A STUDY OF INTERVENTIONAL AND INSTRUCTIONAL STRATEGIES TO ASSIST STUDENTS WHO WERE BORN WITH NEONATAL ABSTINENCE SYNDROME

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Julia Gibbs, April 16, 2018
Abstract

Children who were born with Neonatal Abstinence Syndrome (NAS), which is drug addiction at birth or drug exposure in the womb, make up an increasing percentage of the student population within public schools across the United States. These students often face specific learning challenges in regard to comprehension and cognition, as well as retaining and organizing information. Very few educators have received instruction regarding methods to assist this particular group of students. They are normally referred to special education for services which may or may not meet their needs. Few students have been performed to determine methods that classroom teachers can use to meet the needs of this population. The current study proposed that specific strategies be identified which could help students who were born with NAS experience success within elementary language arts classes. The study implemented three different strategies over a one-month period for four fourth-grade students who were born with NAS. The results of the study showed that direct interaction and student engagement with the material or the instructor was necessary in order for students who were born with NAS to experience success.
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CHAPTER 1

Introduction and Background of the Study

Imagine a young child in a classroom, aware that he does not learn concepts, perform certain tasks as easily as his peers; and he has no idea why. No matter what, he struggles to keep up and to remember new information. Many teachers have tried to help him but are unsuccessful, and this happens year after year to him. This is the case for many children in the United States who are born with Neonatal Abstinence Syndrome (NAS), as a result of being addicted to drugs at birth. Most teachers are not educated about intervention strategies to assist children who have been affected by drug addiction, even though their needs may be different from other students. It is important for educators and parents to have the knowledge and resources to meet the challenges of teaching all children through methods which allow them to learn (Brady, Posner, Lang, Rosati, 1994).

Although often thought of like a modern-day problem, opiate addiction is not a recent occurrence in the United States. Opiates, such as morphine, were originally used during the Civil War to treat battlefield injuries. Addiction among soldiers is documented as early as 1865 (Courtwright, 1978). Eugene O'Neill's Pulitzer Prize-winning play, The Long Day’s Journey into Night, describes a middle-aged, middle-class, housewife during the early 1900’s who suffered from morphine addiction (1941). From 1900-1940, opiates were often prescribed to treat numerous illnesses, such as depression and fatigue. Due to lack of regulation and lack of knowledge of long-term effects, opiates were freely prescribed by physicians (Courtwright, 1978).

Currently, the United States is facing an opioid epidemic, which is getting worse each year. The abuse of opiates had dramatically increased across the United States since the late
1990’s when many new, more powerful painkillers became available and the practices regarding prescriptions changed (Jacobs, 2016). Additionally, the number of opioid overdoses has increased by more than 300% over the past two decades (Thompson, 2014). According to the Center for Disease control, Tennessee is leading the way in this epidemic, placing second out of all fifty states for the number of opiate prescriptions, and second in a number of opiate overdoses (Jacobs, 2016).

The opioid epidemic is not limited to adults. More infants than ever are born drug dependent (Plazas, 2017). It often takes weeks, or months to withdraw infants from addiction. Due to a large number of children born with drug dependency, specialized units in hospitals are being opened to treat Neonatal Abstinence Syndrome (NAS). NAS affects infants experiencing withdrawal from drugs such as opioids, benzodiazepines, and other illicit drugs, such as cocaine and heroin. Recently, a new neonatal treatment unit was opened at Niswonger Children’s Hospital in Johnson City, Tennessee, with the sole purpose of treating infants with NAS. The development of a special treatment unit was necessary due to a large number of infants being born addicted to drugs in Johnson City. There are now more infants being born drug addicted in Johnson City than in Nashville or Memphis. As many as 12 infants a day are treated at Niswonger Children’s Hospital to alleviate the symptoms of NAS (Paykamian, 2017).

The opioid epidemic causes significant harm to neonates, but the consequences do not end in infancy. The effects of NAS continue long after the child has been weaned from the to which he/she was addicted to at birth. Future neurological development is often affected, resulting in learning disabilities later in life. Many patients with NAS require repetitive, painful, invasive procedures during neonatal intensive care, which can permanently alter neuronal and synaptic organization, and, therefore, later behavior. Withdrawal symptoms can cause
neurological damage. Concurrently, analgesic drugs used to wean infants can cause side-effects, inducing neuronal apoptosis or other symptoms in the neonate and behavioral alterations in adulthood (Foder, Timar, & Zelena, 2014).

The use of opiates by a mother can be detrimental to an infant and often produces long-lasting side effects. If the mother is using drugs during pregnancy, the drugs pass through the placenta and the neonate can also become dependent (Lee, 2015). There is a significant increase in the number of stillbirths associated with maternal drug abuse during pregnancy. Birth defects and stillbirth from opiate misuse are more significant and outnumber those of any other drug. A wide range of possible birth defects can occur, and these symptoms can be life-long (National Institute on Drug Abuse, 2017). There is also an increase in the chance of preterm delivery with opiate use, as well as an increase in the number of both early and late-term miscarriages and lower average birth weight (Maas, 1990).

After the child is born, he/she may face a number of immediate issues due to NAS. Common symptoms of neonatal abstinence syndrome are gastrointestinal issues, such as diarrhea and poor feeding, which subsequently causes low weight gain. These infants often have blotchy skin, cry excessively, are overly irritable, and have hyperactive reflexes, increased muscle tone, and seizures. They also often experience respiratory issues such as rapid breathing and low oxygen saturation. Visible symptoms also include trembling and excessive sweating (Lee, 2015). It can take months for infants born with NAS to be completely free of withdrawal symptoms. During this time, these infants experience side effects amplified beyond what an adult addict experiences (Fill et al., 2017). Infants with NAS experience an increase neurological activity due to a cascade of dopamine in the brain. This dopamine uptake occurs both in the womb and after the neonate is born, while he/she is being weaned from medications. Maternal drug use during
pregnancy has been associated with premature birth, low birth weight, slowed growth, and a variety of physical, emotional, behavioral, and cognitive problems. These symptoms can occur in as little as three days of exposure (National Institute on Drug Abuse, 2017). Side effects of NAS include central nervous system irritability, autonomic over-reactivity, and gastrointestinal tract dysfunction. These symptoms may continue for months, years, or the child's entire life (Ko, Patrick, Tong, Patel, Lind, & Barfield, 2016).

Children who were born with NAS often face challenges once they enter school. Due to the increased levels of dopamine and the overstimulation of neurons within their brain, children born with NAS often struggle with attention span, behavior, and comprehension. Beginning in the 1990s, in an attempt to describe the influx of children who were born drug-addicted into school, it was stated that these children would require special services for developmental, behavioral, psychological, and learning problems caused by drug exposure. Additionally, it was stated that as more drug-affected children approached school age, school personnel should be prepared to attend to the special needs of these children, as well as the needs of their families and/or caregivers (Lumsden, 1990).

**Research Problem**

Tennessee educators are unprepared and sometimes unaware of the NAS crisis (Plazas, 2017). NAS refers to a group of problems which occur in a newborn who was exposed to addictive illegal or prescription drugs while in the mother’s womb. Two types of NAS are formally recognized – NAS due to prenatal or maternal use of substances that result in withdrawal symptoms in the newborn, and postnatal NAS secondary to discontinuation of medicines such as fentanyl or morphine used for pain therapy for the newborn. (Hamdan, 2016). Children born with NAS often face many challenges as they grow and develop. The most
common challenges are difficulties with behavior, attention span, and learning. (Ko, Patrick, Tong, Patel, Lind, & Barfield, 2016).

Teachers are normally not informed about children in their classrooms who were born with NAS, and training is not provided to teachers on specific strategies to help their students overcome the academic and behavioral challenges which can be caused by the child’s addiction. Therefore, children born with NAS often fail to make academic gains compared to their peers (Jacobs, 2016). Ideally, interventions need to be implemented to reduce the number of infants in Tennessee who are born addicted. Educators should also receive training regarding NAS and instructional strategies that can help children born with NAS to achieve academic success (Brady, Posner, Lang, Rosati, 1994).

**Purpose of the Study**

As a result of the number of infants born with NAS increasing each year since 2010, there are more children beginning school who experience challenges caused by drug addiction. (Edwards & Pennings, 2015). These students face challenges with behavior and learning in school. Prenatal drug use can cause developmental delays, learning disabilities, and lower IQs (Stanford Children's Health, 2017). Decreased attention span and behavior control, as well as sensory processing and autonomic dysfunction disorders, often occur because of NAS (Seattle Children's Hospital, 2017). Children who were born drug addicted are significantly more likely to have learning disabilities than other children (Fill et al., 2017).

Students born with NAS, as well as addiction to other substances, have experienced an overexposure of dopamine to their neurological receptors, which challenges these students to be able to form neurological connections that are normally formed while learning occurs in the adolescent brain (Stevens, 2017). To meet the specific needs of NAS students, specific
interventions must be developed to help these students overcome the neurological impairments that occur because of neonatal opiate or other drug exposure.

Children who are born addicted often face both physical and social problems. If these children remain with addicted parents, they are at increased risk for problems, such as abuse and neglect, which can negatively impact their physical and emotional well-being. In addition, parental substance abuse has been linked to ongoing behavioral problems, such as adolescent drug use (Calhoun, Connor, Miller, & Messina, 2015). According to Zuckerman (1991), the result of having drug-abusing parents is often damage to the dynamic interaction of the child and the social environment. Thus, it is important to mitigate the negative impact that parental substance abuse has on the developmental outcomes of the children. (Calhoun, Connor, Miller, & Messina, 2015).

An increasing number of students who were born drug addicted are entering classrooms each year, which results in greater challenges regarding behavior and academic progress (Fill et al., 2017). Despite a large number of students who were born addicted, most educators do not receive training regarding specific instructional interventions to assist these students in overcoming the academic and behavior challenges they may face because of NAS, other addiction at birth, or from being raised in at-risk environments (Brady, Posner, Lang, Rosati, 1994). It is important for students’ needs to be met while avoiding labeling, which might hinder these students from progressing due to decreased expectations or attention.

There has been very little research regarding interventions to specifically address the needs of students who were born with NAS. An increasing number of students who were born with NAS are referred for special education services each year. Often, standard interventions for special education students fail to produce successful results in students born with NAS.
However, no other options are provided to help these students make behavioral and academic gains (T. Hubbard, S. Campbell, & L. Andrews, personal communication, May 28, 2017).

The purpose of this study was to determine specific brain-based strategies, which can be used to help students born with NAS improve their academic performance, behavior, and/or retention.

**Research Question**

What learning strategies can be used with 4th-grade students born with Neonatal Abstinence Syndrome (NAS) to improve their academic performance?

**Rationale for the Study**

As the crisis of drug addiction increases in the United States, a greater number of children are affected each year. These students enter school and often fall behind due to their home environment and/or challenges they face due to neonatal drug exposure. No recent studies have been conducted regarding methods that are effective to help these students overcome these challenges. Classroom teachers need information and specific strategies which they can use to help students struggling as a result of drug addiction.

**The Researcher**

The researcher spent fourteen years as a public-school teacher in East Tennessee, with an increasing number of students in her classroom each year who were not making adequate academic progress. These students were receiving Tier 3 intervention, extra tutoring, and modification to assignments and were still making little to no progress. The researcher met with
the parents and families of these students to discuss their lack of progress, and they often described that these children were born drug addicted, or were significantly exposed to drugs as a neonate. The researcher began to examine the common struggles that these students were having: lack of attention or focus, disorganization, and difficulty remembering information. After reading about the effects of NAS, the researcher concluded that they matched the challenges the students were facing. The researcher then realized they were not learning the same as everyone else because their brains were not forming connections the same way.

The researcher concluded that in order to reach this particular group of kids, she had to modify what she was doing in her classroom. The researcher began to implement more hands-on activities, small group instruction, and interactive read-aloud, which provided multiple opportunities for the students to hear a text and required the students to pay attention to particular aspects of the text. Great improvements were made by the students. The researcher wanted to learn more about the science of why they struggled in the specific areas they did. She also wanted concrete information that could be shared with other teachers in the school and system, so that they can help this particular demographic of students as well.

**Definition of Terms**

**Amygdala** is the part of the brain that controls and recognizes a situation in which one should be afraid. It then issues a response to danger or fear (Carter & Frith, 2003).

**Brain-based strategies** are the purposeful implementation of learning strategies that apply how the brain works in the context of education (Jensen, 2017).

**Dendrite** is any of the usually branching protoplasmic processes that conduct impulses toward the body of a neuron (Merriam-Webster, 2017).
**Instructional intervention** is an intentional, specific, formalized program or set of steps to help a child improve in an area of need (Lee, 2017).

**Interactive notebook** is a spiral notebook that is used to organize information. The right side is used for teacher information (notes, lectures, discussions, handouts, etc.) The left side is used for student information (drawings, cartoons, the personalized wording of vocabulary, etc.) (Young, 2003).

**Neonatal Abstinence Syndrome (NAS)** is a result of the discontinuation of substances to which the fetus was exposed or to substances that were used or abused by the mother during pregnancy. NAS can also result from the child being given medications for pain immediately after birth (Kocherlakota, 2014).

**STAR assessments** are created by Renaissance Learning and are designed to measure proficiency in reading and math. The STAR assessments are multiple choice, adaptive assessments for students in grades K-12. The STAR test is designed to establish a baseline performance grade level, provide feedback regarding the mastery of specific skills, and monitor student progress. The STAR assessment is designed to assess reading foundational skills and literacy skills such as craft and structure knowledge, reading fluency, key ideas, integration of knowledge and ideas, as well as establish a reading range and a target zone for text complexity (Renaissance, 2017).

**Synapses** are the tiny gaps between axons and dendrites that transmit messages within the brain (Carter & Frith, 2003).

**Target students** were students who scored more than one grade level below their current grade level on the STAR literacy assessment.
*Thalamus* is the information highway of the brain. It directs new information to the appropriate part of the brain for further processing (Carter & Frith, 2003).

**Summary**

The crisis of drug addiction is an ever-increasing problem in the United States (Whitehouse.org). The increase of drug addiction among adults has resulted in a larger number of infants being born drug addicted than ever before (National Institute of Health, 2014). Children born with NAS often face challenges in learning due to the overstimulation of their neurological receptors. Most teachers have never received training on how to meet the needs of this particular group of students. Research is needed regarding exactly how classroom teachers can help children who were born with NAS achieve academic success (Brady, Posner, Lang, Rosati, 1994).
CHAPTER 2: REVIEW OF RELATED MATERIALS

Introduction

While there is a great deal of research about drug addiction, Neonatal Abstinence Syndrome (NAS), the effects of NAS on infants, and the societal problems created by drug addiction, minimal research exists on the long-term effects of NAS on child’s ability to learn. In like manner, research is negligible regarding the effects on NAS on future academic performance or methods to help students overcome the academic challenges caused by NAS. Although much research exists about the neurological effects of NAS, and correlations can be drawn between neurological deficits and struggles in the academic setting, more formal research is needed.

Broad Historical Literature on the Topic

It is difficult to determine the exact number of cases of substance abuse because a large number of the population who are addicted to drugs do not recognize their addiction or are unwilling to disclose their condition (Marlowe & Carey, 2012). The abuse of opiates has significantly increased since the late 1990’s when many new, more powerful painkillers hit the market, and the practices regarding prescriptions changed. In 2015, there were 52,404 overdoses in the United States. Of those, 63% involved an opioid resulting in an average of 91 opioid overdose deaths in the United States each day during 2015 (Opioid Crisis Fast Facts, 2017).

In 2016, 59,000 people in the United States died as the result of opioid abuse. The situation is only getting worse. It is expected that drug overdose deaths will exceed 64,000 for 2017, which equates to 175 deaths due to drug overdose each day. More Americans die each year from overdose than the total number of American soldiers killed in the Vietnam War (Whitehouse.gov, 2017). Opiate abuse has increased to the point that President Donald Trump
declared opiate abuse a public health emergency in the United States in October 2017 (Davis, 2017). The federal government spent more than one billion dollars in 2017, in an effort to combat drug addiction and the opioid epidemic (Whitehouse.gov, 2017). In an attempt to reduce the number of opioid-related deaths, President Trump's initiative includes stricter restrictions for narcotic prescriptions, increased education for medical practitioners regarding addiction, and an advertising campaign against drug abuse (Davis, 2017).

Opioid abuse is a serious problem throughout the United States, but the situation is particularly dire in Tennessee. Tennessee ranks second in the United States in reported instances of opiate abuse and is the highest per-capita state in prescriptions of high-dose pain relievers (Jacobs, 2016). Instances of drug abuse are higher in areas where a large number of the population is below the poverty level. Similarly, a higher percentage of children born with NAS is evident in these areas. Tennessee is at increased risk for opiate abuse because approximately 1.1 million Tennesseans live below the poverty level (Thompson, 2014).

**Effects of drug addiction on the brain.**

Addiction is defined as a chronic, relapsing brain disease which caused changes in the brain. These changes in the brain can be long-lasting and lead to harmful behaviors by people who use drugs. Drug addiction has significant and long-lasting effects on much of the body, particularly the brain. When scientists began studying addiction in the 1930’s, people who were addicted to drugs were thought to be morally flawed. Today-thanks to scientific research-those views have changed drastically. It is now known that changes occur within the brain when someone becomes addicted to a drug which is beyond the person’s control (National Institute of Health, 2014). Many researchers view addiction as a disease of the brain which affects the way
its circuits, which are responsible for pleasure, stress, and decision-making function. Addictive substances may enter the brain by different methods, however, once arriving in the brain they activate the same circuits and, as a result, the same patterns of behavior (Bozurac, 2015).

The changes in the brain’s circuitry that occur during the exposure to drugs, withdrawal, and recovery from addiction are long lasting (Bozurac, 2015). Drugs affect the brain by interfering with the function of neurons. Exposure interrupts messages being sent and received between neurons (National Institute of Health, 2014). Effects of drug addiction can include hyperactivity, increased sensitivity to gamma-aminobutyric acid benzodiazepine receptors, elevated hypothalamic-pituitary-adrenal axis activity, and changes in the N-methyl-D-aspartate glutamate receptors. During drug addiction, the mesolimbic dopamine system is also affected, causing an initial uptake and the overall decline in dopamine. Together, these subcellular changes in the brain can cause an inability to focus, feelings of sadness or hopelessness, and lack of motivation (Jacques, 2017).

Opiates are one of the most commonly abused types of drugs in the United States. They are useful for relieving pain but are often abused due to the pleasurable effect they create for many patients, and their ability to quickly cause physical addiction. Opiates increase the amount of dopamine released in the brain. When an opiate, like heroin, is injected into a vein, it reaches the brain in less than 20 seconds. Then, it binds to opiate receptors in many regions of the brain, including the reward system. This binding creates a rush of intense euphoria for many people, often followed by hours of a comfortable and relaxed state (Jacobs, 2016).

Even after the person suffering from addiction has stopped taking the drug, the effects may last for many years. The dopamine receptors within the brain create a sense of unrest and a craving for the substance (Jacques, 2017). The powerful control over behavior exerted by
addictive drugs is thought to be the result of the brain’s inability to distinguish between the activation of reward circuitry by naturally rewarding activities and the consumption of drugs (Hyman & Malenka, 2001). Drugs affect a person’s perception of happiness. Over time, natural pleasures seem reduced, and the perceived pleasure caused by drugs is increased (Jacques, 2017). These pleasurable memories, physical symptoms of withdrawal, and environmental factors make relapse very common for those recovering from addiction. The physical effects of drugs on the person suffering from addiction make it very difficult and to completely recover (National Institute of Health, 2014).

**Drug abuse among parents.**

Substance abuse is a major public health concern that impacts the user and the user’s family (Calhoun, Connor, Miller, & Messina, 2015). An estimated 12% of American children live with a parent who is dependent on or abuses alcohol or other drugs. Based on 2002-2007 data, the National Survey on Drug Use and Health (NSDUH) reported that 8.3 million children under eighteen years of age lived with at least one substance-dependent or substance-abusing parent, with at least 2.2 million being addicted to illicit drugs. (SAMHSA, Office of Applied Studies, 2009).

Parents who are suffering from addiction typically have a difficult time being a consistent, positive influence in the lives of their children. Intervention programs have been developed for parents who have a substance abuse problem or are in a substance abuse program (Calhoun, Connor, Miller, & Messina, 2015). Substance abuse results in behaviors that are in conflict with secure and nurturing caregiving such as social isolation, poor coping skills, and difficulty performing everyday tasks (Leif, 1985). Parents who are addicted to drugs often have a difficult time caring for themselves, maintaining a home or job, or providing for their children.
(Barth, Gibbons, & Guo, 2006), which leads to over 30% of the children in foster care being removed from the home due to effects of drug addiction (Whitehouse.org).

**Effects of opioid use on children.**

The impact of parents' substance abuse on children is multifaceted, often affecting the way parents behave and interact with their children, as well as affecting the physical health of neonates who are exposed to drugs. According to The Child Welfare Information Gateway (2014), effects can be indirect (e.g., through a chaotic living environment) as well as direct (e.g., physical or sexual abuse). Parental substance abuse can affect parenting, prenatal development, and early childhood and adolescent development. Children of substance-abusing parents have a high risk of developing physical, mental health, and behavioral problems (Dube et al., 2001; Hanson et al., 2006).

Although intervention programs for drug-addicted parents exist, it remains unclear how to significantly reduce the negative effects of parental substance abuse on children (Calhoun, Connor, Miller, & Messina, 2015). Children being raised by parents who are addicted have an increased risk of abuse or neglect (Dube et al., 2001; Hanson et al., 2006). Children who do not experience direct abuse or neglect are at increased risk for maltreatment and are also at increased risk for entering the child welfare system (Child Welfare Information Gateway, 2014). More than one-third of all children placed in foster care are removed from their parents are a result of drug abuse (Whitehouse.gov, 2017). Children of parents with confirmed substance use issues are more likely to be placed in foster care and are more likely to stay longer than other children (Barth, Gibbons, & Guo, 2006). Parental drug abuse often leads to a life that is both chaotic and unpredictable for children. Basic needs, such as nutrition, supervision, and nurturing may not be met, leaving children neglected. These families may also experience a number of other issues
such as mental illness, domestic violence, unemployment, and housing instability, which also have a detrimental effect on the welfare of the child. (National Abandoned Infants Assistance Resource Center [AIA], 2012).

For more than 400,000 infants each year, which accounts for about 10% of all births, substance exposure begins prenatally (Young et al., 2009). The number of babies born drug-dependent increased more than 500% from 2000-2014 (Whitehouse.gov, 2017). State and local surveys indicate that prenatal substance use is as high as 30% in some populations (Chasnoff, 2010). As a result of prenatal substance abuse, children may display poor cognitive, social, and emotional development, as well as depression, anxiety, and other mental health symptoms. These children often suffer from physical and health issues and are more likely to develop substance abuse problems themselves (Staton-Tindall et al., 2013).

It can be difficult to determine the actual number of infants exposed to drugs during gestation for the following reasons:

- After the March 2017 ruling by the United States Supreme Court, drug testing cannot be performed on pregnant women without their consent (Sealey, 2017). Prior to this ruling, many states had varying guidelines regarding drug testing (Brady, Posner, Lang, Rosati, 1994).

- Toxicology results are not completely accurate because there is no way to determine if opiates or other drugs were used earlier in the pregnancy (Szeto, 1991).

- Researchers often fail to base their estimates on samples which are representative of the entire population of the United States (Mayes, 1992).
• It is often difficult for researchers to establish a matched control group when studying a population which is at risk for substance abuse (Chasnoff, 1991). Other problems such as lack of prenatal care, polydrug use, and lack of reporting can also skew statistics regarding the population of infants who have been exposed to drugs (Roberts, Avalos, Sinkford, Foster, 2001).

Students who are exposed to drugs in utero face challenges with behavior and learning in school. Prenatal drug use can cause developmental delays, learning disabilities and lower IQs (Stanford Children’s Health, 2017). Decreased attention span and behavior control, as well as sensory processing and autonomic dysfunction disorders, often occur because of NAS (Seattle Children’s Hospital, 2017). Children who were born drug addicted are significantly more likely to have learning disabilities than other children (Fill et al., 2017).

**Diagnosing children with NAS.**

Medical professionals are legally obligated to assess newborns who exhibit signs and symptoms of drug exposure or those whose mothers have been identified as substance abusers. The information obtained by detecting fetal exposure to drugs is extremely valuable in treating the infant. Quickly identifying the specific substance abused by the mother allows for a NAS diagnosis, as well as treatment to wean the infant from the addition. Early intervention services for the child and mother are essential to minimizing the acute and long-term effects of prenatal substance exposure. Thus, even if the infant exhibits no clinically significant difficulties in the neonatal period, identification of the substance the infant was exposed to can improve the long-term outcome.
Commonly accepted indications for testing include no prenatal care, intrauterine growth retardation (IUGR), preterm delivery, or cardiovascular accidents in mother or child. Testing for NAS may include radioimmunoassay and enzyme immunoassay, blood tests, urine toxicology assays, meconium analysis, umbilical cord drug testing, and hair analysis (Hamdan, 2016).

**Effects of parental addiction and NAS on education.**

Children who were born with NAS face specific challenges with learning and attention, which makes appropriate classroom behavior and academic success more difficult to obtain (Dube et al., 2001; Hanson et al., 2006).

Children who are born with NAS experience an increase of dopamine and overstimulation of nerve receptors within the brain similar to that of an adult addict. It is believed that the effects of addiction slow the ability of the brain to form dendrite, the branches which form neural connections within the brain. (Zickler, 2004). The effect of neonatal and infant addiction could make it physically more difficult for children born with NAS to learn and respond to stimuli.

Many children who were born with NAS have parents who are still suffering from addiction, which can foster instability in almost every aspect of the child's life. This instability often leads to frequent absences and lack of support or assistance at home. Children of parents with substance use issues are more likely to experience trauma, have difficulties with concentration and learning, and are often unable to control physical and emotional responses. These children often have trouble forming trusting relationships, which may create challenges in forming friendships and effective relationships with teachers (Staton-Tindall et al., 2013).
Theoretical Lens and Related Theoretical Literature

Situated cognition maintains that knowing is inseparable from doing. Situated cognition draws from the work of Dewey (1938), Vygotsky (1978), Lecont’ev (1978, 1981), and Lura (1976, 1979) in regard to theories on early cognitive research. Situated cognition is rooted in the idea of learning within the situation. (Jenlink, 2013). Students born with NAS often do not form neurological connections in the same manner as other students. They are often unable to understand or retain written or verbal information. In order to form effective connections, comprehend, and retain information, “doing” is essential to these students (Lumsden, 1990). The brains of most students with NAS function differently than students not born with NAS. Specific instructional strategies need to be identified, which can allow students with NAS to overcome academic challenges resulting from being born drug addicted. Similarly, these instructional strategies may help these students experience academic success similar to the academic success of their peers.

Literature Related to the Topic

Interventions for students who were born with NAS.

Most children, especially those who are born addicted, experience a greater level of success and are more satisfied when they are in a predictable, secure, and stable environment (Lumsden, 1990). According to the Los Angeles Unified School District (1989), school programs designed specifically for these children, therefore, must include structure, clear expectations, and boundaries, as well as ongoing nurturing and support.

Educators cannot cure the physical and mental challenges faced by students born with NAS. They should, however, strive to offset prenatal risk factors and children's stressful life situations by making changes predictable, incorporating protective factors in the classroom, and
helping children cope with stress in more appropriate ways. According to the Los Angeles Unified School District (1989), which began a pilot program for drug-affected three- to six-year-olds in 1987, attention should be given to the following areas when creating a classroom environment that will promote optimal development among drug-affected children:

- Have an adult-child ratio that is high enough to promote attachment, to provide adequate nurturing, and to assist children in developing more adaptive methods of coping.
- Create a predictable environment through regular routines and rituals.
- Organize the classroom so that materials and equipment can be removed to reduce stimuli or added to increase stimuli.
- Give special attention to transition time.
- Transition time should be viewed as an activity in and of itself. These transitional periods can help children learn how to deal with change.
- Attend closely to children's language development, social and emotional development, cognitive development, and motor development.
- Note how skills in these areas are being applied by the child during play periods, transition times, and while involved in self-help activities.
- Keen observation can provide insight into how a child experiences stress, relieves tension, copes with obstacles, and reacts to change. In addition, it helps teachers become aware of the ways in which children interact with peers and adults.

There are few other interventions specifically suggested for children born with NAS. However, much brain-based research has been performed that identifies strategies that may be beneficial for students born with NAS.
Summary of University of California, Los Angeles and Northwestern studies.

Kronstadt (1991), in two separate studies, examined infants and young children who were born with NAS and later enrolled in an early intervention program. The goal of these studies was to determine the effects of maternal drug uses on the future development of children. The polydrug nature of most pregnant mothers who abuse drugs makes it difficult to determine the effects of specific drugs on neonates and their future development. The developmental deficiencies exhibited by some drug-exposed infants and toddlers may predict future developmental problems. Five important factors related to child development were identified.

1. Development is influenced by constitutional and genetic predispositions, as well as by environmental conditions.
2. Individual children vary in their responses to any one environmental insult, but multiple environmental insults on any one child are quite predictive of poor outcomes.
3. Experiences and events that influence development can be enduring or temporary, obvious or subtle.
4. There is enormous plasticity in development.
5. During infancy, one of the most significant developmental “tasks” is the establishment of bonding and attachment between child and caregiver.

There is a great deal of variance among these developmental factors, and if a child is experiencing developmental difficulties, it is often difficult to determine which are responsible for the challenges the child is facing. The challenges of research are also described in the study. It is often difficult to determine which drugs a pregnant woman has taken during her pregnancy, as well as the duration for which they were taken. Drug-dependent pregnant women often experience other health issues, such as increased infections, poor nutrition, and lack of adequate
prenatal care. There is also no standard method for assessing developmental delays among children who were born with NAS. Some of the delays are too subtle to require the child to be tested for learning disabilities, yet are intense enough to create challenges for learning. Because of the challenges in researching this topic, results vary greatly, and there is no recognized standard for results (Kronstadt, 2001).

Researchers at the University of California, Los Angeles’s (UCLA) Department of Pediatrics and the Center for Perinatal Addiction at Northwestern Hospital in Chicago have monitored the development of children with NAS since birth. Children in both of these groups were observed on a regular basis from birth until they were toddlers (Kronstadt, 2001).

Researchers at UCLA studied the development of 18 full-term and pre-term infants born to drug-addicted mothers who used cocaine and other drugs during their pregnancies. They compared the drug-exposed children to non-drug-exposed children. Families participating in the study were of similar socioeconomic status, had similar family dynamics, and received the same intervention services. When the toddlers were observed interacting with their peers, the drug-exposed toddlers were more impulsive, more disorganized, had greater difficulty following directions, and demonstrated a shorter attention span than their non-drug-exposed peers. Toddlers who were drug-exposed also expressed less attachment to their caregivers than those who were not drug-exposed in utero (Kronstadt, 2001).

Researchers at Chicago’s Center for Perinatal Addiction at Northwestern Hospital have been following a group of 200 infants who were born with NAS as the result of prenatal exposure to cocaine and other drugs. Similarly to UCLA, these toddlers who were drug-exposed displayed delays in learning basic skills, as well as lower attention spans compared to their non-drug-exposed peers. Drug-exposed toddlers performed as well as their peers with some basic,
structured tasks. Approximately 30 to 40% of drug-exposed toddlers displayed decreased language development skills, lacked tolerance for frustration, were easily distracted, and were often disorganized (Kronstadt, 2001).

This study concluded that additional research should be conducted on the impact of prenatal drug exposure on children, but action on behalf of drug-exposed children should be occurring. The following strategies were recommended to assist children who were drug-exposed during pregnancy and/or suffered from NAS.

1. Due to the disorder of some families, basic survival goals much be set before other goals, such as those related to parenting or learning, can be pursued.
2. Training in parenting skills must be coupled with other intervention strategies to create lasting changes in parenting behaviors. The training should be based on didactic and cognitive methods.
3. Instructors and health service providers must be competent and have the necessary knowledge and skills to meet the needs of the child and family.
4. Service utilization and client satisfaction are enhanced by the continuity of providers.
5. Service providers create working partnerships with parents or caregivers on behalf of the child, in order to ensure the success of the interventions.
6. A young child must form a lasting connection with at least one person in his or her life. The person does not necessarily have to be a parent.
7. Referrals to other agencies for more intensive services should be provided, if and when necessary.
8. Intervention efforts must be integrated with existing community services to maintain benefits of the intervention (Kronstadt, 2001).
In order to be most effective, it is important that interventions begin as soon as possible, ideally while the drug-exposed newborn is still in the hospital. It is advisable that a care team be established for the child so the child may form healthy attachments to help him/her overcome challenges. Researchers agree that prenatal exposure to drugs is one of the factors which most influence a child’s development, secondary only to the postnatal environment (Kronstadt, 2001).

Critique of University of California, Los Angeles and Northwestern studies.

The study performed at UCLA did not include a large number of participants; however, these participants were followed closely for an extended period of time. Replicating the study at Northwestern with a larger number of participants helped to ensure the validity of results. Together, the two studies produced consistent results that children who were exposed to drugs prior to birth struggle with impulse control, focus, attention span, and following directions. These studies also determined that children who were born with NAS or were exposed to drugs prior to birth faced a greater number of challenges than other children. The primary factor in determining if a child can overcome challenges resulting from drug addiction is the connection formed with adults. Both studies were thorough and aligned with information presented in other scholarly research.

Summary of the study performed by the Los Angeles Unified School District

The Los Angeles Unified School District began a pilot program for drug-affected individuals ages 3-6 in 1987 with 62 participants. Researchers concluded that behavioral characteristics commonly noted in drug-affected children included heightened response to internal and external stimuli, irritability, agitation, tremors, hyperactivity, speech and language
delays, poor task organization, processing difficulties, problems related to attachment and separation, poor social and play skills, and motor development delays. (Los Angeles Unified School District, 1989).

The following determinations were made through observations and should be considered when creating a classroom environment designed to promote optimal development among drug-affected children:

- Have a child to adult ratio that is small enough to promote attachment, to provide adequate nurturing, and to assist children in developing adaptive methods of coping.
- Follow daily routines and rituals in order to create a predictable environment.
- Show respect for children's work and play space.
- Organize the classroom so that students are not overstimulated. Ensure that equipment, materials, and visual aids can be stored out of view.
- Give special attention to transition time. Transition time should be viewed as an activity in and of itself. These transitional periods can be learning opportunities which can help children learn how to deal with change.
- Attend closely to children’s language development, social and emotional development, cognitive development, and motor development, as these are areas in which the children may struggle (Los Angeles Unified School District, 1989).

The researchers also noted how skills in these areas are being applied by the child during play periods, transition times, and while involved in self-help activities (Los Angeles Unified School District, 1989).
Critique of the study performed by the Los Angeles Unified School District.

This study was one of few to specifically examine the effects of drugs on a child’s ability to learn in the educational setting. A large number of participants were included, and specific areas in which drug-exposed students were likely to struggle were described. Guidelines for supporting these students in the classroom were detailed. Recommendations from this study did not detail specific strategies. Recommendations were also relevant to practical classroom application, but additional specific classroom strategies are needed.

Summary of Study performed at Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center.

In 2015, researchers at UCLA Medical Center conducted a study on improving outcomes for children exposed to methamphetamine prior to birth. The study followed meth-exposed children from birth to age 7.5 and determined that a more supportive home environment can make a difference in their behavior and emotional control. Methamphetamine abuse during pregnancy can lead to a child developing both behavioral and emotional problems. In 2015, nearly 25% of pregnant women seeking treatment at federal inpatient facilities were addicted to methamphetamine. The study followed 290 children of various socio-economic status and ethnic origins. It found that adversities, such as continued drug abuse by the parent(s), and ongoing poverty contributed to the issues faced by these children. This study also stated that emotional and behavioral issues could be improved by working to improve the home life of the family. The researchers concluded that both behavioral and emotional control issues are related to the prenatal use of methamphetamine and may be an early determinant of behavioral outcomes. Researchers also determined that the most significant improvement in outcomes resulted directly
from an improvement in the home environment. The study stated that longer-term studies need to be performed, which follow students for more than 7.5 years (Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center, 2016)

**Critique of a study performed at Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center.**

This study was well-organized, easy to understand, and included numerous participants. Findings appeared to be reliable and reasonable. The recommendation for ongoing research was also practical.

The study conducted simultaneously at the University of California Los Angeles and at Northwestern University, the study performed by the Los Angeles School District, and the study conducted by the Los Angles Biomedical Research Institute at Harbor-University of California Los Angeles Medical Center collectively theorized that forming lasting and healthy connections with adults could significantly help students overcome the difficulties they face due to being born with NAS, and from continued drug use within the home.

The studies conducted by the University of California Los Angeles, Northwestern University, the Los Angeles Unified School District, and the Los Angeles Biomedical Research Institute at UCLA Medical Center describe the issues faced by drug-addicted children, as well as the causes of those issues. These studies detailed broad methods or strategies to provide help to these children, such as low teacher/student ratio, which would be beneficial to students who are experiencing challenges in the academic setting as a result of drug addiction. Many of these strategies, however, are not practical for classroom teachers to implement, primarily because they would require budgetary allocations or other major decisions, which would be out of a teacher’s realm of control. Even though these studies relate to education, minimal research exists
regarding the topic of instructional interventions for children who were born with NAS. How to best adapt current instruction methods and determining which activities should be implemented for these students to improve their academic performance are issues in need to further research to allow students born with NAS to reach their full academic potential.

There is a currently a plethora of information available in periodicals, research articles, and other sources regarding the increasing crisis of drug addiction. However, minimal information is available regarding the long-term effects of NAS and instructional strategies educators could utilize to assist the increasing number of students born with NAS. Some studies have been done, but none of those have been recent or applicable for classroom teacher use. While labeling these students should be avoided, educators need more useful tools to help students who were born with NAS and are having trouble staying on task, remembering information, and organizing information and materials.

Specific Literature Related to the Current Study

Brain-based learning strategies.

As the body of knowledge within the field of neuroscience has increased, so has the ability to understand how the brain’s physical and structural function affect the way humans learn (Sylwester, 1995). There are countless triggers for neuron activity, and these triggers often vary greatly from person to person. As a nerve cell is triggered by new information, a synaptic branch called a dendrite is formed. With use and the right environment for connections to be made, dendrites flourish rapidly. Without stimulation, dendrites fail to form or thrive (Diamond, 1988). The brain is divided into different sections. Each section performs a separate function.
The cerebral lobe is divided into the left and right hemispheres, which are divided into the occipital lobe which processes visual information; the temporal lobe which is responsible for processing auditory information and some memory; and the parietal lobe, which is responsible for feeling and touch. The frontal lobe controls decision-making, planning, and problem-solving (Stickel, 2005).

Teachers need to understand that, in order for students to remember what they have learned, students must make storage sites for the information to be placed in. The development of each area of the brain must be considered as teachers decide what to teach and how to teach it (Sprenger, 2002). Renate Numella Caine and Geoffrey Caine, in their book *Unleashing the Power of Perceptual Change: The Potential of Brain-Based Teaching*, confirm the idea that our brains are whole and interconnected. “Even though there is a multitude of specific modules with specific functions, thought, emotion, physical health, the nature of our interactions with others, even the time and environment in which we learn, are not separated in the brain (1998). They are not dealt with one thing at a time.” "The human brain is the best-organized, most functional three pounds of matter in the known universe,” says educator Robert Sylvester in his book, *A Celebration of Neurons: an Educator’s Guide to the Human Brain* (1995, p. 4). An average brain is made up of approximately 100 billion neurons, with each one having as many as 10,000 synaptic connections to other neurons (Wess, 2000). According to Wess (2000), “Our brains are a web of interconnected synapses” (p. 21).

Research in brain-based learning has shown that neurological ability to pay attention is cyclic in manner, with highs and lows occurring about every 90-110 minutes. This research contributes to periods of time in which students are more attentive, and periods where their attention level is decreased (Dodd, 1998). These waves of attention often correlate with waves of
energy as well. Attention and energy are both affected by other internal factors, such as stress or fatigue, and external factors such as environment and the behavior of others.

When faced with a high-stress situation, in which a person has control, information entering his/her brain follows the most direct path through the brain to the cerebellum, along the primary pathway through the thalamus and amygdala. Interestingly, when a sense of control within the situation is removed, information no longer follows the direct path to the cerebellum but shifts to other parts of the cortex. The particular challenge of being in a high-stress situation, in which one feels he or she has no control, reduces the speed and ability of the individual to process information at the neurological level. In mature, normal functioning individuals, this slowing of neurological processes often prevents an overreaction to stimuli (Wess, 2000). This slowing of processes can have a detrimental effect on the neurological processes of students who continually live in a high-stress state. Many children born with NAS continually experience high levels of stress due to health issues, academic challenges, and home environment (National Abandoned Infants Assistance Resource Center, 2012).

Reoccurring exposure to high-stress situations can prevent new dendrites from forming and can actually reduce the number of synaptic connections being made. Learning situations that are high-stress actually reduce the ability of the individual to carry out higher order or analytic thinking and can reduce the ability of the individual to retain information (Dodd, 1998). These facts are important when considering the education of students who were born with NAS because they commonly face academic challenges, which cause stress. Often these children encounter a great deal of stress within their personal lives as well (Dube et al., 2001; Hanson et al., 2006).

Students born with NAS face particular academic challenges, as well as stressful situations they may be dealing with at home. Therefore, it is essential for students to be engaged
with the academic content being presented to them. For students to learn at the highest possible level, they must be comfortable in their environment, focused, and fully engaged. Brain-based strategies can help these students be successful (Tate, 2006).

Interactive notebooks are a brain-based strategy that has proven to be valuable by increasing student engagement, understanding, focus, and retention of information. Some school systems have even made them mandatory for specific grade levels and/or subjects. Interactive notebooks provide teachers with a tool for organizing lessons and incorporating different lesson types. They can also be useful when planning for the learning styles of students (Wist, 2006). The use of an interactive notebook makes a student become involved in the process of selective attention, encoding, memory placement in both long-term and short-term memory, as well as memory retrieval (Kiwera, 1996). The right side of the notebook is often used for teacher provided notes or guided note-taking. The left side of each set of pages is normally used for student application activities or assessment. Teachers who provide students with notes have been shown to have higher achievement levels than those who had their students personally record them (Kiwera, 1985). The use of pages side by side for information provided and information applied helps the brain form connections between what is learned and the meaning of the information (Caine, 2005).

Interactive notebooks allow students to record information in an engaging way so that they actually become involved with the information being presented. An interactive notebook is a hands-on tool which allows students to organize and apply their learning by making charts, illustrating, notes, creating timelines, and writing (Trucillo, 2006). As students learn new information and develop ideas, they can use numerous types of writing and graphics techniques. The teacher may choose to provide them with guides to determine how their information is
organized. In the younger grades, handouts may be provided for students to complete in their notebook, and, in some instances, teachers may even guide students through the note-taking steps. The application of ideas within the notebook is very important. By organizing and applying information, students use critical thinking skills, which allow them to become independent thinkers (Ayati, 2006).

Interactive notebooks can be a powerful instructional tool that allows students to take ownership of their learning, while simultaneously processing information, analyzing ideas, and reflecting on their learning (Waldman & Crippen, 2009). Students transfer knowledge and make connections with previously learned information, which they can later view in their notebook and retrieve from their long-term memory, as well as refresh in their short-term memory. The brain seeks familiar patterns in information, which helps to create connections between pieces of information that would have otherwise seemed meaningless (Kaufeldt, 1999). Interactive notebooks encourage the formation of connections within the brain, thereby improving understanding and memory (Wist, 2006). They also provide a varied set of strategies to create a personal, organized, and documented learning record, which students can use as a reference, as well as an anchor for future knowledge (Waldman & Crippen, 2009).

Interactive read-alouds are also be considered a brain-based strategy. It uses increased focus and interaction to improve student understanding of a text. Interactive read-alouds are a systemic method of reading instruction, which involves the teacher interacting with students about the text, while modeling and scaffolding comprehension strategies, vocabulary strategies, and comprehension. Interactive read-alouds increase engagement and understanding, while cultivating a community of learners (Wiseman, 2011). A growing body of research suggests that
frequent interactive read-alouds positively affect literacy development (McGee & Schickendaz, 2007).

Interactive read-alouds may include two to three readings of the text. Each time, the teacher may ask students to pay particular attention to a different aspect of the text (McGee & Schickedanz, 2007). Interactive read-alouds provide an opening for the response, create opportunities for students to construct meaning, and allow students to respond to literature. Interactive read-alouds build on student strengths and extend knowledge (Wiseman, 2011). These read-alouds can be structured to meet the specific needs of students, standards that need to be met, or the requirements of the administration. Interactive read-alouds have been proven to improve reading skills and student engagement with the text. Many students state that being read to aloud is one of the most enjoyable and memorable parts of their day (Miller, 2014).

Small-group instruction is another brain-based strategy which is designed to meet the specific needs of students. Small group instruction is used in classrooms varying from Pre-K to higher education (Lynch & Pappas, 2017). In small group instruction, a teacher meets with a group of students, usually less than 6 to examine reading abilities or provide instruction on specific skills that the students need. Evidence-based research has shown dramatic reductions in the number of students falling behind in reading when direct, small-group instruction is carried out in the classroom (Small Group Teaching). Small-group instruction can be more effective than whole-group instruction, especially for at-risk students due to the increase in adult-child interaction (Wyatt & Chapman-DeSousa, 2017). The proximity of the adult to the students creates opportunities to isolate and personalize moments of teaching and learning (Yamauchi, 2013). To address the needs of children who are the most at risk for academic failure, the same instructional components which are used with students performing at or above level are relevant,
but they need to be more explicit, intensive, comprehension, and personalized. Small group instruction allows these needs to be met (Small Group Teaching).

The argument is made that by coordinating effective classroom reading instruction with small-group and one-on-one reading instruction we can meet the literacy needs of all children Foorman & Torgesen (2001). Small group instruction increases the ability of the teacher to build on the students’ background knowledge. The teacher is also able to model more easily and effectively. Studies have shown that the overall attitude of students within the classroom improves. In small-group instruction, the teacher can not only teach the students the content but also ways to think, describe and understand the world (Wyatt & Chapman-DeSousa, 2017).

Brain-based learning strategies strategically increase the engagement of the student with the information being presented, as well as with the presenter. They help students form connections between new information, information they have previously learned, and personal prior knowledge (Dodd, 1998) They also help the student communicate with the teacher on a regular basis and form personal connections, which are necessary for students who are suffering from the effects of drug addiction personally or in their homes (Los Angeles Unified School District, 1989).

Summary

Children who are born with NAS face challenges because of the effect of drug addiction on their bodies. Their challenges are often further exasperated if their parent(s) continue to use drugs. The lack of stability, consistency, and support often creates a situation in which students need extra support inside the classroom. Most teachers receive no training or support regarding methods that are effective in helping this particular group of students. It is important that such
information be available to educators since the number of students being born with NAS and dealing with the effects of drug addiction within their homes is increasing each year.
CHAPTER 3: METHODOLOGY

Description of Qualitative Research

A qualitative research design was chosen for this study because the comparative information was obtained via surveys, student interviews, and observations. Reading strategies were used specifically to increase the engagement, retention, organization, and reading skills of the participants. The instructional strategies used were interactive notebooks, interactive read-alouds, and small group instruction. The research determined which learning strategies were most successful in improving the academic performance of upper elementary students who were born with Neonatal Abstinence Syndrome (NAS).

Description of Specific Research Approaches

Information related to the study was obtained through observations of the participants by the researcher, who was also their classroom teacher. Informal interviews were also conducted individually with each of the study participants. Student surveys were also completed at the beginning at the end of the research period.

Description of Study Participants and Setting

Research participants were four fourth grade students enrolled in the researcher’s reading and language arts classes for the 2017-2018 school year. Two of the students were nine years old and had not been previously retained; the other two students were 10-years-old and had previously been retained. Two participants were male, and two of the participants were female. All research participants were students who were born with neonatal abstinence syndrome. The students were selected as research participants after examination of school records, classroom observations, benchmark testing, and parent interviews. At the onset of the study, all participants read significantly below grade level, as determined by the STAR literacy assessment. Each of the
participants was performing below their current grade level. They also struggled with remembering information, concentration, and organization. Participants were unaware that they are born with NAS, and they were not informed of the diagnosis at any point during the study. Participants were, however, aware that their reading level was significantly below grade level. They were informed that they were receiving extra help to improve their reading skills. Strategies that were used for the study were also used for every student in the classroom. The study was not addressed in relation to many of the interventions and activities but was generically addressed during surveys and discussions.

The research was conducted in a fourth-grade reading/language arts classroom at a small, rural elementary school in Tennessee. The research school is a Title 1 school with 83% of students considered to be below the poverty level. Approximately 30 students in grades K-6 were born addicted to opiates or other drugs. The majority of the research strategies were implemented in the normal classroom setting and in Response to Intervention (RTI) instruction.

Data Collection Procedures

Data was collected using researcher-created student surveys, teacher observations, and participant interviews. Longitudinal Likert-scale surveys were utilized (Appendix A). Participates completed a paper survey at the onset of the research period to determine which aspects of reading and learning participants believed to be particularly challenging for them, as well as learning strategies or methods they felt worked best for them. The survey asked questions of students regarding their personal evaluation of their learning and what methods or strategies help them learn. The Likert-scale was used to measure attitudes and perceptions of participants, and the survey supplied the participants with five options ranging from (1) Strongly Agree, (2)
Agree (3) Neither Agree or Disagree, (4) Moderately Disagree, and (5) Strongly Disagree (Ary et al., 2014).

At the end of the research period, students were provided the same survey (Appendix A). The results of student survey were used to help determine the effectiveness of the learning strategies. Surveys to address each strategy included questions about interactive notebooks, small group instruction, and interactive read-alouds.

Student observations were conducted by the researcher when the applicable strategies were being used. Observed behaviors were recorded and tallied. The following behaviors were identified as relevant to the study and recorded: time on task, engagement, retention, comprehension, and application. Time on task and engagement were measured by observing whether the student is participating in the lesson, is keeping up with the steps in following the lesson, and can answer questions during the lesson. Retention was measured by verbally asking questions about the lesson one day later and formally testing the information taught two to four days later. Student comprehension was measured through verbal questions and written questions specifically designed to assess comprehension. The application was determined by asking the student to apply knowledge gained to a real-life scenario or in a different context than how it was presented by the teacher.

Informal student interviews were conducted in a discussion format, with the purpose of determining the students’ thoughts and feelings about learning using other strategies, as opposed to being taught using the brain-based strategies of interactive notebooks, interactive read-alouds, and small group instruction (Appendix B). The interviews were conducted at the end of the research period. A special education teacher was present during the interviews to ensure the correct understanding of answers by the researcher. This is all illustrated in Figure 1 below:
Coding

The information gathered from Surveys, Interviews, and Observations used open coding illustrated in Figure 2 on the next page:

**Data Collection Process**

1. Initial Student Surveys
2. Preliminary Student Interviews
3. Ongoing Student Observations
4. Final Student Survey
5. Final Student Interview

**Data Analysis**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retention</td>
<td>Describes that student has accurately recalled information previously presented.</td>
<td>R</td>
</tr>
<tr>
<td>Comprehension</td>
<td>Describes that the student has displayed comprehension of a text or concept.</td>
<td>C</td>
</tr>
<tr>
<td>Organization</td>
<td>Shows that the student has shown adequate organizational skills.</td>
<td>O</td>
</tr>
<tr>
<td>Motivation</td>
<td>Shows that the student has displayed motivation to learn.</td>
<td>M</td>
</tr>
</tbody>
</table>
Ethical Considerations

Quality and integrity of research were ensured through oversight and examination by the researcher’s dissertation committee at Carson Newman University. Participants voluntarily participated in the study, and informed consent was obtained from all study participants. All participant information obtained during the study remained anonymous, and all information related to the study was kept confidential. There was no risk of harm to participants during the duration of the study. The research was conducted independently and impartially, with no bias toward specific outcomes.

Data Analysis Procedures

Information obtained through the surveys, observations, and interviews was collected and summarized in order to develop an understanding of which methods were successful, as well as what made them successful for this particular group of students. Through information collection and examination, the researcher was able to determine the rate of success for implemented instructional strategies when used with students who were born with NAS.

Data Analysis

The results of participant surveys, interviews, and teacher observation notes were compared and analyzed to determine common patterns and the most effective instructional methods for the participant groups. This is illustrated in Figure 3 below:
Summary

Students born with neonatal abstinence syndrome are often unable to achieve success in the academic setting. The results of this study were scrutinized to determine which interventions were successful. The purpose of this study was to improve the reading ability and overall academic achievement of students who struggle academically due to the learning challenges they face as a result of drug addiction and to provide information to other educators regarding methods to help this particular group of students.
CHAPTER 4: PRESENTATION OF THE FINDINGS

Introduction

Chapter 4 presents the findings of the interviews, focus groups, and individual interviews.

Survey Findings

At the beginning of the study, students were given a survey regarding learning and instructional methods (Appendix A). The results of the survey described challenges with auditory learning. The Three students strongly disagreed that they understood information presented to them orally. One student disagreed with the statement. All four students strongly disagreed with the statement that they were able to remember information presented orally. Students were then surveyed regarding their understanding of and ability to remember information about which they read. Two of the students stated that they strongly disagreed that they learned best when they read about a topic, the other two stated that they disagreed with the statement. In terms of remembering what they have read, all four strongly disagreed with the statement that they could usually remember what they read. The students were then given statements regarding hands-on instructional activities. All four participants stated that they learned best, and remembered best from hands-on activities. Three participants agreed that they remember information about a topic better if they are able to talk about it. One participant strongly disagreed with that statement. All participants strongly agreed that they learn best when they know exactly to what they are supposed to be paying attention and to remember. Two participants strongly agreed, and two agreed that they learn best when information is presented in small groups. The responses were the same to the statement that they remember information
better when presented in small groups. Three students disagreed with the statement that they learn best in a whole class setting. One student neither agreed or disagreed with the statement. The overall results of the initial survey were that all survey participants learn best when hands-on activities are used. They also prefer small-group instruction and remember information better when they have the opportunity to discuss what has been presented to them.

**Interview Findings**

Prior to the research period, students were also interviewed about their educational experiences using predetermined questions (Appendix B). All four participants described that school as often difficult for them, while two of them added that it was also enjoyable. Two participants stated that it was not enjoyable because the work they were given was often too difficult.

When asked what they liked best about language arts class, their responses were completing interactive activities, small-group time, reading, and being able to sit beside a friend. When asked what their least favorite aspect of language arts class, their responses were reading, having to write so much, and getting tired.

When asked about particular areas of reading/language arts with which they struggle, all participants said reading and/or writing. Students were then asked to describe situations in which it was easier for them to learn when. Responses were that it was easier for them to learn when they were interested in the topic, when they weren’t sleepy, when they were completing hands-on activities, and when they were being instructed in small-groups.

When asked what their thoughts were about interactive notebooks, three of the students stated that they enjoyed them. One participant stated that notebooks got on his nerves. When
asked what their thoughts were about interactive read-alouds, each student stated that they enjoyed them and remembered information better when they were used.

When asked what their thoughts were about small-group instruction, all four students stated that they enjoyed it. When asked what activity they thought best helped them to remember information, one student said notebooks; two responded that interactive read-alouds helped them remember, and one responded that they didn’t know.

**Read-Aloud Findings**

During the month-long research period, interactive read-alouds were used twice per week, interactive notebooks were used four days per week, and small-group instruction was used three days per week. Participant behaviors were observed during times when each of the instructional methods were used. Focus behaviors of retention, comprehension, organization, and motivation were recorded, coded, and tallied.

After the eight interactive read-alouds, the four participants adequately retained information. They were able to retell the story including the characters, setting, and main events with 87% accuracy one week after participating in the interactive read-aloud. After completing the interactive read-aloud, each student took the Accelerated Reading comprehension test. The four participants’ average score for the eight tests they took was 92%. During each of the interactive read-alouds, all four participants were engaged and participated in the lesson by answering questions and contributing ideas.

**Interactive Notebook Findings**

Each of the four participants participated in sixteen classes using interactive notebooks. They were quizzed on information covered in their notebooks one week after each lesson, and
again at the end of the study period. Participants were able to answer questions with 91% accuracy one week after instruction, and with 88% accuracy at the end of the study period. Some information had been taught days prior to the end of the study period. The first lesson had been taught one month prior to the end of the study period. Comprehension resulting from lessons for which interactive notebooks were assessed by weekly formal assessments and a unit test at the end of the study period. The participants’ average score on the weekly test was 90% and 86% on the unit test. Three of the students’ notes and activities were well organized in their notebooks. One of the students faces challenges with motor skills and required assistance with his notebook. All students completed each of the sixteen sets of notes and activities in their notebook with accuracy and were engaged during the lesson.

**Small-Group Instruction Findings**

The four participants each participated in twelve sessions of small-group instruction during the one month study period. For small-group instruction, a text set which included vocabulary, text structure, and comprehension questions was used. Each week, students completed a new text with a different set of questions. Their average score on the four sets of comprehension questions was 94%. Retention was measured by re-telling the main parts of the text one week after the small-group lessons, for it had been completed. Students were able to describe the text with 88% accuracy. Students were required to organize information and their ideas in order to complete an essay using information from the text. Three of the students were able to write an essay for each of the four texts successfully. One student was able to write an essay for two of the texts successfully. He was off topic for one essay and had issues with the organization on the other
essay. Each of the students displayed motivation during small-group instruction. They were continually on-task, participated in the discussion, and answered questions voluntarily.

**Post-Study Findings**

At the end of the month-long study period, the student surveys (Appendix A) and interviews were repeated. Different interview questions were used for the post-study interview (Appendix C). The results of the post-study survey were very similar to the pre-study survey.

On the post-study survey, all participants stated that it was more difficult for them to understand and remember information they read, or that is presented orally in whole groups than for them to remember what they were taught in small-group instruction, with interactive read-aloud, or with the use of interactive notebooks.

In the post-survey interview, students were asked specific questions regarding their thoughts on different methods of instruction. Participant A stated that she often had a hard time focusing during whole group instruction and that when given something to read, it is often too difficult for her. She said that she enjoyed using interactive notebooks because she was able to focus on what she was supposed to learn and remember the information given. She said that it was easier for her to focus on small-group instruction than whole group instruction. She said that even though she does not like to read, she enjoys interactive read-aloud because they are relaxing and acted fun. She said that reading/language arts class could be made better for her if she did not have to do so much reading and writing. Participant B stated that she was not good at writing and that she does not like to read or write. She said that she liked the interactive notebooks because they are enjoyable, and she remembers information better it is in her notebook. She said that she does not really enjoy small-group instruction, because she does not like having to talk
and read aloud. She said that she feels like she learns best when using interactive notebooks and computer programs like IXL. She said that she would do less writing in reading/language arts class if she could. Participant B also stated that she enjoys interactive read-aloud, and they help her remember information about the book. Participant C stated that he enjoys group work and reading during reading/language arts class, but he does not like to write. He stated that his favorite instructional methods were small-group instruction and computer programs such as IXL. He stated that he learns best when he is actually doing something. Participant C stated that he enjoys interactive notebooks sometimes, but occasionally they are too difficult. He stated that he does not really like interactive read-aloud, even though he thinks that they help him remember information from the text. He described small-group instruction as being fun and helpful. Participant D stated that his favorite part of language arts class is using interactive notebooks. He stated that he learns best when he can work alone and figure things out for himself. He stated that he wishes he did not have to write so much in class.

**Overall Findings**

Overall, the study participants retained information better when they received small-group instruction than when information was presented in the whole group setting. Interactive notebooks were the second most effective strategy, and interactive read-aloud was the least effective of the three but could overall be considered an effective strategy for participants. Participants’ thoughts about each of the strategies varied, but all participants enjoyed each of the strategies more than traditional whole-group instruction. The study results show that all three strategies were effective, but it did not show that one was significantly more effective than the others. Engagement with the material was sometimes difficult to achieve with students who were
born with NAS. However the three methods used in the study increased the students’ engagement, retention, motivation, and comprehension.
CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Summary

The study examined the value of different academic instructional methods for fourth-grade reading and language arts students who were born with NAS. The study was based on Situated Cognition, which maintains that knowing is inseparable from doing. Situated cognition draws from the work of Dewey (1938), Vygotsky (1978), Lecont’ev (1978, 1981), and Lura (1976, 1979) in regard to theories on early cognitive research. Situated cognition is rooted in the idea of learning within the situation. (Jenlink, 2013). The brains of most students with NAS function differently than students not born with NAS. Students born with NAS often do not form neurological connections in the same manner as other students. They are often unable to understand or retain written or verbal information. In order to effectively form connections, comprehend, and retain information “doing” is essential to these students (Lumsden, 1990). Hands-on activities and interaction with the information significantly improved the academic performance of students born with NAS.

Consistent engagement with the material being presented during lessons proved essential to academic success for study participants. The study was limited by the number of participants and the individual classroom setting, but logical conclusions were drawn that student engagement and performance increased with the use of hands-on strategies and increased individualized instruction. More research regarding academic instruction for students who were born with NAS is needed in order to establish broader proven conclusions.
**Recommendations**

Students who were born with NAS and those who suffer other effects of drug addiction are an underserved population in terms of education in the United States. There has been very little research regarding interventions to specifically address the needs of students who were born with NAS. In the United States, more than 400,000 infants each year are born drug addicted, or exposed to illicit drugs while in utero (Young et al., 2009). An increasing number of students who were born with NAS are referred for special education services each year. Often, standard interventions for special education students fail to produce successful results in students born with NAS. However, no other options are provided to help these students make behavioral and academic gains (T. Hubbard, S. Campbell, & L. Andrews, personal communication, May 28, 2017). Decreased attention span and behavior control, as well as sensory processing and autonomic dysfunction disorders, often occur because of NAS (Seattle Children's Hospital, 2017).

This study attempts to fill the gap between the needs of students born with NAS and the strategies with which teacher are equipped to assist the students. However, much more research and education for classroom teachers are needed. As the population of students who were born drug addicted increases, schools within the United States need to be adapted to assist all students with the academic challenges they face.
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Appendix A
Student Survey

Student Name: _________________________________ Date: __________________

I understand information when the teacher tells me about it.


I am able to remember information from lessons when the teacher tells me about something.


I learn best when I read about a topic.


I am usually able to remember what I read.


I learn best when I am doing something hands-on.


I am usually able to remember information about a topic, if I have completed a hands-on activity about it.


I learn best when I talk about what I am learning.

I remember information about a topic better if I am able to talk about it.


I learn best when I know exactly what I am supposed to be paying attention to.


I remember information better if I am told exactly what I need to remember during the lesson.


I learn best when the teacher presents information in small groups.


I remember information better when the teacher has presented it in small groups.


I learn best in a whole class setting.

Appendix B
Student Pre-Study Interview Questions

1. What is school like for you and why?

2. What do you like best about reading/language arts class?

3. What is your least favorite thing about reading/language arts class?

4. What area(s) of reading/language arts are you the best at?

5. What areas of reading/language arts do you feel you struggle with?

6. Complete this sentence. It is easier for me to learn when

7. What are your thoughts about interactive notebooks?

8. What are your thoughts about interactive read-aloud?

9. What are your thoughts about small group instruction?
10. What activity do you think most helps you learn and remember information?
Appendix C
Student Post-Study Interview Questions

1. What do you enjoy about reading/language arts class?

2. What do you not enjoy about reading/language arts class?

3. What is your favorite method of instruction (whole class, small-group, interactive read-aloud, individual work, interactive read-aloud, computer activities like IXL)?

4. How do you think that you learn the best?

5. What would you change about reading/language arts class if you could?

6. Do you like interactive notebooks? Do you think that interactive notebooks help you learn?

7. Do you enjoy interactive read-aloud? Do you think they help you learn?

8. Do you enjoy small-group time? Do you think it helps you learn?