle one) Explain.

5. Did this program fit in satisfactorily with your regular class schedule? Yes No (circle one) Explain.
APPENDIX J

Parent Questionnaire
Parent Questionnaire

Student's Name ______________

1. Briefly describe how this student was academically before this program began.

2. Briefly describe how this student was behaviorally before this program began.

3. Did you notice any change in this student, which you would attribute to this program? Yes No (circle one)

   Explain.
REFERENCES


Center for Early Education and Development (1990). Children of cocaine: Facing the issues. Fact Find Publication from the University of Minnesota.


