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Teaching Strategies for Students with Attention Deficit Hyperactivity Disorder

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TEACHING STRATEGIES FOR STUDENTS
WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER

by

Trevor P. Higgins

A Research Project Presented in Partial Fulfillment
of the Requirements for the Degree
Master of Education

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ABSTRACT

Teaching Strategies for Students with Attention Deficit Hyperactivity Disorder

Attention Deficit Hyperactivity Disorder (ADHD) is a multifaceted condition which can be influenced by multiple factors. Once the various aspects of the condition are acknowledged, the student with ADHD will be more understood by his or her teacher.

Teaching students with ADHD can be a challenging task. A variety of strategies can be implemented by instructors to help alleviate the problems that can occur when there is a student with ADHD in the classroom. By the use of these techniques, students with ADHD will experience more academic success, and the teacher will have a more controlled classroom.

TABLE OF CONTENTS

Chapter	Page
1. INTRODUCTION	1
Statement of the Problem	1
Purpose of the Project	2
Introduction to Attention Deficit Hyperactivity Disorder (ADHD)	2
List of Definitions	3
Chapter Summary	5
2. REVIEW OF LITERATURE	6
Historical Background of ADHD	6
Causes of ADHD	9
Factors that can Influence ADHD	12
Gender	12
Culture and Ethnicity	14
Socioeconomic Status	18
Comorbidity	19
Dual Exceptionalities	21
Diet	23
Teaching Strategies	26
Verbal Prompts	27
Nonverbal Prompts	30
Peer Collaboration	33
Classroom Accommodations	36
Chapter Summary	39
3. METHOD	41
Targeted Audience	42
Goals of the Applied Project	42
Procedures	43
Peer Assessment	44
Chapter Summary	44

4. RESULTS	46
Unit Plan	47
Lesson 1: Sun, Earth, and Moon	54
Lesson 2: Moon Phases	57
Lesson 3: Eclipses	60
Lesson 4: Space Station Overview	62
Lesson 5: Space Exploration Part 1	67
Lesson 6: Space Exploration Part 2	71
Lesson 7: Moon Water Part 1	74
Lesson 8: Moon Water Part 2	78
Lesson 9: Rockets and Space Flight	80
Lesson 10: “Classroom Feud” Solar System Review	84
Chapter Summary	89
5. DISCUSSION	90
Overview of Findings	91
Limitations of the Project	91
Merits of the Project	92
Additional Comments and Suggestions	93
Recommendations for Future Research	94
Chapter Summary	95
REFERENCES	97
APPENDICES	
The Story of Fidgety Philip	102
ADHD Timeline	105
School Situations Questionnaire	108

Chapter 1

INTRODUCTION

This project is dedicated to the author's nephew, who from a very early age exhibited a number of characteristics associated with Attention Deficit Hyperactivity Disorder (ADHD). He was diagnosed with the disorder at the age of 2 and, subsequently, was placed on a medication regime to help control the disorder. Over the course of the next 4 years, the symptoms he exhibited continued to worsen and resulted in hospitalization when he was 6 years old. During his hospital stay, he was given an additional diagnosis of Bipolar Disorder.

This author would like to note, however, that the boy in question is extremely affectionate and relates well with his peers. He continues to excel academically, particularly in the areas of reading and writing.

It is for these reasons, together with the complex issues that surround ADHD, that this author decided to investigate the true nature of the disorder. In addition, this author believes that it is essential to understand the accommodations that could be instigated by the teacher to help the student excel both academically as well as socially.

Statement of the Problem

Traditionally, teachers have worked in classrooms where there were students who were difficult to manage. Often, this is a result of a small number of students who find it difficult to remain focused for any length of time. One possible reason for this

inattentiveness and unruly behavior is ADHD. Students with ADHD are more easily distracted in the classroom and, generally, are more difficult to manage.

There is a need for effective strategies to help these students be more focused, more attentive, and more compliant in the classroom. If the teacher is able to identify students who may have ADHD, and is trained in effective classroom management techniques as well as teaching strategies, then it is more likely that the environment will be greatly improved.

Purpose of the Project

The purpose of this project was to develop a unit that consisted of 10 lesson plans to teach science. These lesson plans were designed to assist teachers of students with ADHD between 9-11 years of age. The author believed that the use of precise instructions, combined with hand gestures, the use of peers, and classroom accommodations, can improve both the behavior and the aptitude to learn for students with ADHD.

Introduction to Attention Deficit Hyperactivity Disorder (ADHD)

Scott (1987) defined ADHD as a child's demonstration of inappropriate inattention, impulsivity, and hyperactivity based on the child's age. Further, children who are diagnosed with ADHD at an early age usually exhibit more profound signs of the disorder. In addition, poor self-esteem and lack of social skills can be problems for children diagnosed with ADHD.

According to *Teaching Children* (1998), ADHD is characterized by a child's difficulty in three areas: (a) attention span, (b) impulse control, and (c) hyperactivity. As

many as 5% of school children may suffer from this disorder. In order for an individual to be diagnosed with ADHD, a clinician must be able to identify two-thirds of the major criteria that are related to attention span, hyperactivity and impulsivity.

In *Appropriate Education* (1992), the author estimated that 3-5% of children are diagnosed with ADHD. The condition may be genetic, and medication and environmental conditions could contribute to development of ADHD or amplification of its effects. The author purported that the responsibility of the school staff should be unilateral in regard to accommodations for students diagnosed with ADHD. The author claimed that failure on the part of the school staff to make these accommodations could result in a further deterioration in a student's performance, as well as an increased loss of self-esteem.

It is important to note that Attention Deficit Disorder (ADD) was, at one time, considered to be a disorder separate from ADHD (FocusonADHD.com, n.d.). It was considered separate because of the lack of hyperactivity. Presently, however, ADD is categorized as one of the three subtypes of ADHD: (a) inattentive type, which is ADD; (b) hyperactive or impulsive type; and (c) inattentive and hyperactive combined. For this project, the term ADHD will be used almost exclusively.

List of Definitions

Attention Deficit Hyperactivity Disorder (ADHD): a condition in which a child is unable to pay attention and also has a lack of impulse control. There are three subtypes: (a) inattentive; (b) hyperactive; and (c) combined (Scott 1987).

Bipolar Disorder: a mood disorder characterized by extreme highs and lows (Strock, 2003).

Compliance: a student's ability to follow the instructions of the teacher, both academically and behaviorally (Kapalka, 2005).

Conduct Disorder: a serious pattern of antisocial behavior, including lying, stealing, fighting and/or bullying (Strock, 2003)

Comorbidity: two or more conditions that are present at the same time with the same patient (Taber's, 1993).

Culture: the customary beliefs, social forms, and material traits of a racial, religious or social group.

Diagnose: to determine the cause and nature of an illness or disease (Taber's, 1993).

Dual Exceptionality: the term used when a child is both gifted and disabled (Willard-Holt, 1999).

Ethnicity: refers to a person's racial origin.

Manipulative: any object that a student can manipulate with his or her hands (U.S. Department of Education, 2004).

Noncompliance: the term used when a student is unable or unwilling to comply with an instructor's commands (Kapalka, 2005).

On task: when a child pays attention to the task at hand (Rief, 1993).

Oppositional Defiant Disorder: a pattern of behavior marked by defiance of those in authority (Strock, 2003).

Peer collaboration: a group of children, usually in the same class, who work together to help one another (DuPaul & Eckert, 1998).

School Situations Questionnaire: a tool developed to help determine how severe a student's ADHD symptoms are when he or she is in school (Barkley, 1987).

Socioeconomic status: relates to the amount of money a family earns which determines whether a family is upper class, middle class, or in poverty.

Chapter Summary

Attention Deficit Hyperactivity Disorder is a multifaceted disorder that is often not fully understood. The only way to help instructors understand the disorder is to teach them about the wide variety of aspects of the condition, and how various factors can have an influence on ADHD. In Chapter 2, several of these aspects will be investigated, as well as the techniques that teachers can use in the classroom to help students with ADHD succeed to the best of their ability. In Chapter 3, the method to be used in this project will be presented.

Chapter 2

REVIEW OF THE LITERATURE

The purpose of this project will be to develop a unit of lesson plans to teach science so that students with ADHD will be able to achieve their full potential in regard to their behavior and their academic performance. The objective of this literature review is to explore teaching strategies for students who have been diagnosed with Attention Deficit Hyperactivity Disorder (ADHD). This will begin by a review of the history that surrounds ADHD, after which the potential causes for the disorder are examined.

To further understand the true nature of ADHD, the factors of gender, class, and culture are examined to establish whether ADHD is more prevalent in any one segment of society. Further information will be provided in regard to: (a) comorbidity, (b) dual exceptionalities, and (c) diet.

The final area to be addressed in this chapter is teaching strategies. This will consist of four categories: (a) verbal, (b) nonverbal, (c) peer collaboration, and (d) classroom accommodations. It is hoped that, by dividing teaching strategies into four groups, a greater variety of suggestions to assist the teacher within the classroom will be offered.

Historical Background of ADHD

Strock (2003) reported that the first description of ADHD was made by a German doctor, Dr. Heinrich Hoffman in 1845. Dr. Hoffman, in addition to being a physician,

was an author whose work included a poem titled, “The Story of Fidgety Philip” (see Appendix A for an English translation of the poem). In the poem, Philip is described with classic symptoms of hyperactivity. Since this is a work of fiction, it is unclear whether this was based on an actual child that Hoffman encountered.

Some symptoms of ADHD were first reported in 1902 by a British pediatrician, Dr. George F. Still, in the medical journal, *Lancet* (as cited in de Armas, 2001; Martin, n.d.; Singh, 2002). These reports, based on a series of lectures he gave at the Royal College of Physicians, were about children he had treated who demonstrated impulsive behavior and a lack of inhibition. In his reports, Still indicated that the moral control of these children was defective. Also, he reported that these were not bad children, but rather that this was a biological condition and, therefore, beyond the ability of the children to control. It should be noted, however, that the symptoms Dr. Still described may have been descriptions of Oppositional Defiant Disorder or Conduct Disorder.

After an encephalitis outbreak in 1917-1918, many children who were affected began to show symptoms of hyperactivity that had been described by Still (de Armas, 2001; Singh, 2002). This led many physicians to believe that hyperactivity and impulsivity were caused by brain damage. After doctors came to realize that these children were just as intelligent as unaffected children, the disorder was termed minimal brain damage. This was later renamed minimal brain dysfunction, which was the term used in the 1940s and 1950s.

The possibility of medication for use as treatment came to the fore in the 1930s (Breggin, 2001; de Armas, 2001; FocusonADHD.com, n.d.). In particular, amphetamines

were the focus of treatment in a study conducted by Dr. Charles Bradley. The first drug to be used to treat psychiatric disorders in children was Benzedrine, which was originally developed to treat asthma. Other stimulants came into common usage during the 1950s and 1960s. It was in 1957 that Ritalin, probably the best known medication to treat ADHD, was approved for use by the Food and Drug Administration (FDA). Originally, Ritalin was used to treat narcolepsy, but it was found to subdue hyperactivity and other behavioral problems. In the 1960s stimulants became more widely used after the researcher, Chess (1960, as cited in de Armas, 2001) developed the term, Hyperactive Child Syndrome, to describe the disorder, and reported that she felt it had a biological basis.

It was in the early 1970s that research was conducted that provided the greatest insight to the current understanding of ADHD (Martin, n.d.). Dr. Virginia Douglas (1974, as cited in Martin, n.d.) was a Canadian researcher who investigated cognitive impulsivity. Prior to this, only hyperactivity and verbal outbursts were considered to be part of Hyperactive Child Syndrome, as it was still called at that time. After the Douglas study, however, doctors began to understand that lack of attention and focus on tasks was an integral part of the condition.

In 1980, the terms Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD), began to be used (FocusonADHD.com, n.d.). Those children whose symptoms included inattentiveness, but did not include hyperactivity, were diagnosed with ADD, while ADHD was used for those who had hyperactivity only, and also for those who had hyperactivity and inattentiveness combined. In 1987, however,

ADD became one of three categories under the umbrella of ADHD: (a) inattentiveness, or ADD, (b) hyperactivity, and (c) inattentiveness and hyperactivity combined.

A 10 year study (Castellanos et al., 2002) was completed in 2001 which attempted to demonstrate that ADHD is a biological condition. It was found that children with ADHD had smaller brains than children who did not have the disorder. The researchers examined these children's MRIs to make this determination. The size of the brain was as much as 3-4% smaller in the children affected by ADHD. Also, it was found that the smaller the child's brain was, the more severe the symptoms.

In 2002, a new type of medication was approved by the FDA for treatment of ADHD (FocusonADHD.com, n.d.). While stimulant medications have been very helpful for countless children with ADHD, not all children have responded well to such treatment. Strattera is the first nonstimulant medication approved for treatment of ADHD. A timeline of the history of ADHD is presented in Appendix B.

Causes of ADHD

There are many possible causes of ADHD, and the search for a cause has been the subject of many studies. De Armas (2001) indicated that one of the first theories was that hyperactive behavior resulted from brain damage. This theory came about after an encephalitis outbreak in 1917-1918. Many of the children affected by encephalitis later exhibited hyperactive and impulsive behaviors. Even children who had not had encephalitis were thought to have brain damage.

Also, Barkley (2000) discussed a correlation between brain injury and ADHD. The area of the brain that has the greatest impact on the presence of ADHD is the orbital-

frontal region, which lies just behind the forehead. People who have experienced damage to this area of the brain have behavior problems that resemble those of children with ADHD. Along similar lines, Barkley (2000) discussed the use of animals in ADHD research. He stated that numerous studies on animals have provided evidence of a correlation between brain injury and ADHD. Primates were trained to do particular tests, and once the researchers had obtained their baseline data, they disabled the frontal region of the brain of these primates. After the induced injury, the behavior of the primates was similar to children with ADHD. In particular, the animals were more hyperactive and impulsive, and had decreased attention spans. Additionally, the social behavior of the primates was compromised. The studies referenced by Barkley also indicate that these reactions are not present when other regions of the brain are damaged.

A more recent theory on the cause of ADHD is genetics (ADHD attention, n.d.; Martin, 2006). Hawi et al. (2005) researched genetic links and transmission of the disorder from parent to child. They found that there were nine genes that were associated with ADHD, and children were more likely to inherit these genes from their fathers rather than their mothers. Approximately one-third of all men, who had been diagnosed with ADHD as a child, fathered at least one child with ADHD. Also, adoption studies (Payton et al., 2001) have supported the premise that the disorder is inherited rather than caused by environmental influences.

There is further evidence to support the argument for a genetic link to ADHD (Martin, 2006; Strock, 2003). First, ADHD is a disorder that never disappears, which is typical of genetic disorders. It may change as a person matures, learns to deal with the

condition, and receives treatment, but it never disappears completely. Second, in the families with children with ADHD, 25% of the close family members have the disorder as well.

The focus of other studies has been on whether the cause of ADHD could begin in utero (ADHD attention, n.d.; Ben Amor et al., 2005; Biederman & Faraone, 2005; Strock, 2003). Biederman and Faraone (2005) reported that the use of cigarettes and alcohol during pregnancy has been linked to ADHD in the child. In addition, they described a possible link between prenatal and/or labor and delivery complications and the incidence of ADHD; it was found that children with ADHD had a higher rate of complications while the child was in utero. Along similar lines, children with low birth weight, defined as being 1,500 grams or smaller, were more likely to be diagnosed with ADHD when they got older.

Castellanos et al. (2002) conducted research on the brain that showed certain differences in the brain and/or the brain function of children with ADHD. It has been shown, that the brain of a child with ADHD is 3-4% smaller than that of a child without the disorder, and the smaller the brain, the more severe the symptoms. In addition, it has been shown that children with ADHD do not respond appropriately to the brain chemical, dopamine, and that there is a deficit of this chemical in the brain of individuals with ADHD. Vaidya et al. (1998) conducted a study on boys in which it was demonstrated that there is an abnormal increase of activity in two of the brain structures, the frontal lobe and the striatal areas below the frontal lobe. Since these areas are responsible for the control of voluntary actions, the boys had to work harder to maintain self-control.

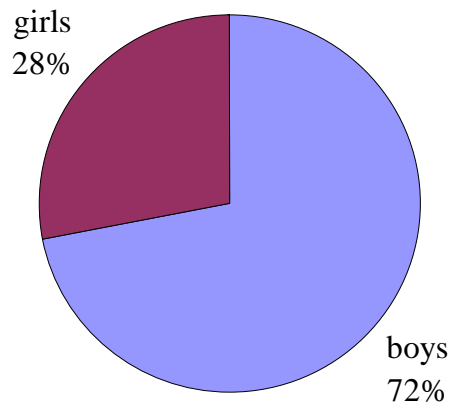
Factors that Can Influence ADHD

There are numerous factors that can influence ADHD, in particular the: (a) diagnosis, (b) symptoms and/or (c) treatment of the disorder. These factors can include: (a) gender, (b) culture and ethnicity, (c) socioeconomic status, (d) comorbidity, (e) dual exceptionalities, and (f) diet. Each of these are explored in further detail.

Gender

Cantwell (1975, as cited in Barkat & Lee, 2000) suggested that the ratio of boys diagnosed with ADHD can be as much as four times higher than girls. This theory was supported by Barkley (1995, as cited in Barkat & Lee, 2000), who suggested that the number of males who are referred by clinicians because of aggressive or antisocial behavior is much higher than females. Greenblatt (1994) reported that, of children correctly identified with ADHD, 72% were males whereas 28% were females (see Figure 1). The author suggested that the behavioral differences between males and females may play a part and that, as a result, girls with this disorder are more likely to go undiagnosed.

Figure 1. Comparison of boys and girls with ADHD



Ackerman, Dykman and Oglesbury (1983, as cited in Greenblatt, 1994) suggested that the reason that boys are more frequently diagnosed as being hyperactive is primarily due to the fact, that, in general, males are more assertive, aggressive, and bigger risk takers than females. They suggested that, excluding hyperactivity, ADHD may have a similar rate of occurrence between boys and girls. McGee and Silva (1987, as cited in Greenblatt) observed that, because the majority of literature on ADHD is male based, it is commonly perceived that ADHD is a male specific disorder. Therefore, only those females who exhibit severe symptoms of the disorder are identified. Greenblatt suggested that, since females are generally more passive and compliant, the likelihood of them being diagnosed is greatly reduced. The implications of this are first, an increased risk of academic failure, and second, an erosion of social interaction skills for the child with ADHD.

The diagnosis of girls with ADHD is complicated by the fact that they are less likely to exhibit the hyperactive and impulsive behaviors that, often, are the first behaviors that teachers notice about children with ADHD (Shepps Battle, 2002). The hyperactive and impulsive behaviors associated with ADHD are much more distracting in the classroom, therefore, these students are more noticeable. This means that the child who daydreams, may be left alone and ignored, or perhaps not even noticed at all.

Very often, girls with ADHD have adapted discreet ways to mask their lack of attention in class (Sanchez, 2001; Shepps Battle, 2002). In contrast, often, boys will doodle on paper or look around the room or out the window when they do not pay attention; girls are much more likely to look at their teacher and give the impression that

they are paying attention to what the teacher is saying. In this way, their inattentiveness avoids detection, and they are much less likely to get into trouble. Because this lack of focus is nearly undetectable, it is much harder for teachers to identify girls who are affected by ADHD.

Also, girls with ADHD exhibit their symptoms in ways that are different from boys (Jackson & King, 2004; Rabiner, 1999). Boys tend to display their aggression physically. In contrast, girls tend to exhibit relational aggression, that is, they verbally attack their family and peers. This results in social rejection from peers and a higher incidence of family conflict.

One interesting difference between boys and girls with ADHD is related to the changes that puberty brings (Sanchez, 2001). When a girl with ADHD enters puberty, her symptoms become exacerbated. This can be problematic because one of the criteria for a diagnosis of ADHD is that symptoms begin before the age of 7; however, often symptoms are not noticed until they worsen during puberty. On the other hand, boys' symptoms begin to alleviate when their bodies go through puberty. For boys, this can be a great relief and reassure them that their adult lives will not be plagued with these disruptive symptoms that are so difficult to control.

Culture and Ethnicity

Mann et al. (1992) conducted a study to determine whether the clinical findings of ADHD were universal regardless of culture; the researchers were from China, Indonesia, Japan and the United States. The researchers observed two 8 year old boys from the U.S. and two from Japan, in both group and individual settings, and attempted to define

whether the behavior they exhibited was universally agreed upon by all researchers. The findings showed that the clinicians from China and Indonesia reported the boys had more adverse behavioral problems than those of their U.S. and Japanese colleagues. Mann et al. suggested that the reasons for this discrepancy were related to values that the Chinese and Indonesians place on acceptable behavior, whereas their U.S. and Japanese counterparts viewed the behavior of the children as being self-expressive.

In another study, Barkat and Lee (2000) discussed the ways in which ADHD is identified in Pakistan and the U.S. They reported that the percentage of children identified with the disorder was higher in the U.S. than in Pakistan. They suggested that one reason for this could be the inconsistency within U.S. society in regard to what is deemed acceptable and unacceptable behavior. Also, they reinforced the importance of consistency within a culture and noted that, in the Pakistani culture, alcohol is forbidden. This, they claimed, greatly reduced the potential for parents to develop alcohol or substance abuse problems and, thereby, the uniformity of the environment in which the children are raised is consistent. Due to the higher stability in the households, the children are more stable.

Barkat and Lee (2000) noted that the high level of importance placed on family and respect for one's elders helps to reinforce the notion that a child should not only respect his or her elders but, also, behave in a manner that is culturally acceptable. To further reinforce this, Barkat and Lee (2000) restated the old adage "it takes a village to raise a child" (p. 52). Vygotsky (1934, as cited in Barkat & Lee) viewed the interaction

between children and adults as paramount because it allows children to acquire the skills and behaviors that are representative of societal values.

However, Burcham and DeMers (1995) suggested that there is little empirical evidence to show that culture enhances the potential for a child to develop ADHD. In contrast, Barkley (1995, as cited in Barkat & Lee, 2000) implied that both culture and society can be influential in the determination of whether a child has ADHD. Also, Barkley noted that cultural attitudes and opinions in regard to acceptable behavior can be influential and determine whether an individual may be diagnosed with ADHD. Pearson and DeMers (1990, as cited in Burcham & DeMers) suggested that the traditional methods by which children are assessed places an unfair advantage on minority students, because it fails to take into consideration their cultural backgrounds and alternative methods by which they may learn. A more objective way to assess a child's progress would be through the use of performance based tests. This, they claimed, would allow the teacher to observe the progress of a student over a period of time, thereby allowing a more objective assessment of the student's progress.

Rhode et al. (2005) observed that a study conducted in a different culture that demonstrates different prevalence rates of ADHD can be deceptive. One of the reasons for this is that, in different countries, different criteria may be used for the diagnosis of ADHD. However, when the same criteria are used, the results show a remarkable similarity in the prevalence of ADHD between Brazil and other countries, including the U.S., Germany, and Australia.

Meyer, Eilertsen, Sundet, Tshifularo, and Sagvolden (2004) found similar findings in South Africa. However, they did not use the same diagnostic scale as is used in the U.S. because most of the parents of the children included in the study were illiterate and, therefore, unable to complete any of the surveys that are a part of other rating systems. The rating system used in the South Africa study was the Disruptive Behavior Disorders (DBD; Meyer et al.) rating scale, instead of the DSM-IV criteria used in the U.S. and Europe. In spite of the use of different rating systems, the results still showed a similar prevalence rate between South Africa and the U.S. and Europe. This indicates that the factors of culture and race do not play a major part in whether a child is diagnosed with ADHD.

On the other hand, culture and/or race can play a part in the treatment a child with ADHD receives (Perry, Hatton, & Kendall, 2005). In the U.S., minority children are less likely to receive appropriate treatment for ADHD. Part of the reason for this is based on the way that members of their ethnic culture view the disorder. For example, Hispanic Americans' beliefs about emotional or behavioral problems are rooted in their culture; they believe that hyperactive behavior is disrespectful rather than having a biological or psychological cause. As a result of this, Hispanic American parents are less likely to pursue the same methods of treatment as Anglo Americans.

According to Eaves (1975, as cited in Greenblatt, 1994), Anglo American teachers were more likely to identify African American students as having behavioral problems in comparison to Anglo students. In contrast, African American teachers viewed the behavior of both Anglo and African American students equally. Gibbs and Huang (1989,

as cited in Greenblatt) suggested that the school environment is reflective of not only academic achievement but, also, social and cultural values.

Reid, Casat, Norton, Anastopoulos, and Temple (2001) used the IOWA Conners Rating Scale (Pelham, Milich, Murphy & Murphy, 1989, as cited in Reid et al.) to assess whether ADHD was more prevalent in Anglo or in African American students. The researchers paid careful attention to socioeconomic factors, particularly those related to: (a) family size, (b) marital problems, (c) economic status and (d) foster care placement. Also, it was noted that hunger played a role in a child's inability to concentrate and display of acting out behaviors. Reid et al. concluded that African American students were twice as likely to exhibit behavioral problems as their Anglo American counterparts. Further, they concluded that, in part, this could be due to the high level of economic hardship experienced by this population in comparison with their peers.

Socioeconomic Status

The economic status of one's family can have an affect on ADHD. Pastor and Reuben (2002), reviewed data compiled by the National Health Interview Survey (1997-1998, as cited in Pastor & Reuben) to determine the prevalence of both ADHD and learning disabilities (LD). Pastor and Reuben divided family income into two categories to determine the prevalence of ADHD and LD: (a) \$20,000 or higher annual income, and (b) an annual income below \$20,000. The results showed that, among the higher income families, 6.05% of children either had ADHD or both ADHD and LD. However, the lower income families had a slightly higher rate, 8.36%, of children who had either ADHD or both ADHD and LD.

According to Currie and Stabile (2004), the prevalence of ADHD among children whose family income is under \$20,000 is nearly double that of children from higher income families. The researchers acknowledged that part of the reason for the higher rate in the lower income families could be due to other reasons that affect this population, such as less access to medical care and the fact that there are more single parent families.

To assess the treatment of ADHD and its relationship to socioeconomic status (SES), Stevens, Harman, and Kelleher (2005) conducted a study to compare the demographics of patients who used short acting vs. longer acting medications. In relation to income, 72.8% of patients with a higher income, defined by the researchers as middle and high income, used the longer acting medications, compared to 61.7% of those with a lower income, defined as being poor, near poor, and low income. The reason for the difference, the researchers theorized, was that the longer acting medications are newer and more expensive, which may make it more difficult for those with a lower income to afford them.

Comorbidity

Comorbidity exists when a person has two or more diseases or disorders that occur at the same time (Rabiner, 1999; Taber's, 1993). Approximately 45% of girls with ADHD have another disorder; in addition, this rate is only one-half the rate of comorbidity in boys. In children with ADHD, the disorders that can have an affect on their symptoms include: (a) Oppositional Defiant Disorder, (b) Conduct Disorder, (c) depression or mood disorders, and (d) Bipolar Disorder.

Oppositional Defiant Disorder (ODD) is a pattern of behavior marked by defiance of those in authority (Jackson & King, 2004; Strock, 2003). It can include: (a) belligerence, (b) stubbornness, (c) noncompliance, and (d) outbursts of temper. It has been estimated that between one-third and one-half of all children with ADHD have ODD as well, most of these are boys. There is some thought that these two disorders may have similar causes, as does Conduct Disorder.

Conduct Disorder (CD) is characterized by a serious pattern of antisocial behavior (Jackson & King, 2004; Strock, 2003). This can include: (a) bullying, (b) lying, (c) cheating, (d) stealing and (e) other aggressive behaviors. In the Ontario Child Health Study, Jackson and King found that, of the boys they studied with CD, 58% met the criteria for ADHD as well. In addition, girls with ADHD were 40 times more likely to be diagnosed with CD than girls who did not have ADHD.

In regard to depression and mood disorders, Rabiner (1999) and Strock (2003) reported that girls and boys have about the same rate of comorbidity. If the mood disorder is properly treated, the person with ADHD can deal with the ADHD symptoms much better. In addition, with the proper treatment of ADHD, the symptoms of the mood disorder are lessened.

Bipolar Disorder is characterized by manic and depressive episodes (Strock, 2003). The percentage of children with ADHD who also have bipolar is unclear. Often, the symptoms of bipolar overlap with those of ADHD, which makes it difficult to differentiate between the two; symptoms that overlap include the high energy level and

the decreased need for sleep. The primary distinguishing characteristics between ADHD and Bipolar are the elated moods and the grandiosity of bipolar.

Dual Exceptionalities

Willard-Holt (1999) argued that children with dual exceptionalities, that is, children who are both gifted and disabled, are often overlooked in regard to their disabilities. She reported that, often, students who may have difficulty in putting their thoughts into writing are misdiagnosed even though their verbal thought processes may be advanced. Willard-Holt identified the areas in which a student with learning disabilities can excel. Examples of this include: (a) excellent abstract and problem solving ability, (b) advanced vocabulary, and (c) a need for perfection.

Willard-Holt (1999) cited Webb and Latimer (1993) who claimed that, often, a child is improperly diagnosed due to certain behaviors that he or she may exhibit. These researchers suggested that, if the individual demonstrates a particular behavior in a certain situation, it may indicate that the child is gifted, whereas if the same behavior is apparent in all situations, then it is more likely related to ADHD.

Webb and Latimer (1993) maintained that, for a child to be diagnosed with ADHD, 8 of 14 characteristics listed in the Diagnostic and Statistical Manual of Mental Disorders (American Psychological Association, 1987, as cited in Webb & Latimer) must be present. Behaviors that are associated with ADHD include: (a) difficulty staying on task, (b) blurting out answers, and (c) problems with following instructions. However, Webb and Latimer argued that all these behaviors can be found in gifted children. They claimed that professionals are more likely to misdiagnose a child based on subjective

input from the parent or teacher, than when they observed the behavior of the child themselves.

Further, Webb and Latimer (1993) noted that, to differentiate between those children who are gifted and those diagnosed with ADHD, a more thorough examination needs to be conducted to determine how they react in all situations. Webb and Latimer drew on research by Barkley (1990, as cited in Webb & Latimer), in which it was maintained that children who exhibit behaviors in certain circumstances, but not all, are probably gifted, and the reason for their behavior is boredom, whereas those who exhibit behaviors in all settings, regardless of the circumstances, are diagnosed with ADHD.

Turk and Campbell (2002) described the difficulties that a child with dual exceptionalities can experience in the classroom. The presence of a student with ADHD or a gifted child in the classroom is difficult for many teachers, but when a child falls into both categories, the problems increase. If a child is distracted, it is difficult for the teacher to determine whether it is because of the child's ADHD, or if it is because the child is bored with the material. If both are present, it is even more difficult for the teacher. When a child is gifted, often, their intelligence can help them cope with their symptoms better than others with ADHD; in effect, they can mask the ADHD symptoms. One of the best ways to help children with dual exceptionalities is to challenge them with multifaceted projects; this will test their abilities to the fullest, which can help fulfill their intellectual needs and, at the same time, help their organizational skills, which can be deficient due to ADHD.

Ramirez-Smith (1997) discussed the problems faced by gifted children with ADHD, that is, they do not feel as though they belong anywhere. They are not truly accepted with either the gifted children, the learning disabled, or ADHD children; often, they have to deal with their particular issues alone. It is essential to remember that these children have their own needs in regard to their education, and teachers need to encourage these students and challenge them, while at the same time make sure that they do not place unrealistic expectations on themselves. The main key to helping these children is to recognize that they do not fit into a particular mold, and that all their needs must be met.

Diet

Many people dislike taking medications on a daily basis and prefer not to be dependent on them for normal functioning. For these people, the idea of dietary control of ADHD is quite appealing.

The idea behind the theory of dietary control is that something the child with ADHD has eaten is not tolerable to the system and, therefore, the result is negative behaviors (Hazell, 2000; Raby, 1995). This could include the possibility that a child has an allergy to a food or an additive, or that the child ingests too much or too little of a needed nutrient. Examples of items that have been theorized to have an effect on ADHD behaviors include: (a) caffeine, (b) chocolate, (c) insecticides and pesticides, (d) artificial colors or flavors, and (e) preservatives.

One item that has been tested has been the artificial coloring agent, tartrazine, which is a synthetic food coloring (Rowe & Rowe, 1994, as cited in Hazell, 2000).

Children were tested in relation to their consumption of tartrazine, and their reactions were evaluated in the following categories: (a) restlessness, (b) irritability, (c) sleeplessness, (d) aggression, and (e) poor attention span. The results showed that there was an increased amount of restlessness, irritability and sleeplessness when the children ingested the tartrazine, but there was no apparent effect on aggression or attention span. While some of the primary symptoms of ADHD did not seem to be affected by the use of tartrazine, the results indicated that it does have a potentially negative effect on the child.

In another study on diet control (Kaplan, McNicol, Conte, & Moghadam, 1989, as cited in Hazell, 2000), certain items were eliminated from children's diets: (a) artificial dyes and flavorings, (b) preservatives, (c) monosodium glutamate, (d) chocolate, and (e) caffeine. All of the children were of preschool age and were assessed by both their parents and their daycare providers throughout the study. The parents' evaluations indicated improvement with the new diet, but the daycare providers did not report a notable improvement in the behavior of the children involved. However, the researchers noted that the children had fewer sleep disturbances while they were on the additive free diet.

According to Jacobson and Schardt (1999), while some studies (Boris & Mandel, 1994; Carter et al., 1993; Egger et al., 1985; Harley et al., 1978; Pollock & Warner, 1990; Swanson & Kinsbourne, 1980; all cited in Jacobson & Schardt) have exhibited the benefits of diet control, it still is not a common treatment for ADHD. Even the FDA, which funded a study (Weiss 1986, as cited in Jacobson & Schardt) that demonstrated that dyes can have an adverse effect on behavior, endorsed statements by the International

Food Information Council (IFIC; 1995, as cited in Jacobson & Schardt) which reported that there was no evidence that food additives had a negative affect on hyperactivity.

In addition, Barkley (1999, as cited in Jacobson & Schardt, 1999), who has published numerous books and articles on hyperactivity, has discredited the benefits of diet modification. Barkley (2000) has discussed and dismissed the theory that ADHD can be caused by either sugar or food additives. He stated that

“Americans have been so fascinated for the last 35 years with how foods affect human health that it should come as no surprise when links between diet and ADHD continue to be proposed, but at this point such claims cannot be taken seriously” (p. 77).

He discussed studies (Kavale & Forness, 1983; Rosen, 1988; Wolraich et. al., 1985; Milich et. al., 1986; Hoover & Milich, 1994; all as cited in Barkley, 2000) in which particular foods were removed from the diet of children with hyperactivity, and these studies resulted in no appreciable change in the behavior of the children. It is interesting to note that, in this particular publication, Barkley does not discuss studies where there has been a positive change in behavior. One theory as to why Barkley and some other researchers discredit the benefits of diet modification is that medication treatment is more reliable than diet therapy. Jacobson and Schardt (1999) argued that trying to ignore or deny the potential benefits of diet therapy displays ignorance and, as a result, the welfare of children with ADHD may be placed at risk.

The research into diet control brings up the issue of whether to treat with medication or with diet modification (Jacobson & Schardt, 1999). One thing that makes dietary changes problematic is that it is difficult to control what a child eats outside the home. The child could be in school or at a friend’s house and be given something to eat

that is not allowed on the diet. In addition, if a child is unable to eat something that his or her friends are eating, it makes the child feel excluded. However, some medications need to be taken throughout the day, and this can be problematic when a child is outside of the house.

The decision whether to treat with diet modification or medication should be discussed with the child's physician (Jacobson & Schardt, 1999). It is possible to use both treatments simultaneously. If both are used concurrently, the medication would cover any lapses in the diet and, also, it is possible that the dosage of the medication may be lowered as a result of the diet.

Teaching Strategies

It has been suggested that the establishment of an environment which is both structured and supportive will help a student with ADHD succeed (*Teaching Children*, 1998). Examples of this would include encouraging peer cooperation and having the student's desk close to that of the instructor's. To further assist with the student's progress, instructions should be repeated and concise, so they are easy to understand.

In *Teaching Children* (1998), it was suggested that, by giving out assignments one at a time and allowing extra time for assignments to be completed, the frustration of a student with ADHD would be reduced. Consistency concerning rules is fundamental and, if a student is in violation, that pupil should receive the same consequences as his or her peers who do not have ADHD; this should be done in a calm and composed manner.

There are a variety of tools that a teacher can use to help students with ADHD be more successful. These include: (a) verbal prompts, (b) nonverbal prompts, (c) peer

collaboration, and (d) classroom accommodations. Each of these categories will be explored further, but it is important to note that some ideas can fall into more than one category. For the purpose of this project, each of the various techniques will be discussed according to whichever category it is best suited.

Verbal Techniques

For the purpose of this project, verbal techniques for teaching students with ADHD are intended to be verbal on the part of the instructor. They may or may not include verbal responses on the part of the students.

Rief (1993) provided advice for teaching students with ADHD. In regard to giving directions, a number of suggestions were made. First, Rief recommended that the teacher wait until the class is completely quiet and all students are paying attention before directions are given. Second, when instructions are given, the teacher should face the class, and the instructions should be given slowly and clearly, without overloading the student with too much information. Third, Rief suggested that the teacher check to make sure that the class understands what is expected of them by asking specific questions about the instructions, or have the students repeat the directions. Finally, instructions should be complete, including what is expected of the students once the task is completed. By use of these tips, teachers can improve their success in the classroom.

Similar recommendations were made by Salend, Elhoweris, and van Garderen (2003), but they expanded on them as well. They recommended that the instructor state that the students need to pay attention before something important is said. This lets students know that they need to focus on what the teacher is about to say. Also, Salend et

al. indicated that motivation is an important factor in keeping a student with ADHD interested in completion of the work and to stay focused. Teachers can improve motivation when they encourage students and involve them in the education process.

Another way to motivate students, according to Salend et al. (2003), is to add novelty to the learning experience, for example, ask pupils to complete their mathematics homework in their favorite color rather than the use of a regular pencil. The novelty helps create more enthusiasm on the part of the student, which in turn improves classroom performance. Another recommendation made by Salend et al. to aid students with ADHD is to use an interactive question and answer time to ensure that the pupils understand what has been taught. In the question and answer time, the instructor can vary questions, and who answers them, to maintain the attention of the students. For example, the teacher can call on pupils randomly, regardless of whether they have their hand raised or not. Also, the instructor can switch from questions about one subject to another, so that the students never know what they are going to be asked about next.

Taylor and Larson (1998) emphasized the necessity to reinforce that students understand what is expected of them and/or what they have learned. They suggested that pupils be asked to repeat instructions. Also, to help aid the student, they recommended that any verbal instruction be given at a cognitive level that the pupil can understand. To help with some of the self-esteem issues that many students with ADHD have, Taylor and Larson (1998) recommended that the teacher encourage pupils to recount to themselves what they can do so that they do not focus on what they cannot do. In addition, the

authors recommended the use of positive reinforcement as a way to both encourage students with ADHD and improve their self-esteem.

Also, the use of positive reinforcement was suggested by the staff of the U.S. Department of Education (2004) as a means to help ADHD students behave better in the classroom. They illustrated four objectives in regard to positive reinforcement: (a) the appropriate behavior must be mentioned while giving the praise so the student knows precisely which deed is being praised; (b) praise should be given immediately because the student will be more likely to repeat the positive behavior if he or she knows it will be recognized; (c) statements of praise should be varied because, if the same statement is used repeatedly, it may lose its value in the eyes of the student; and (d) praise should be consistent and sincere so that the student will recognize that his or her efforts are genuinely appreciated by the instructor.

Kapalka (2005) conducted research into helping students with ADHD with compliance issues. It is difficult for many pupils with ADHD to follow teachers' instructions; this can lead to more disruption in the classroom environment. In his study, Kapalka asked 86 teachers to evaluate the boys in their classrooms who had been diagnosed with ADHD. The evaluations were done with the use of the School Situations Questionnaire (SSQ; Barkley, 1981, as cited in Kapalka), in which students are rated in 12 possible school situations. For the purposes of Kapalka's study, however, a modified version of the SSQ was used; 5 of the situations were utilized. In this study, the teachers in the treatment group gave instructions in the following manner: (a) ask once, (b) repeat

once, (c) warn of the consequence, and (d) follow through with the consequence.

Kapalka argued that use of this method would improve consistency and help the teacher remain calm when dealing with an unruly student. As a result of the use of this technique, the rating on the SSQ went down, an indication of improvement in the behavior of the students being evaluated. These results showed that this technique can be a great help for teachers, and since it can be used with all students, it is easily adapted to regular use in the classroom (see Appendix C for a copy of the SSQ).

Nonverbal Techniques

For the purpose of this project, nonverbal techniques to help pupils with ADHD are intended to be nonverbal on the part of the instructor, not necessarily on the part of the student. However, some of the recommendations that follow do require verbal participation by the student.

Wang, Bernas, and Eberhard (2004) conducted a study to test the effectiveness of the use of hand gestures, and different types of hand gestures, in the teaching of students with ADHD. There were five types of hand movements: (a) deictic, used to provide directions and gain attention; (b) representational, used to imitate shapes or motion; (c) metaphoric, used to demonstrate abstract ideas; (d) emblematic, conventional gestures that are recognized by a particular society; and (e) beating, repetitive motions used to illustrate a point. The researchers examined three different scenarios: (a) use of hand gestures alone, (b) use of verbal instruction alone, and (c) the use of both hand gestures and verbal instruction. Wang et al. found that the use of hand gestures alone was more

effective in order to keep students on task, and students were more likely to complete the task than when verbal instruction was used alone. When the two were combined, the effectiveness was even greater. The researchers demonstrated that the addition of hand gestures, which requires the use of another of a student's senses, is a simple but effective way to improve a pupil's performance in the classroom.

Also, Salend et al. (2003) made recommendations for nonverbal techniques to use in the classroom to help students with ADHD. First, ensure that the students have any complex assignment in written form, either on a blackboard, an overhead projector, or by use of handouts. Second, students should keep a homework journal and be encouraged to write down any assignments so they can take responsibility for their own work. Third, the teacher can compile a weekly assignment checklist, so that students can confirm that all their work has been completed. Also, Salend et al. suggested that assignments should be individualized for students with ADHD. For example, if a long mathematics assignment is assigned, the teacher could require only the odd numbered problems so that the student with ADHD would be more likely to complete the assignment. Also, Salend et al. recommended the incorporation of movement into a lesson; this will fulfill the need of the student with ADHD to move around and expend some of his or her excess energy. Educational games that require movement are ideal for this.

In addition, the staff of the U.S. Department of Education (2004) advocated the use of movement for students with ADHD. For example, the use of computer games that reinforce classroom lessons will give students an opportunity to practice their skills with

mathematics, reading, spelling, and other subjects. Many students with ADHD have difficulty with timed tests, so the reduction or elimination of them is a crucial accommodation. If a timed test is necessary, the pupil with ADHD should be allowed extra time to complete so that they are on a more equal basis with other students in the classroom. Students can be provided with index cards of spelling words with which to study. Also, a teacher can make a checklist of the things in an assignment that present difficulties to a particular student with ADHD, so the student can then go through the checklist to see if anything needs to be corrected before he or she submits the assignment.

Barkley (2000) recommended the use of a token system to improve the behavior of students with ADHD. His suggestions on the system were various, intended to be modified for the particular student to match his or her needs or interests. For example, a token can be awarded for good behavior, or for scholastic achievement. Tokens can then be redeemed based on the interests of the student, such as time playing a game or more tangible rewards. The tokens can also be accumulated for a larger or more coveted prize.

One of the simplest techniques a teacher can utilize to ensure the good behavior of a student with ADHD is to ignore inappropriate behavior whenever possible (U.S. Department of Education, 2004). Items that cause the pupil with ADHD to be distracted can be removed. Also, the student with ADHD should be allowed a quiet manipulative, such as a squeeze ball, that can be utilized for additional sensory input when needed. Other recommended methods to encourage good behavior are to stand near a student to draw his or her attention to the instructor, and the use of hand signals to communicate

privately with the ADHD student to prevent embarrassment in front of the whole class if his or her attention wanders. Tangible rewards, like stickers, can be used to reinforce good behavior or the completion of a task. The implementation of a system, whereby students receive points for each completed assignment, is beneficial, because once the student has received a certain number of points he or she will receive a reward.

Rief (1993) suggested that a simple touch on the shoulder can refocus a student with ADHD. Other silent signals were highly recommended by Rief, including signs that the instructor and the pupil agree on together so that the student can receive instructions to redirect his or her attention. Also, the teacher can use these signals to help prevent problems when he or she notices that the student with ADHD becomes overstimulated or upset. One way to help pupils with ADHD to use some of their excess energy is to allow stretch breaks in between lessons. Similarly, students should practice calming exercises after they have been away from the classroom (i.e., after lunch or recess).

Peer Collaboration

The staff of the U.S. Department of Education (2004) made a number of recommendations that involve peer collaboration. The student with ADHD can be paired with another student to take turns reading to one another. Playing board games with other students to enhance learning is effective as well. Students can be paired to quiz each other in preparation for an upcoming examination. Also, a pupil with ADHD can be assigned a homework partner, who will help the ADHD student record homework assignments correctly and keep his or her things organized.

Use of peers to help students with ADHD was recommended by DuPaul and Henningson (1993) as well. They suggested that peer instruction is a more effective method of instruction than the more traditional lecturing, and it makes more efficient use of the teacher's time. Often, students with ADHD receive more benefit from one-on-one or small group interaction, and the teacher can provide this by use of a readily available resource, other students. Peer tutoring has been shown to have a positive impact on students with ADHD: they are able to stay on task longer, and their academic performance improves as well. One of the reasons theorized by DuPaul and Henningson for this improvement is that, when students with ADHD work with their peers, they receive immediate positive feedback which is important for their continued success. An added benefit is that, when students with ADHD work with their peers, it helps them to improve their social skills, which are often deficient.

A related study was done using ClassWide Peer Tutoring (CWPT) with a group of students to test its effects on a broader scale (DuPaul, Hook, Ervin, & Kyle, 1995, as cited in DuPaul & Eckert, 1998). This technique incorporates full classroom involvement in peer tutoring. DuPaul et al. found that the active engagement of a student with ADHD nearly quadrupled when CWPT was implemented in comparison with traditional classroom instruction led by the teacher. The academic performance of the students with ADHD improved as well. Even students without ADHD showed improvement in their behavior and academics as a result of the CWPT, which shows that this technique has multifaceted benefits.

Another type of peer collaboration is peer mediated reading instruction (PMI; Locke & Fuchs, 1993; as cited in DuPaul & Eckert, 1998). This strategy involves a pair of students: one reads for a short time while the other follows along and makes corrections when needed, and then the two pupils switch roles. The researchers found that, in addition to an increase in on task behavior and higher academic scores in reading, also, the students with ADHD exhibited an improvement in their social interactions.

In a study conducted by Burcham, Carlson, and Milich (1993, as cited in Ostoits, 1999), the findings were similar to those of Locke and Fuchs (1993, as cited in DuPaul & Eckert, 1998) and, also, Burcham et al. observed that, when peer collaboration is used, the student with ADHD will become a more successful reader. In addition, they found that, when structured feedback was given every 15 minutes, there was a decrease in undesirable behaviors.

DuPaul and Eckert (1998) reported that there are numerous benefits to the use of peer collaboration in the classroom. Students benefit in their attentiveness, their academics, and quite often in their social interactions, regardless of whether or not the pupil has ADHD. This means that peer collaboration is an excellent alternative to traditional teacher led instruction. However, DuPaul and Eckert noted that teacher led instruction is still necessary, and that further study is required to determine the long term effects of peer collaboration to determine whether the positive results continue over a period of time.

Classroom Accommodations

There are numerous strategies that a teacher can implement to help maintain order in the classroom, which can only benefit students with ADHD (Rief, 1993). It is of utmost importance to keep structure in the classroom, so it is essential to maintain the same routine, both with the class schedule and with discipline. A very useful tool for instructors is to allow a student time out or time away from a situation that has escalated. Since pupils with ADHD can become overstimulated easily, when the teacher gives those students time away to settle themselves down, problems will be avoided.

Other strategies can be used to help students with ADHD remain focused and on task in the classroom (Rief, 1993). For example, an overhead projector can be used. An overhead projector is effective because it allows the instructor to write information for students without the need to turn his or her back to the class. In addition, students can be given the opportunity to write on the transparencies as a reward for good behavior. Also, the use of colored pens or markers will help draw focus to the lesson. Another technique to focus a student's attention is the use of a flashlight. With the classroom lights turned off, the flashlight will draw the attention of a student with ADHD.

Other accommodations that Rief (1993) recommended were to seat a student with ADHD close to the teacher and to clear the student's desk of distractions. Being prepared for lessons will help reduce down time in the middle of a class, which can result in a pupil's distraction. Also, lessons should be prepared to incorporate the use of multiple senses of the students; this helps them to retain the information and to maintain their

attention. Another recommendation of Rief's was to teach relaxation techniques to students with ADHD. By doing this, the teacher can then signal to a pupil that he or she needs to practice the relaxation techniques to help prevent problems when he or she becomes overstimulated. In addition, a useful tool for some students would be to establish a contract for the student's behavior. This would include rewards for good behavior and, likewise, repercussions for inappropriate behavior.

Several of the above recommendations have been made by the staff of the U.S. Department of Education (2004). In addition, they suggested that a student with ADHD be seated close to a student role model. In this way, the pupil with ADHD can attempt to model the other student's behavior. A work area designed to be free of distractions is beneficial as well. A student with ADHD can use this area for quiet study or to take tests. However, it should be noted that discretion must be used when a pupil with ADHD is directed to this area in order to ensure that the student does not feel that he or she is being punished.

According to the staff of the U.S. Department of Education (2004), another recommended idea is to provide an ADHD student with a pointer, such as a bookmark. With use of this tool, pupils can help themselves to follow along visually in a book. Also, it is important that the desk and chair are the right size for the student with ADHD; if they are the wrong size, the student will be more likely to fidget and squirm because he or she will not be as comfortable as possible.

Reid (1999) made further recommendations about management of the classroom. The class schedule should be posted prominently, and adherence to the schedule will help to maintain order and provide stability for students with ADHD. Additionally, he suggested that more challenging material should be completed earlier in the day when it is easier for most pupils with ADHD to concentrate. Also, a preferred activity or subject should be scheduled after one that is less enjoyable for the ADHD student. In this manner, participation in the favored activity can be contingent upon completion of the less pleasurable task.

A simple and unobtrusive way to help the student with ADHD to stay on task is to have a reminder card taped to the student's desk (Reid, 1999). The card can have simple prompts, to redirect the student back to the task. Also, students with ADHD can be helped to stay on task by minimization of certain distractions; the instructor can organize a particular time for certain interruptions, such as making use of the pencil sharpener or the drinking fountain, for the entire class, as this will help students with ADHD because their attention is more likely to be on the immediate task rather than watch someone who gets up for a few moments.

For the student with ADHD who needs more movement, a stand up desk is a potential solution to prevent fidgeting (Reid, 1999). This is a desk that has the legs adjusted so that it is the correct height when the student stands. The student with ADHD can stand at this desk to work when he or she feels the need for more movement. The stand up desk is recommended primarily for work on independent tasks. In addition,

study carrels are a great asset in the classroom. The student with ADHD can use these whenever it is more difficult for him or her to remain on task with independent work, or during a test when it is more important that the student remain focused. It is important to note, however, that if study carrels are used for disciplinary purposes, then the ADHD student will likely resist the idea of using them as a tool and view them as a punishment instead.

Chapter Summary

After examining the research available on ADHD, it is apparent that this is a multifaceted disorder. It has a history going back more than 100 years, and it has been the subject of a great deal of research. While its cause is not yet known with complete certainty, there are viable theories being tested to find the roots of the disorder. Many factors have shown to have an effect on ADHD. Gender primarily affects rate of diagnosis as well as when and how symptoms occur. Culture and ethnicity play a part in the diagnosis rate of ADHD and, also, in how the disorder is treated. Likewise, the socioeconomic status of the child with ADHD can have an effect on treatment. Comorbidity can often exacerbate symptoms of the disorder. If the child is gifted in addition to having ADHD, there are even greater challenges both for the child and for the teacher trying to instruct him or her. Lastly, the child's diet can have an effect on how severe his or her ADHD symptoms are.

There are numerous teaching strategies that can be of use for students with ADHD. When the verbal strategies, nonverbal techniques, peer collaboration, and

classroom accommodations are used in conjunction with one another, a learning environment is created that is best suited to meet the needs of the student with ADHD. In Chapter 3, the method to be used in this project will be presented.

Chapter 3

METHODS

The purpose of this project was to explore the methods that can be used by teachers to help students with Attention Deficit Hyperactivity Disorder (ADHD) succeed in the classroom. In this chapter, the population, the goals, the procedures, and assessments will be outlined.

As explained in Chapter 2, ADHD is a disorder characterized by hyperactivity and/or inattentiveness that is not appropriate for the child's age (Scott, 1987). In the classroom environment, ADHD poses many challenges, both to the student who has the disorder and to the instructor who tries to teach him or her (Rief, 1993; U.S. Department of Education, 2004).

There are numerous strategies a teacher can use to help keep these students on task (DuPaul & Eckert, 1998; DuPaul & Henningson, 1993; Kapalka, 2005; Reid, 1999; Rief, 1993; Salend et al., 2003; Taylor & Larson, 1998; U.S. Department of Education, 2004; Wang et al., 2004). These strategies can be categorized as: (a) verbal techniques, (b) nonverbal techniques, (c) peer collaboration, and (d) classroom accommodations. When these strategies are used in conjunction with one another, and individualized as needed to the particular needs of each pupil with ADHD, the student will experience improvements in both academic performance and in attentiveness.

Targeted Audience

The intended audience for this project was teachers of students aged 9-11.

Goals of the Applied Project

The goal for this project was to provide an array of teaching strategies that will prove beneficial to students with ADHD. This will allow the students to be more successful, both academically and socially, within the school setting. It was this author's opinion that, with the establishment of an environment that is both caring and structured, a student with ADHD can succeed to the best of his or her ability. It was anticipated that, if a classroom is established appropriately, students with ADHD will remain more focused and be less distracted by whatever may happen around them.

The first part of this overall goal was to improve the compliance of the student with ADHD. The instructor needs to have clear and concise guidelines for what is appropriate and inappropriate behavior. When the teacher is consistent, the student will be more aware of the expectations and goals in regard to behavior within the classroom, and, also, what the consequences will be if those expectations are not met.

The second goal was to assist the student with ADHD academically. To achieve this, it is important to use concise instructions. When the teacher's directions are simple and clear, and the student is required to repeat them, the student is more likely to understand and complete an assignment. Also, collaboration with one's peers is necessary to achieve the academic goal, because it provides the ADHD student the opportunity to learn in a different and more enjoyable manner. This can encourage the

student to take responsibility to complete his or her portion of the project. In turn, the ADHD student can be more focused and determined to complete the task.

Also, peer collaboration was essential to the third facet involved in helping students with ADHD reach their full potential: social acceptance. This offers the student with ADHD the opportunity to converse with his or her peers for ideas or suggestions; in this manner, there is an opportunity for the social skills of the ADHD student to improve.

The final goal was related to the student's self-esteem. When the ADHD student is enveloped in an environment that is safe, structured, and nurtures self-growth, that student will fully realize his or her own potential, thereby, the self-worth of the student will be enhanced.

Procedures

The procedure that was implemented for this project involved the use of a unit that consisted of 10 lesson plans to teach science. The lesson plans, while being individualized for each separate lesson, included some areas of consistency. Primarily, these will be focused on classroom accommodations to familiarize a student with ADHD with the expectations for the class. Areas that remained constant throughout the unit will include the desk location for a student with ADHD, and classroom expectations about appropriate and inappropriate behavior, such as raising one's hand rather than calling out.

During the course of each lesson, a variety of alternative methods to improve the student's understanding of the subject matter was implemented. These will include the use of an overhead projector, handouts, and notes that the students will be required to

make in their journals. By the use of a variety of different teaching methods, an ADHD student's understanding of, and expectations for, the lesson will be greatly increased. To reinforce this, the use of peer collaboration will be extremely beneficial, because it requires pupils with ADHD to take responsibility for their portion of a project if they work in groups. Also, ADHD students have the opportunity to receive comments and suggestions made by their peers.

By adapting lesson plans in this way, and teaching each lesson in a different manner from the last, the likelihood that a student with ADHD remained focused was increased. Another aspect that was of particular importance throughout the unit was the continued use of positive reinforcement for work and tasks that were completed successfully. This should be encouraged among peers as it helped to build self-esteem for students with ADHD.

Peer Assessment

Once the unit was completed, the lesson plans were reviewed by peers of the author. The peer reviewers consisted of five teachers who work with students aged 9-11 on a daily basis. These teachers reviewed the unit and provided informal feedback in regard to any suggestions, additions, or deletions.

Chapter Summary

A variety of teaching strategies can be implemented to assist students with ADHD. These methods should be effective regardless of the gender, race, or socioeconomic status of the student or of the teacher. The overall objective was to utilize

these strategies to enable the pupil with ADHD to achieve his or her greatest potential. A unit, which incorporates some of these strategies and how to implement them, was developed to demonstrate how these accommodations can be integrated into general use in the classroom.

In Chapter 4, the unit of 10 science lesson plans will be presented. Subsequently, Chapter 5 will contain an evaluation of the plausibility of the unit, the merits and the limitations of the lesson plans, the assessments from the peer reviewers, as well as recommendations and suggestions for further research.

Chapter 4

RESULTS

In this chapter, the author has created a unit of 10 lesson plans for teaching science. This unit is on the solar system, and is intended for students in 5th grade. These lesson plans have been developed towards use for students with ADHD. Each lesson plan lists adaptations and/or accommodations that can be made to help the student with ADHD to succeed in the classroom. The strategies that will be used will fall under the categories of (a) verbal techniques, (b) nonverbal techniques, (c) peer collaboration, and (d) classroom accommodations. Since it is not always appropriate to use strategies from each of the four categories, each lesson plan will only list techniques that are more appropriate for the lesson being taught.

In addition, the lessons all follow the Colorado State Standards, which are listed on each lesson plan. Each lesson plan also consists of any materials needed, guidelines for teaching the lesson, and any handouts created by the author. Additionally, each lesson plan will have an evaluation by the author including any recommendations for future improvement of the lesson. The textbook that is referenced is Harcourt Science (2000).

UNIT PLAN

Unit Title:

Solar System

Content Area:

The relationships between the sun, Earth, and moon, their position within the solar system, and how they affect one another. Also, the exploration of space and how we have learned to live in space.

Grade:

5th grade

Duration:

40 minutes for each lesson, total of 10 lessons

Materials:

Textbook, Harcourt Science
Workbook, Assessment Guide, Harcourt Science
Handouts
Paper
Pencils
Basketballs
Baseballs or softballs
Golf balls
Ball that is half black and half red
Overhead projector
Ball
Model space station
Cups, enough for entire class plus two for teacher demo
Frozen moon water (dirt and water frozen)
Filters, half cheesecloth, half denim
Hair Dryer
Balloon
Prepared cards with questions on one side and numbers on the other side
Sheets with team names - Space Monkeys, Space Cadets, and Teletubbies
3 envelopes with letters needed to spell the phrase "science rocks"

Anticipatory Set:

Keep students informed as to what they will be learning as the unit progresses.

Pre-Assessment:

Ascertain subject knowledge previously acquired by the students regarding the solar system.

Teaching lessons:

The teacher should endeavor to make the lessons as interesting as possible, using hands-on techniques and have the students involved to prevent distraction and boredom.

Guided Practice:

Demonstrate to the students what they will need to do, and remain available and approachable during the quiet work time.

Post-Assessment:

Open discussion, review subject material and check for understanding so that future lessons can be modified if there was difficulty with any particular lesson.

Closure:

Review over each lesson, check for understanding.

Independent Practice:

Students will be given homework, students will also do research to acquire further subject knowledge.

Accommodations:

A variety of strategies can be used to assist students with learning disabilities, particularly ADHD. These may be verbal techniques, nonverbal strategies, peer collaboration, and classroom accommodations. The strategies that fall into the first three categories will be listed with each lesson plan. The techniques that fall into the category of classroom accommodations will be listed here, and apply to the entire unit:

- 1) The student will be seated in close proximity to a student or students who are either gifted or who generally understand concepts of a lesson fairly quickly.
- 2) The student will be seated near the front of the class to minimize distractions from other students.
- 3) The pupil will be allowed to use the computer for further research when time allows.
- 4) If a student with ADHD has particular difficulty with taking notes, a selection of 4-5 students will be assigned at random each lesson to be a scribe and write down an extra copy of notes.
- 5) Silent signals will need to be worked out with the student with ADHD to help bring the student back into focus if their mind should wander.

Accommodations (continued):

- 6) An overhead projector will be used to provide visual stimulation while allowing the teacher to remain facing towards the class.
- 7) Study carrels will be placed in the classroom if the student with ADHD needs a place with fewer distractions, particularly during quiet work time.

Colorado State Standards:

Science Standards

Science Standard 1 – Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations

- Identifying and evaluating alternative explanations and procedures
- Using examples to demonstrate that scientific ideas are used to explain previous observations and to predict future events
- Asking questions and stating hypotheses that lead to different types of scientific investigations
- Creating a written plan for an investigation
- Using appropriate tools, technologies, and measurement units to gather and organize data
- Interpreting and evaluating data in order to formulate conclusions
- Communicating results of their investigations in appropriate ways
- Using metric units in measuring, calculating, and reporting results
- Explaining that scientific investigations sometimes result in unexpected findings that lead to new questions and more investigations
- Giving examples of how collaboration can be useful in solving scientific problems and sharing findings

Science Standard 4.1 – Students know and understand the composition of Earth, its history, and the natural processes that shape it

- Modeling natural processes that shape Earth’s surface
- Explaining the distribution and causes of natural events

Science Standard 4.2 – Students know and understand the general characteristics of the atmosphere and fundamental processes of weather

- Explaining how atmospheric circulation is driven by solar heating

Science Standard 4.3 – Students know major sources of water, its uses, importance, and cyclic patterns of movement through the environment

- Investigating and comparing the properties and behavior of water in its solid, liquid, and gaseous states
- Describing the distribution and circulation of the world’s water through oceans, glaciers, rivers, groundwater, and atmosphere

Science Standard 4.4 – Students know the structure of the solar system, composition and interactions of objects in the universe, and how space is explored

- Describing the basic components, composition, size, and theories of origin of the solar system
- Explaining the effects of relative motion and positions of the Sun, Earth and Moon
- Comparing Earth to other planets
- Identifying technology needed to explore space

Science Standard 5 – Students know and understand interrelationships among science, technology, and human activity and how they can affect the world

- Investigating and describing the extent of human uses of renewable and non-renewable resources
- Describing how the use of technology can help solve an individual or community problem

Science Standard 6 – Students understand that science involves a particular way of knowing and understand common connections among scientific disciplines

- Explaining why a controlled experiment must have comparable results when repeated
- Giving examples of how scientific knowledge changes as new knowledge is acquired and previous ideas are modified
- Describing contributions to the advancement of science made by people in different cultures and at different times in history
- Identifying, comparing, and predicting variables and conditions related to change
- Identifying and illustrating natural cycles within systems

Reading and Writing Standards

Reading and Writing Standard 1 – Students read and understand a variety of materials

- Use comprehension skills such as previewing, predicting, inferring, comparing and contrasting, re-reading and self-monitoring, summarizing, identifying the author's purpose, determining the main idea, and applying knowledge of foreshadowing, metaphor, simile, symbolism, and other figures of speech
- Make connections between their reading and what they already know, and identifying what they need to know about a topic before reading about it
- Adjust reading strategies for different purposes such as reading carefully, idea by idea; skimming and scanning; fitting materials into an organizational pattern, such as reading a novel chronologically; finding information to support particular ideas; and finding the sequence of steps in a technical publication

Reading and Writing Standard 1 continued

- Use information from their reading to increase vocabulary and enhance language usage
- Using a full range of strategies to comprehend technical writing, newspapers, magazines, poetry, short stories, plays, and novels in addition to the types of reading material mentioned above. Students extend their thinking and understanding as they read stories about people from similar and different backgrounds

Reading and Writing Standard 2 – Students write and speak for a variety of purposes and audiences

- Writing stories, letters, and reports with greater detail and supporting material
- Choosing vocabulary and figures of speech that communicate clearly
- Drafting, revising, editing, and proofreading for a legible final copy
- Applying skills in analysis, synthesis, evaluation, and explanation to their writing and speaking
- Writing and speaking in the content areas
- Recognizing stylistic elements such as voice, tone, and style

Reading and Writing Standard 3 – Students write and speak using conventional grammar, usage, sentence structure, punctuation, capitalization, and spelling

- Using simple, compound, complex, and compound/complex sentences in writing and speaking
- Punctuating and capitalizing titles and direct quotations using possessives and correct paragraphing in writing
- Expanding spelling skills to include more complex words

Reading and Writing Standard 4 – Students apply thinking skills to their reading, writing, speaking, listening, and viewing

- Using reading, writing, speaking, listening, and viewing skills to solve problems and answer questions
- Making predictions, drawing conclusions, and analyzing what they read, hear, and view
- Recognizing, expressing, and defending a point of view orally in an articulate manner and in writing

Reading and Writing Standard 5 – Students read to locate, select, and make use of relevant information from a variety of media, reference, and technological sources

- Locating and selecting relevant information
- Using available technology to research and produce an end-product that is accurately documented

Mathematics Standards

Mathematics Standard 2 – Students use algebraic methods to explore, model, and describe patterns and functions involving numbers, shapes, data, and graphs in problem-solving situations and communicate the reasoning used in solving these problems

- Represent, describe, and analyze patterns and relationships using tables, graphs, verbal rules, and standard algebraic notation

Mathematics Standard 3 – Students use data collection and analysis, statistics, and probability in problem-solving situations and communicate the reasoning used in solving these problems

- Read and construct displays of data using appropriate techniques and appropriate technology

Mathematics Standard 4 – Students use geometric concepts, properties, and relationships in problem-solving situations and communicate the reasoning used in solving these problems

- Construct two- and three-dimensional models using a variety of materials and tools
- Transform geometric figures using reflections, translations, and rotations to explore congruence

Mathematics Standard 5 – Students use a variety of tools and techniques to measure, apply the results in problem-solving situations, and communicate the reasoning used in solving these problems

- Estimate, use, and describe measures of distance, perimeter, area, volume, capacity, weight, mass, and angle comparison
- Select and use appropriate units and tools to measure to the degree of accuracy required in a particular problem-solving situation

Visual Arts Standards

Visual Arts Standard 2 – Students know and apply elements of art, principles of design, and sensory and expressive features of visual arts

- Using elements of art, principles of design, and styles of art to communicate ideas and experiences

Visual Arts Standard 3 – Students know and apply visual arts materials, tools, techniques, and processes

- Selecting and using materials, tools, techniques, and processes that enhance communication of ideas through art

Visual Arts Standard 5 – Students analyze and evaluate the characteristics, merits, and meaning of works of art

- Identifying and discussing reasons for creating works of art

Geography Standards

Geography Standard 3.1 – Students know the physical processes that shape Earth’s surface patterns

- Explaining how Earth-Sun relationships produce day and night, time zones, seasons, and major climactic variations

Geography Standard 5.3 – Students know the changes that occur in the meaning, use, location, distribution, and importance of resources

- Describing the role of resources in daily life
- Identifying how technology affects the definition of, access to, and use of resources
- Explaining the fundamental role of energy resources

Sun, Earth, and Moon

Subject Area: Science

Grade Level: 5th grade

Unit Title: Solar System

Duration: 40 min

Lesson #: 1

Learner Outcomes/Benchmarks/Objectives:

- By the end of this lesson, students will be able to identify the interrelationship of the sun, Earth, and moon. They will also be able to explain how long it takes for the moon to orbit the Earth and for the Earth to orbit the sun. Students will learn and be able to identify key vocabulary words: orbit, rotate, revolve, axis, eclipse, ellipse.

Colorado State Standards:

Science Standards

- Science Standard 1
- Science Standard 4.4
- Science Standard 6

Reading and Writing Standards

- Reading and Writing Standard 1
- Reading and Writing Standard 4

Mathematics Standards

- Mathematics Standard 4
- Mathematics Standard 2

Transition:

- Students will be moving outdoors after the exercise is explained, students need to have their needed materials ready to go so there is a minimum of distraction

Materials Needed:

- basketballs
- baseballs or softballs
- golfballs - note, the number of balls will depend on the number of students in the class, the class will be divided into groups of four, each group will need one of each type of ball
- textbook pages D4-D5
- workbook pages WB174-175
- paper
- pencils

Anticipatory Set:

- Inform students we will be doing a lesson in how the Earth moves around the sun and how the moon moves around the Earth. They will understand that the Earth revolves around the sun and that it takes 365 days or one year for it to orbit the sun. They will understand that the moon revolves around the Earth, and that it takes about 28 days or one month for the moon to orbit Earth. This means that the moon orbits the Earth approximately 12 times per year. Students will also learn that the Earth rotates as it revolves, which gives us night and day, but the moon does not rotate, it always has the same face towards the Earth.

Pre-Assessment:

- Ask students what they know about how the Earth and moon move:
 - How does the Earth move?
 - What does orbit mean?
 - How long does it take the Earth to orbit the sun?
 - How long does it take the moon to orbit the Earth?
 - Why do we only see one side of the moon?

Teaching the Lesson:

- Write the vocabulary words on the board and have students write them down in their notebooks.
- Using the overhead projector, draw a diagram of the sun-Earth-moon system, including the orbits of the Earth and the moon, and have the students copy it into their notebooks.
- Tell the students that the Earth rotates on its axis once per day. It takes the Earth 365 days to rotate once around the sun. The moon stays fixed on its axis, but rotates around the Earth approximately once per month. Then ask the students how many times the Earth rotates on its axis in a year, and also the number of times the moon orbits the Earth in a year.
- To represent the size of the sun, the Earth, and the moon, various sized balls will be used. The sun will be represented by a basketball, the Earth by either a baseball or softball, and the moon will be a golf ball.
- With the aid of three students demonstrate the activity. One person holds the basketball over their head, and that person remains stationary. The second person holds the baseball over their head, and that person will be moving around the “sun,” but at the same time spinning around to demonstrate the Earth spinning on its axis. The third person holds the golf ball over their head to represent the moon, and that person will be moving around the “Earth,” always keeping his or her face to the “Earth.”

Guided Practice/Instructional Strategies

- The experiment will then be moved out to the playground. The class will be divided into groups of four, each group will have a sun, an Earth, a moon, and a note taker. If there are four-square boards on the playground, these are very helpful for the demonstration. The sun stands in the middle of the four-square board. The earth starts at one corner of the grid, with the moon by its side. The Earth begins to move along one side of the grid, spinning around as it moves. The moon will move around the Earth, always keeping its face towards the Earth. When the Earth and the moon get to the next corner, this represents three months, or one season. The note taker makes notes to show where the Earth and moon are in relation to the sun, both at the start and after three months. The note taker can use the four-square grid in the notes to make it easier. If there is no four-square grid on the playground, the Earth will simply move in a circle around the sun. The teacher will circulate among the groups to ensure that everyone is doing the experiment correctly, and to answer any questions that may arise.

Post-Assessment

- Open discussion with the class about the activity including problems and concerns
- Have students share findings with their peers.

Closure

- Review concepts of the lesson: how the Earth moves around the sun and how the moon moves around the Earth.
- Ask students what they learned.

Independent Practice:

- Have students look up vocabulary words – revolve, orbit, rotate, axis, eclipse, ellipse.
- Workbook pages WB174-175 for homework.

Accommodations

The overhead projector used at the start of the lesson provides visual stimulation of the subject matter for the student with ADHD. Additionally, when the teacher asks questions to verify student comprehension, the pupil's understanding of the lesson is heightened, because the student is required to be more focused. The lesson is further reinforced by the use of a demonstration in the classroom, and by having the pupils take part in the experiment and discuss the findings of the experiment with their peers. To increase the students' comprehension of the subject matter, they are grouped into pairs to work on finding definitions for the vocabulary words. The added advantage of this is that if a student has difficulty remaining focused, then his or her peer could act as a scribe to ensure that the notes are taken down correctly. The student with ADHD should also be provided with index cards for the vocabulary words to help him or her study them.

Moon Phases

Subject Area: Science

Grade Level: 5th grade

Unit Title: Solar System

Duration: 40 min

Lesson #: 2

Learner Outcomes/Benchmarks/Objectives:

- The students will understand the phases of the moon and the cycle of the phases: new moon, waxing crescent, quarter moon, waxing gibbous, full moon, waning gibbous, quarter moon, waning crescent, new moon.

Colorado State Standards:

Science Standards

- Science Standard 1
- Science Standard 4.1
- Science Standard 4.4
- Science Standard 6

Reading and Writing Standards

- Reading and Writing Standard 1
- Reading and Writing Standard 2

Mathematics Standards

- Mathematics Standard 2

Transition:

- Students will take out their science books and pencils.

Materials Needed:

- Copies of moon phases sheet for students to fill out
- Ball that is half black and half red
- Textbook page D6-D7
- Workbook page WB177
- Overhead projector
- Acetate with 8 circles, all blank

Anticipatory Set:

- Tell the students that we will be learning about the phases of the moon and why the moon looks different at different times of the month. The light we see from the moon actually comes from the sun, it is reflected off the moon. Depending on where in space the moon is in relation to the sun and the Earth will dictate what phase the lunar cycle is in.

Pre-Assessment:

- Ask the students:
 - What phases of the moon do you know?
 - Where does the light from the moon come from?

Teaching the Lesson:

- Explain that the light from the moon is actually light from the sun that is reflected off the moon like a mirror.
- Explain that how much of the moon we see depends on where the moon is in relation to the sun and the Earth.
- This results in the phases of the moon.
- Place the acetate on the overhead projector and hand out copies of WB177 to the students. Go over each of the phases, color/shade in part of each circle as appropriate to represent each phase, and write the name of the phase to correspond with it. The blank circle will represent the full moon, the totally colored circle will represent the new moon.

Guided Practice/Instructional Strategies

- Use the black and red ball, hold it up, red side to the class, and explain that the red side represents the part of the moon that is lit up by the sun.
- When the red side is completely to the class, this is a full moon.
- Rotate the ball to show the gibbous moon, the quarter moon, and the crescent moon.

Post-Assessment

- Ask the students if they have any questions about the cycles of the moon.
- Ask the students to list the various phases of the moon.
- On the board, draw 8 circles, have some of the students go up and shade in a phase that they have identified.

Closure

- Recommend to the students that they pay attention to the moon over the next month or so to see the phases of the moon in action.

Independent Practice:

- Workbook page WB177 with the aid of the textbook pages D6-D7
- Vocabulary words – revolve, orbit, rotate, axis
- Have the students chart the phases of the moon over the next month, including the date.

Accommodations

The overhead projector provides much-needed visual stimulation, and when the student copies down what he or she sees, the concept of the phases of the moon is reinforced. When questions are asked of the students to check for comprehension, their understanding of the lesson will be enhanced. The student with ADHD can be allowed to hold the ball and rotate it so he or she can visualize how the phases of the moon change over time. In addition, the pupil with ADHD should be one of the students to go up to the board at the end of the lesson to shade in one of the moon phases. If time allows, the student with ADHD should be allowed on the computer to do further research on his or her own. Additionally, the teacher can provide index cards for the student with ADHD so he or she can draw each moon phase on a separate card with its name for independent study.

Eclipses

Subject Area: Science

Grade Level: 5th grade

Unit Title: Solar System

Duration: 40 min

Lesson #: 3

Learner Outcomes/Benchmarks/Objectives:

- Students will understand how solar and lunar eclipses occur. They will also understand the positioning of the sun, Earth and moon in both a lunar eclipse and a solar eclipse.

Colorado State Standards:

Science Standards

- Science Standard 4.1
- Science Standard 4.4
- Science Standard 6

Transition:

- All students will need to be seated where they can see the front of the classroom.

Materials Needed:

- Overhead projector
- Flashlight
- Ball

Anticipatory Set:

- An eclipse happens when one object passes through the shadow of another. A lunar eclipse is more common, and happens when the moon passes through the shadow of the Earth. A solar eclipse occurs when the Earth passes through the shadow of the moon.

Pre-Assessment:

- Ask students what they know about eclipses:
 - How does a solar eclipse occur?
 - How does a lunar eclipse occur?

Teaching the Lesson:

- Explain that eclipses occur when the light from the sun is blocked.
- With a lunar eclipse, the Earth comes between the sun and the moon. This blocks the sun's light from reaching the moon and, therefore, it cannot be reflected back to Earth. This can look as though the moon is disappearing.
- With a solar eclipse, the moon comes between the sun and the Earth, blocking the sun's rays from reaching the Earth. Because the sun is so much larger than the moon, you can always see a part of the sun during a solar eclipse. This can be dangerous to look at, however, so it is not recommended that you look up during a solar eclipse.

Guided Practice/Instructional Strategies

- Eclipses can be demonstrated with the help of the overhead projector.
- Draw a circle on the board to represent the moon and turn on projector so the light shines on the circle.
- Use a ball to represent the Earth and block the light that is shining on the circle, this creates a lunar eclipse.
- Same can be done to demonstrate a solar eclipse, the circle on the board would be the Earth and the ball would be the moon.
- Write the definitions for a solar and lunar eclipse on the board for the students to copy down into their notebooks.

Post-Assessment

- Ask students questions about the lesson to ensure that they understand how eclipses happen.

Closure

- Tell students the date of the next solar or lunar eclipse so they can keep an eye out for it if they want to.
- Have the students give the definitions of a lunar and solar eclipse.

Accommodations:

The overhead projector provides visual stimulation for the student with ADHD. Having the definitions on the board will help the student correctly enter the information into his or her notebook. If a student has a problem with handwriting, a scribe can be assigned. The instructor should make a point of telling the students to pay attention at the beginning of the lesson, as solar and lunar eclipses can be confused with one another. The student with ADHD should be allowed the opportunity to do the demonstration independently to reinforce the concept if needed.

Space Station Overview

Subject Area: Science

Grade Level: 5th grade

Unit Title: Solar System

Duration: 40 min

Lesson #: 4

Learner Outcomes/Benchmarks/Objectives:

- Students will understand what is expected of the space station model they will need to make. They will need to design and build a model space station which will be presented to the class at a later date, and they will need to incorporate what they have learned and what they will learn throughout the course of the unit in regards to space exploration and surviving in space.

Colorado State Standards:

Science Standards

- Science Standard 1
- Science Standard 4.3
- Science Standard 4.4
- Science Standard 5
- Science Standard 6

Reading and Writing Standards

- Reading and Writing Standard 2
- Reading and Writing Standard 3
- Reading and Writing Standard 4
- Reading and Writing Standard 5

Visual Arts Standards

- Visual Arts Standard 2
- Visual Arts Standard 3
- Visual Arts Standard 5

Transition:

- Students will need to see the teacher when the model space station is being presented.

Materials Needed:

- Papers reviewed from the sun-Earth-moon lesson
- Model space station
- List of questions for the students to answer in making their own space stations

Anticipatory Set:

- Review questions from the sun-Earth-moon lesson paying particular attention to how the Earth orbits around the sun and how the moon orbits around the Earth. The Earth takes 365 days or one year to orbit the sun, and the moon takes 28 days or one month to orbit the Earth. During the course of 1 year, the moon will orbit the Earth about 12 times. The Earth rotates on its axis, one full rotation per day, which gives us night and day.

Pre-Assessment:

- Ask the students if they had any questions about the relationships between the sun, Earth, and moon.
- Give brief review on the movements of the Earth and the moon around the sun and the Earth, respectively.
- Questions to ask students:
 - What keeps one object in orbit around another?
 - Can you think of any objects currently in space that orbit the Earth?

Teaching the Lesson:

- Present the space station model and how it supports life, so the students can have an idea of what will be expected of their presentations later in the space unit. Explain how it keeps its position by orbiting Earth. Describe the purposes of various equipment, for example solar panels to generate energy, the greenhouse for growing food, etc.
- Explain to the students that they will each have to build their own model space station and present it to the class, as well as write an essay about their space station. They will have to answer questions in relation to the space station. These questions will be given to them in a handout for their reference and are as follows:
 - What will be your source of energy on the space station?
 - How will you maintain food and water?
 - How long will you be on the space station?
 - Where will you sleep?
 - What type of work will you do?
 - How many people will be on the space station?
 - What will keep the space station from floating off into space?
 - What will you do when you are not working?

Guided Practice/Instructional Strategies

- Review the space station questions and some sample answers. Ask the students to give other ideas for possible answers. Talk to the students about being as creative as possible, both in their presentation and in the design of the space station. Explain to the students that they can do further research outside of class work and incorporate it into their project, as well as information they have learned in class.

Post-Assessment

- Ask students if they have any questions.
- Have students explain what keeps the space station in space and to list other objects that are currently orbiting the Earth.

Closure

- Give students the schedule of when portions of the space station project will be due and the questions they will need to answer.
- Interactive question and answer.
- Make note of any absent students to ensure they receive the schedule and the questions when they return to class.

Independent Practice:

- Students will review vocabulary from the sun-Earth-moon lesson.
- Students will begin work on space station project, beginning with answering three of the above questions to be due at the beginning of lesson 6.

Accommodations

The teacher should provide sample answers of the space station questionnaire to students with ADHD to help them complete their essays. The teacher's space station model should remain in the classroom for students to review as needed. The interactive question and answer session with the students will help to reinforce what they learned. Students should be called upon randomly to help maintain their focus on the lesson.

Space Station Project Schedule

Lesson 6 - Submit proposal for essay, include answers to three of these questions:

- What will be your source of energy on the space station?
- How will you maintain food and water?
- How long will you be on the space station?
- Where will you sleep?
- What type of work will you do?
- How many people will be on the space station?
- What will you do when you are not working?
- What will keep the space station from floating off into space?
- Do you have any other ideas?

You can do research on the Internet or from books to help give you ideas.

Lesson 9 - Essay due to include answers to all of the above questions.

Lesson 12 - Presentation of the space station models begins.

Sample answers to the questions

What type of work will you do?

When I am on the space station, I will be exploring space. I will use powerful telescopes to study other stars and to try to find planets around those stars. I hope that by studying them I might be able to find a planet that we can create a colony on.

How will you maintain food and water?

The majority of food aboard my space station will be dried food, this will require water being added before it can be eaten. I will also have a large supply of bottled water. My space station will also be fitted with a greenhouse. This will allow me to grow my own food.

How will my space station be powered?

Solar panels will be used to power my space station. The way this will work will be by the panels attracting energy directly from the sun. This energy can then be stored and used as necessary aboard the space station.

Space Exploration Part 1

Subject Area: Science

Grade Level: 5th grade

Unit Title: Solar System

Duration: 40 min

Lesson #: 5

Learner Outcomes/Benchmarks/Objectives:

- Students will understand the history of space exploration from simple observation to modern day space travel. Students will also understand the vocabulary words: telescope, satellite, space probe.

Colorado State Standards:

Science Standards

- Science Standard 4.4
- Science Standard 5
- Science Standard 6

Reading and Writing Standards

- Reading and Writing Standard 1
- Reading and Writing Standard 2
- Reading and Writing Standard 3
- Reading and Writing Standard 4
- Reading and Writing Standard 5

Transition:

- Students will get out their science textbooks and pencils.

Materials Needed:

- Time Line of Space Exploration handout
- Textbook, pages D14-D17
- Workbook page WB181

Anticipatory Set:

- Discuss with students the history of space exploration over time, beginning with the Mayans in 900 a.d., who built a number of observatories in Central America to view the stars and the planets. The next major development was in 1609, Galileo built the first telescope, which had two pieces of glass, one at each end of a long tube. This was followed by Sir Isaac Newton, who in 1668 developed his own telescope with two mirrors and one lens, which gave him more clarity in his observations. Further developments were a long time in coming, it was in 1936 that any major accomplishments came about, with the first radio telescope being built, which allowed objects in space to be monitored. Technology progressed, and 1957 saw the launch of the Sputnik satellite; Sputnik means traveling companion in Russian. This satellite circled the globe every 95 minutes. The USA joined in the fascination with space, and in 1961 the Mercury program sent the first Americans into space.

Pre-Assessment:

- Ask students what they know about the history of space exploration:
 - Who were the first people known to observe the stars and planets?
 - What instruments can be used to observe space?
 - Who developed the first telescope?
 - Can you think of any objects in space that relay information to us on Earth?

Teaching the Lesson:

- Review the timeline of space exploration using the overhead projector. Have the timeline copied onto a piece of acetate, cover up the sheet with regular paper, and reveal one section at a time to discuss with the students.
 - Where would the Mayans have built their observatories?
 - How did the invention of the telescope change space exploration?
- Ρεπινεω θυεστιονσ ον παγε Δ15 οφ τεξτβουκ:
 - In what way was Newton's telescope different from Galileo's telescope?
 - What is being pulled out of the ocean on page D15? (A space capsule with astronaut inside)
 - What is Neil Armstrong doing in the photograph? (Saluting)
 - Why do you think the observatory built by the Mayas is on a mound?

Guided Practice/Instructional Strategies

- Have students work in pairs and begin completing the workbook page with the aid of their textbook if needed.

Post-Assessment

- Ask students if they have any questions and review over the first half of the timeline for space exploration.

Closure

- Discuss with students why there was such a big gap in space exploration between 1668 and 1936.

Independent Practice:

- Students will look up vocabulary words: telescope, satellite, space probe.
- Have students think of what the prefix tele- means.
- Students will complete workbook page WB181.

Accommodations:

By having the students work in pairs, the student with ADHD will get help from his or her peers. The students can also quiz one another and act as tutors for one another while they are working. The use of the overhead projector will help to visually stimulate the students. The student with ADHD will also be provided with a completed copy of the timeline to use as a reference in addition to the textbook. Index cards will be given to the student with ADHD for the vocabulary words to help with his or her independent study. To help prevent fidgeting, the student with ADHD should be allowed to use a squeeze ball to expend excess energy.

Timeline of Space Exploration

900 – the Mayans in Central America built several observatories to view the stars and the planets.

1609 – Galileo built the first telescope to observe the sun, moon, and planets, his telescope had two curved pieces of glass, one at each end of a long tube.

1668 – Sir Isaac Newton developed his own telescope, it differed from Galileo's by having two mirrors and one lens. This allowed him to view objects more clearly than Galileo's original telescope.

1936 – First radio telescope built, allowed objects in space to be monitored or detected.

1957 – Launch of Sputnik Satellite (Sputnik means traveling companion in Russian), the satellite circled the globe every 95 minutes.

1961 – The Mercury program sent the first Americans into space.

1969 – The United States landed the first person on the moon.

1976 – Two Viking spacecrafts landed on Mars, took photographs and sent information back about the planet's soil and atmosphere.

1977 – Voyager I and Voyager II launched, they have sent back photos of Jupiter, Saturn, Uranus, Neptune, and are going beyond the solar system.

1981 – Launch of the space shuttle.

1990 – Launch of the Hubble space telescope.

Space Exploration Part 2

Subject Area: Science

Grade Level: 5th grade

Unit Title: Solar System

Duration: 40 min

Lesson #: 6

Learner Outcomes/Benchmarks/Objectives:

- Students will complete the second half of the timeline on space exploration.

Colorado State Standards:

Science Standards

- Science Standard 4.4
- Science Standard 5
- Science Standard 6

Reading and Writing Standards

- Reading and Writing Standard 1
- Reading and Writing Standard 2
- Reading and Writing Standard 3
- Reading and Writing Standard 4
- Reading and Writing Standard 5

Transition:

- Students will get out their science textbooks and pencils.

Materials Needed:

- Textbook pages D16-D19
- Workbook page WB182

Anticipatory Set:

- Review homework.
- Get homework feedback from students and discuss.
- Explain that we will be finishing the lesson on space exploration. In 1969 the United States landed the first people on the moon, Neil Armstrong and Buzz Aldrin. Space travel continued, and in 1976, two Viking spacecrafts landed on Mars, took photos, and sent the information back on the atmosphere and soil. In order to learn more about other planets in our solar system, Voyager I and Voyager II were launched 1977; they have sent back photos of Jupiter, Saturn, Uranus and Neptune, and they are continuing on beyond the solar system. 1981 saw the launch of the first Space Shuttle, which has the advantage of being reusable rather than being destroyed on each mission, making space exploration more cost effective. In order to further view space, in 1990 the Hubble Space Telescope was launched, which allowed more detailed images of the planets and stars.

Pre-Assessment:

- Ask students what they remember from the previous lesson:
 - How did the Mayans study the stars?
 - How did Newton's telescope differ from Galileo's?
- Ask students about modern space exploration:
 - Who was the first person to walk on the moon?
 - How is space explored today?

Teaching the Lesson:

- Review reading from pages D16-D17.
- Continue with the timeline on the overhead projector, again revealing one item at a time and discuss with students.

Guided Practice/Instructional Strategies

- Discuss what kind of information space probes collect.
- Discuss the space shuttle and its shape, i.e. its advantages and why it is shaped the way it is.
- If time allows, review page D18, "Space Exploration in the Future."

Post-Assessment

- Ask the students if they have any questions about space exploration.
- Check for understanding in regards to the timeline by asking questions for the students to answer.

Closure

- Ask the students how they would feel about exploring space.
- Ask the students how they think space exploration might change in the future.

Independent Practice:

- Students should work in pairs to review space vocabulary if needed.
- Students will complete workbook page WB182 for homework.

Accommodations

Individual instruction will be given for those students who are struggling. By having the students work in pairs, the student with ADHD will get help from his or her peers and, again, the students can tutor one another on the content of the timeline. The use of the overhead projector will help to visually stimulate the students. The ADHD student should be given encouragement to keep him or her on task, and a tangible reward should be provided for success, such as a sticker. The same can be provided for all students to avoid the perception of favoritism. If time allows, the student with ADHD should also be allowed on the computer to see if he or she can find any other information on the history of space exploration. The student can make use of a squeeze ball or other silent manipulative if he or she feels the need to fidget.

Moon Water Part 1

Subject Area: Science

Grade Level: 5th grade

Unit Title: Solar System

Duration: 40 min

Lesson #: 7

Learner Outcomes/Benchmarks/Objectives:

- Students will watch frozen moon water be transformed into drinking water.
- Students will understand the purpose of a filter, which is to purify something such as water or air to make it safe for humans to use.

Colorado State Standards:

Science Standards

- Science Standard 1
- Science Standard 4.3
- Science Standard 5
- Science Standard 6

Reading and Writing Standards

- Reading and Writing Standard 2
- Reading and Writing Standard 3
- Reading and Writing Standard 4

Mathematics Standards

- Mathematics Standard 2
- Mathematics Standard 3

Geography Standards

- Geography Standard 5.3

Transition:

- Students will need to be positioned so that all of them can see the experiment to be done at the front of the class.

Materials Needed:

- Cups, 2, for the demonstration
- Frozen moon water (dirt and water frozen)
- Filters – one of cheesecloth, one of denim
- Hair dryer
- Moon Water worksheet

Anticipatory Set:

- Explain to students that the experiment to be done today will be demonstrated by the teacher only, but that they need to pay attention because they will be doing the experiment themselves the following lesson.

Pre-Assessment:

- Explain the purpose of a filter and explain that they can come in many forms and have many purposes, one of them is to clean water, which will be demonstrated today. Air can also be purified with filters to remove carbon dioxide or dust.

Teaching the Lesson:

- Demonstrate the experiment:
 - Place cheesecloth over one cup and attach with tape, place denim over the other cup and attach with tape.
 - Place some frozen moon water on top of each filter.
 - Use the hair dryer to help the frozen moon water thaw faster.
 - Show the results of the water and discuss how well the filters worked.

Guided Practice/Instructional Strategies:

- Have students record steps taken in the experiment and note the results.
- Have students draw conclusions from the experiment.

Post-Assessment:

- Ask students if they have any questions.
- Discuss the difference in the appearance of the water and how effective the filters were.
- Ask students why ice was used rather than water for the experiment.

Closure:

- Remind students that they will be doing this experiment during the next lesson.
- Give the students the worksheet with the questions and advise them that they will need to have them for the next lesson.

Independent Practice:

- Advise the students to finish working on the Moon Water sheet, it will be due at the end of the next lesson.

Accommodations:

If a student is having difficulties, he or she should ask for help. The instructor can ask for volunteers to help with such things as taping the filters to the cups or holding the hair dryer, and select the student with ADHD as one of the volunteers to actively involve them in the lesson. By telling the students to pay attention, the students are more likely to focus their attention successfully. The student with ADHD can also be provided with a written copy of the instructions to review so he or she is prepared for the next lesson.

Name: _____

Moon Water

What was the equipment you used for this experiment on moon water?

Describe the steps of the experiment, in other words, what was the first thing you did, the second thing, and so on.

Can you drink your water? Why or why not?

What do you think you could do to make your water cleaner?

page 1 - keep going, one more page to go!

What was the filter you used in your experiment?

In your opinion, did your filter do a good job? Why or why not?

Think of items around your house that use filters.

What do you think the purpose of a filter is?

How would a filter help on a space station?

page 2 - now you're all done!

Moon Water part 2

Subject Area: Science

Grade Level: 5th grade

Unit Title: Solar System

Duration: 40 min

Lesson #: 8

Learner Outcomes/Benchmarks/Objectives:

- Students will attempt to transform frozen moon water into drinking water.
- Students will understand the purpose of a filter, which is to purify something such as water or air.

Colorado State Standards:

Science Standards

- Science Standard 1
- Science Standard 4.3
- Science Standard 5
- Science Standard 6

Reading and Writing Standards

- Reading and Writing Standard 2
- Reading and Writing Standard 3
- Reading and Writing Standard 4

Mathematics Standards

- Mathematics Standard 2
- Mathematics Standard 3

Geography Standards

- Geography Standard 5.3

Transition:

- Students will need to clear the tops of their desks to have room to conduct the experiment.

Materials Needed:

- Cups, 1 for each student
- Filters, half the class will use denim and half the class will use cheesecloth
- Frozen moon water, enough for the entire class
- Students will need their Moon Water worksheet they received at the previous lesson
- Pencils

Anticipatory Set:

- Remind the students of the experiment they watched during the previous lesson and remind them that they will be doing their own experiment today. Students will be working in pairs and each pair will use one cheesecloth filter and one denim filter.
- Students will be required to record the steps taken and the results with the help of the Moon Water worksheet they received at the previous lesson.

Pre-Assessment:

- Ask the students if they remember the purpose of a filter.
 - Why would it be important to have a filter on a space station?

Teaching the Lesson:

- Remind the students of the steps of the experiment and distribute the materials they need, each pair will need two cups, one cheesecloth filter and one denim filter. Each group will also need the frozen moon water and tape or elastic to hold the filters in place.

Guided Practice/Instructional Strategies

- Supervise the students as they conduct the experiment and facilitate as needed.
- Students should finish answering questions on the worksheet as they work on the experiment.

Post-Assessment

- Ask students if they have any questions.
- Discuss any difficulties the students had conducting the experiment.
- Review the use of filters and their uses in both everyday life and in a space station.

Closure

- Discuss how people's lives would be different if there were no filters.

Accommodations:

Since this is an experiment where the students work in pairs, the students can help one another out as needed. If further assistance is required, then the student will raise his or her hand to get help from the teacher. If the student with ADHD has difficulty with focusing on writing down answers, the partner can be a scribe for him or her while the student does more work with the actual experiment. As the teacher circulates through the classroom to check on student progress, the teacher can use hand gestures in addition to verbal instruction to help remind students of the next step of the experiment.

Rockets and Space Flight

Subject Area: Science

Grade Level: 5th grade

Unit Title: Solar System

Duration: 40 min

Lesson #: 9

Learner Outcomes/Benchmarks/Objectives:

- Students will understand how a rocket works and how they have affected space travel. Rockets have been necessary to propel objects, such as satellites and manned spacecraft out of the Earth's atmosphere.

Colorado State Standards:

Science Standards

- Science Standard 4.4
- Science Standard 5
- Science Standard 6

Reading and Writing Standards

- Reading and Writing Standard 2
- Reading and Writing Standard 4
- Reading and Writing Standard 5

Transition:

- Students will need to take out their science textbooks.

Materials Needed:

- Textbook, pages D20-D23
- Solar system word search
- Solar system crossword
- Balloon

Anticipatory Set:

- Have students read the title of the article beginning on page D20 of textbook (The History of Rockets and Spaceflight) and make predictions about what they will learn from the lesson.
- What is a rocket? It is essentially a tube with an opening at one end. When there is a gas inside the tube that builds up pressure, the gas leaves through the opening, and the rocket is propelled in the opposite direction.

Pre-Assessment:

- Record students' predictions about the lesson on the board so they will see later in the lesson if they were right.

Teaching the Lesson:

- Do a basic demonstration of how a rocket works. Blow up a balloon, then release it without tying the opening. The students will watch the balloon fly around the room and see how the gas escaping from the balloon is propelling it forward.
- Have the students read the entire article in the textbook, pages D20-D21. The students should take turns reading aloud, one paragraph at a time.

Guided Practice/Instructional Strategies

- Ask the chapter concepts questions on page D21 of teacher's textbook, have students use the pictures in the book to help them answer the questions if needed:
 - How are rockets used to place a space shuttle in orbit around Earth?
 - Why do you suppose it was important to the United States to be the first country to land a person on the moon?
 - Why do you think many countries have joined together to produce the International Space Station?

Post-Assessment

- Ask random students questions about rockets and space travel, if there seems to be any confusion, review the concepts again briefly.

Closure

- Tell students to think about how space travel would be changed if rockets had never been invented.
- Ask students what rockets were originally used for.

Independent Practice:

- Hand out space unit word search and crossword for the students to complete and tell them that if they do not understand any of the terms to look them up in the textbook.

Accommodations:

The teacher will provide assistance as and when needed to students who may be having difficulty. The question and answer session will help to focus the attention of the students as well as reinforce the content of the lesson. The student with ADHD will be allowed to find only half the words on the word search, and will be able to do either all the across or all the down on the crossword puzzle. This will enable that student to focus better on the assignment. The student can make use of a squeeze ball or other silent manipulative if he or she feels the need to fidget. Additionally, half way through the lesson the students can all be allowed a brief stretch break to work out excess energy.

Name: _____

Date: _____

SOLAR SYSTEM WORD SEARCH

S	Q	W	E	R	T	H	T	R	A	E	Y	U	I	O	P	A	S	D	F
G	O	H	T	J	S	K	L	Z	X	C	E	T	I	L	L	E	T	A	S
V	B	L	U	N	M	U	S	P	A	D	N	S	F	Y	R	W	E	S	D
B	N	W	A	A	F	J	N	D	W	O	C	U	H	G	F	S	L	A	N
L	U	V	N	R	W	C	U	A	E	Y	X	V	S	J	K	F	E	Q	E
A	F	H	O	G	S	B	D	L	R	R	Z	B	N	M	L	H	S	W	P
S	S	I	R	O	D	Y	I	A	D	U	A	Q	S	D	G	K	C	E	T
T	M	M	T	M	N	L	S	P	A	C	E	S	T	A	T	I	O	N	U
O	O	D	S	F	A	J	L	T	O	R	W	W	M	Y	Z	A	P	R	N
F	O	X	A	G	S	W	D	G	E	E	O	H	S	E	A	B	E	T	E
F	N	S	F	T	H	J	K	Y	S	M	W	I	H	X	C	T	I	Y	H
S	C	I	E	N	C	E	R	O	C	K	S	!	K	P	D	F	O	U	A
S	S	P	A	C	E	I	S	C	O	O	L	E	C	L	Z	C	P	X	V
R	G	Z	X	S	Q	C	H	I	G	R	U	F	A	O	N	S	I	H	I
H	O	W	D	Y	W	S	F	H	U	B	O	T	U	R	P	S	W	M	N
R	T	C	V	B	U	R	I	W	G	I	A	R	Q	A	S	C	Q	K	G
J	H	U	K	N	G	L	C	G	K	T	E	F	V	T	V	R	G	O	F
S	S	P	E	E	K	Y	E	S	P	I	L	C	E	I	F	R	A	P	U
S	H	V	E	E	T	V	G	H	U	T	E	D	G	O	U	J	M	M	N
F	J	U	P	I	T	E	R	Q	D	R	U	D	O	N	E	Y	E	T	?

WORDS TO SEARCH FOR:

ASTRONAUT

MARS

SATELLITE

AXIS

MERCURY

SOLAR SYSTEM

EARTH

MOON

SPACE STATION

ECLIPSE

NEPTUNE

SUN

EXPLORATION

ORBIT

TELESCOPE

GALILEO

ROCKET

URANUS

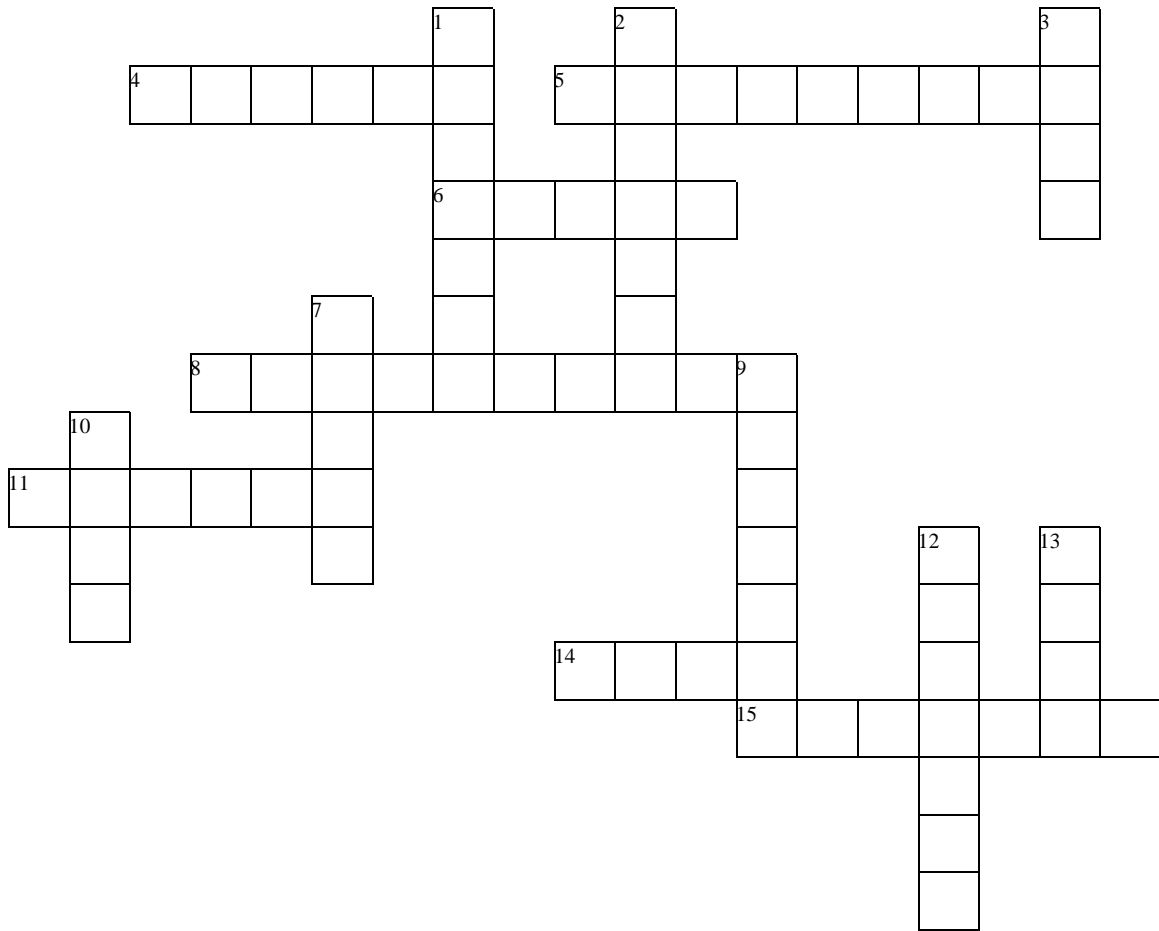
JUPITER

VENUS

Please note, words will be forward, backward, up, down, and diagonal.

Date: _____

Name: _____



ACROSS

- 4 The spinning of Earth on its axis
- 5 A natural body or an artificial object that orbits another object
- 6 The path one body in space takes as it revolves around another body
- 8 A robot vehicle used to explore deep space
- 11 A tube, filled with something explosive, that is not sealed at one end
- 14 An imaginary line that passes through Earth's center and the North and South Poles
- 15 The passing of one object through the shadow of another

DOWN

- 1 To travel in a closed path around an object, as the Earth does around the sun
- 2 This is the first person believed to have invented the telescope
- 3 The prefix that means distant or far
- 7 The planet we call home, also the third planet from the sun
- 9 A circle that has been pulled a bit at both ends
- 10 The Earth's only natural satellite
- 12 The largest planet in our solar system
- 13 The fourth planet from the sun, also known as the red planet

“Classroom Feud” – Solar System Review

Subject Area: Science

Grade Level: 5th grade

Unit Title: Solar System

Duration: 40 min.

Lesson #: 10

Learner Outcomes/Benchmarks/Objectives:

- Students will understand what they are expected to know for the upcoming solar system test.

Colorado State Standards:

Science Standards

- Science Standard 4.4
- Science Standard 6

Reading and Writing Standards

- Reading and Writing Standard 2
- Reading and Writing Standard 3
- Reading and Writing Standard 4
- Reading and Writing Standard 5

Transition:

- Students will need to be split up into three groups based on where they are sitting.

Materials Needed:

- Prepared cards with test questions on one side and numbered on the other side
- Sheets with team names – Space Monkeys, Space Cadets, and Teletubbies
- 3 envelopes with the letters needed to spell the phrase “science rocks”
- Review sheet for the students

Anticipatory Set:

- Tell the students that today’s lesson will be a review of the solar system unit in preparation for their upcoming test.
- Place the cards with the questions on the solar system on the blackboard with the numbers facing the class and the questions facing the board. Each card will have a separate number.
- Attach the sheets with the team names on the board to keep score.

Pre-Assessment:

- Ask the students if they have any questions before the review begins.

Teaching the Lesson:

- Divide the class into three groups based on where they are sitting so there is a minimum of disruption.
- Name the groups: Space Monkeys, Space Cadets, and Teletubbies.
- Explain the rules – each student will have the opportunity to pick a number, and then answer a question based on that number, if they get the question wrong, the other two teams will be given the opportunity to answer the question. If this happens, the students in each team will be allowed to collaborate with one another.

Guided Practice/Instructional Strategies

- Play Classroom Feud, if a question is not answered correctly by any of the teams, briefly review the content of the question.
- When Classroom Feud is finished, each team can earn additional points by identifying the phrase in the envelopes they will be provided.

Post-Assessment

- Ask the students if they have any questions.
- Hand out the review sheet for them to study at home before the test.

Closure

- Remind students to study and inform them of the date of the test.

Accommodations:

For any student with ADHD who has a hard time processing verbal instructions or questions, he or she can read the question off the card (with the answer covered up). By each group being allowed to collaborate with its own members, the student with ADHD is more involved, and it enhances the potential for the student to acquire the knowledge. If the ADHD student seems to be getting overstimulated, the teacher can silently cue him or her to do relaxation exercises to help maintain self-control.

SOLAR SYSTEM - STUDY GUIDE

Vocabulary:

Axis - an imaginary line that passes through Earth's center and its North and South poles

Eclipse - the passing of one object through the shadow of another

Ellipse - a circle that has been pulled a little at both ends 

Orbit - the path one body in space takes as it revolves around another body, such as that of Earth as it revolves around the sun

Revolve - to travel in a closed path around an object such as Earth does as it moves around the sun

Rotate - the spinning of Earth on its axis

Satellite - a natural body, like the moon, or an artificial object that orbits another object

Space probe - a robot vehicle used to explore deep space

Telescope - an instrument that magnifies distant objects or makes them appear larger

Other facts to know:

The Earth takes 365 days or one year to orbit the sun.

The moon takes 1 month to orbit the Earth.

The Earth rotates on its axis once per day.

The moon rotates on its axis once per month.

The gravity of the sun keeps the Earth in orbit.
The gravity of the Earth keeps the moon in orbit.

The Earth's mass is larger than the moon's mass, so the Earth has a greater gravitational pull. This means that an object will weigh more on Earth than it does on the moon.

The phases of the moon are: new moon, waxing crescent, first quarter, waxing gibbous, full moon, waning gibbous, last quarter, and waning crescent.

During the new moon phase, a person on Earth cannot see the moon because the sun is shining on the far side of the moon.

During the full moon, the moon looks like a complete circle in the sky.

The moon does not have its own light - it is really light from the sun that reflects off the moon like a mirror.

The two basic types of eclipses are the solar eclipse and the lunar eclipse

The first telescope is believed to have been invented by Galileo.

Observatories are used to study the solar system and space.

The moon is Earth's only natural satellite.

The first artificial satellite to be launched into space was the Sputnik.

The first person to walk on the moon was Neil Armstrong.

Neil Armstrong's space suit cost 10 million dollars.

The Russian word for astronaut is cosmonaut.

The Apollo space flights gave scientists firsthand knowledge of the moon.

The "race to space" was between USA and the USSR (or Soviet Union).

Rockets were originally used as weapons of war.

What would people living on the moon need to survive? - food, water, oxygen, energy, clothing, shelter with heat and air conditioning.

Astronauts use a special drinking bag inside their helmets to drink water.

Filters are used to purify or clean water or air.

The largest planet in the solar system is Jupiter, it is the 5th planet from the sun.

The planet called "the red planet" is Mars, it is the 4th planet from the sun.

The space shuttle is shaped like a plane so that it can land like an airplane on a runway.

Chapter Summary

It can be difficult to create lesson plans that meet the needs of each student. However, when there is a student in the class with ADHD, the challenge is that much greater. It is hoped that by implementing the suggestions made in this chapter will help to alleviate some of the stress a teacher can experience when teaching a student with ADHD.

In Chapter 5, this thematic unit will be discussed and evaluated, including suggestions from peers who teach students age 9-11 on a daily basis. Additionally, some ideas for future research will be discussed as well.

Chapter 5

DISCUSSION

The purpose of this project was to develop a series of lesson plans that could be used to assist teachers to be more successful in meeting the needs of students with ADHD. The manner in which this was to be achieved was by incorporating a variety of different teaching strategies into each lesson. These ranged from: (a) verbal instruction, (b) nonverbal instruction, (c) peer collaboration and (d) classroom accommodations. It is believed that, by having an array of strategies implemented into each lesson, the student with ADHD would feel more engaged in the class, and have a greater opportunity to remain focused and acquire the concepts of the lesson being taught.

ADHD affects 3-5% of all children (*Appropriate Education*, 1992). This is a disorder characterized by inattentiveness, impulsiveness, and hyperactivity that is not appropriate based on the child's age (Scott, 1987). Because of the nature of this disorder, students with ADHD are often disruptive in a classroom situation, which can be frustrating both for the teacher and for their fellow students. It is imperative, therefore, to have techniques ready to help these students remain focused in the classroom environment.

The results of the unit will be presented in this chapter, including a discussion on the merits and the limitations of the lesson plans. Additionally, suggestions will be made for further research on students with ADHD in the classroom.

Overview of Findings

This author conducted an applied research project by reviewing a quantity of the research available that discussed ADHD and its effect on students. After compiling the data, a unit of 10 lesson plans was created, with the goal of being able to help students with ADHD in the classroom to be more successful through the use of a variety of teaching strategies. Once these lesson plans were completed, 9 copies were distributed to peers, and 6 were returned with comments. The peers included one elementary principal and teachers of various grades from 2nd to 5th.

An applied research design was appropriate for this project, as the needs of students with ADHD are frequently overlooked within the classroom. Generally, more traditional methods of instruction appear to be favored by the teacher. This focuses primarily on the needs of the majority of the class, compared to those of the student with ADHD.

The strategies that were used for this project fell into the categories of (a) verbal techniques, (b) non-verbal techniques, (c) peer collaboration, and (d) classroom management. When these strategies are used together, the student with ADHD will excel more in the classroom.

Limitations of the Study

There was a general consensus that the overall lesson plans were good, and that by having a variety of different strategies, the likelihood for success in meeting the needs of the student with ADHD were greatly increased. However, some observations were noted concerning areas that needed additional consideration.

First, several of the reviewers made note of the frequent use of the overhead projector. While it does provide visual stimulation for the students, overuse of it makes it routine and, therefore, boring. Additionally, it was noted that the noise the overhead projector makes can create a distraction, thereby reducing its benefits.

Second, one of the reviewers made a comment about the use of a peer taking notes and/or writing information down for the student with ADHD. This reviewer stated that this is a responsibility of the teacher, and should not be placed on a fellow student.

Third, a limitation of this project was the inability to test it over an extended period of time to truly judge its effectiveness. If students with ADHD could be observed prior to the start of the project to determine how often they are remaining on task and to observe their academic achievement, then there would be qualitative data to show the effectiveness of the strategies implemented.

Merits of the Study

The fact that a variety of different strategies were used is of great benefit to a student with ADHD. The use of more than one technique increases the chance of a student's success because of the different ways in which students can learn. Additionally, by using multiple strategies, the classes are less likely to become mundane, and more likely to maintain the focus of a student with ADHD.

When the lesson plans were distributed, they were given to instructors of a variety of grades, as the behaviors exhibited by a student with ADHD would be consistent in 2nd through 5th grade, even though the material being taught may be different. Also, by

utilizing a wider population, the possibility for validation concerning the project's effectiveness was increased.

The general consensus from the reviewers was positive. Overall, they commented on how thorough the lesson plans were. Some of their comments included: "You have some great ideas," "A very fine job and a lot of work," and "I'm extremely impressed."

Additional Comments and Suggestions

There were a number of ideas presented by the reviewers of additional accommodations that could also be implemented. It should be noted that, while one technique may work well for one teacher and/or student, it may not be as effective for another classroom situation.

One of the recommendations made was in regard to the seating arrangements. In the unit plan it was noted to have the student with ADHD seated in the front, close by the instructor. It was noted by the reviewers that it would also be beneficial to have the student seated at one end of the row. This way, they only have neighbors on one side and behind them, thereby limiting the distraction caused by fellow students. Also, it was suggested that if there are particular students in the class who are more distracting to the student with ADHD, those other students should be placed at the opposite end of the classroom.

The use of games was recommended by more than one of the reviewers. This would benefit the students because they would be more likely to remain on task. Also, they would be learning without having to work at it, and it would enhance retention of the lesson's concepts.

One reviewer in particular had several suggestions for additional accommodations. The daily routine should be discussed verbally and outlined on the board so the student knows what will be happening and at what time. Instructions should be simplified and given in small doses so as not to overwhelm the student.

Positive reinforcement should be used often to maintain good behavior, this can be done with the use of a reward system, and the teacher can also send home notes to the parents when the student has had improvements in learning or behavior. One of the rewards a student with ADHD can earn with good behavior is a “no-work” time, which will give them a break from concentrating.

A timer can be used to help the student with ADHD improve his or her ability to focus in the classroom. The student with ADHD can also be given opportunities to get out of the classroom on errands, like taking a note to another teacher, to allow them a few minutes of movement, which can result in a reduction of fidgeting once the student returns. Headphones can be used to block out distractions. A checklist can be provided to help the student with organization. Lastly, the student with ADHD should always be prepared for any changes in routine, such as an assembly, to minimize the residual effects of the distraction.

Recommendations for Future Research

Quite a bit of research has been conducted on ADHD, but there are still aspects of the disorder that need further study, particularly in regard to students with ADHD in the classroom. After reviewing the suggestions and limitations of this project, the researcher noted a particular environment that would ideally be suited for additional research.

This would be to have a study conducted in a setting that is predominantly comprised of students with ADHD. The students would initially be monitored in regard to their behavior and academic success prior to the teaching strategies being implemented. Additionally, the study should be conducted over an extended period of time.

Following these protocols would offer the researcher a more detailed finding as to the validity of the study. The greater number of students with ADHD being involved in the study will confirm that the strategies are effective with a larger population. Having the students observed prior to the study's inception would give a more detailed evaluation as to its success upon completion. Also, the time involved would test the strengths of the techniques over an extended period of time and confirm if their continual use results in continuing benefits.

Chapter Summary

Throughout the course of this project, a great deal of information has been gathered regarding ADHD. This researcher has demonstrated that ADHD can be affected by many variables, and that there are a variety of methods of treating the disorder. Because of the multi-faceted nature of ADHD, its effects will differ from one person to another.

An instructor must take this into consideration when teaching a class that has one or more students with ADHD. Strategies must be implemented so that the ADHD student is productive in class and is not disruptive to the remainder of the students. However, this must be done in such a way that the student with ADHD does not feel singled out or

embarrassed about the disorder. When working with students who have ADHD, it is very easy for the teacher to get frustrated and concentrate on the needs of the majority, and not those solely of the ADHD student.

The purpose of this project was, therefore, to offer teachers a variety of accommodations that they could utilize, which would assist in the successful planning and instruction of the lesson. By incorporating the use of verbal and nonverbal strategies, together with peer collaboration and classroom management techniques, the student with ADHD will be more stimulated and the potential for success is increased. The lesson plans worked extremely well for this purpose, as it allowed the teacher to focus beforehand on what could potentially be problematic for the ADHD student.

By implementing the strategies discussed in this research project, the student with ADHD can have more success in the classroom, and that success will only have a positive influence on the other aspects of his or her life.

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APPENDIX A

The Story of Fidgety Philip

The Story of Fidgety Philip

“Let me see if Philip can
Be a little gentleman;
Let me see if he is able
To sit still for once at table.”
Thus spoke, in earnest tone,
The father to his son;
And the mother looked very grave
To see Philip so misbehave.

But Philip he did not mind
His father who was so kind.
He wriggled and giggled
And then, I declare,
Swung backward and forward
And tilted his chair,
Just like any rocking horse;
“Philip! I am getting cross!”

See the naughty, restless child,
Growing still more rude and wild,
Till his chair falls over quite.
Philip screams with all his might,
Catches at the cloth, but then
That makes matters worse again.
Down upon the ground they fall,
Glasses, bread, knives forks and all.

How Mamma did fret and frown,
When she saw them tumbling down!
And Papa made such a face!
Philip is in sad disgrace.
Where is Philip? Where is he?
Fairly cover'd up, you see!
Cloth and all are lying on him;
He has pull'd down all upon him!

What a terrible to-do!
Dishes, glasses, snapt in two!
Here a knife and there a fork!
Philip, this is naughty work.
Table all so bare, and ah!
Poor Papa and poor Mamma
Look quite cross, and wonder how
They shall make their dinner now.

APPENDIX B

ADHD Timeline

Timeline of Attention Deficit Hyperactivity Disorder

1845 - Dr. Heinrich Hoffman of Germany publishes “The Story of Fidgety Philip” in which a child is described with hyperactivity and lack of impulse control (Strock, 2003).

1902 - Dr. George F. Still of England gave a series of lectures at the Royal College of Physicians where he described some children as having symptoms that correlate to ADHD. He called it a defect in moral control, but he also indicated that this was the result of something biological rather than resulting from poor parenting or other outside influences (De Armas, 2001).

1917-1918 - An encephalitis outbreak occurred, and many children displayed symptoms that Dr Still had described. This led many physicians to theorize that the symptoms resulted from brain damage. This was later changed to minimal brain damage when it was discovered that these children were just as bright as other children, and then it was changed to minimal brain dysfunction in an attempt to more accurately describe the condition (De Armas, 2001).

1937 - Amphetamines were discovered to be helpful for those with impulsive and/or hyperactive disorders. In particular, Benzedrine, originally used in inhaler form for asthma, was the first medication to be used as a psychiatric treatment for children (Breggin, 2001).

1957 - Ritalin, a type of stimulant, was approved by the FDA for use in treatment of children with hyperactivity and impulsivity (Breggin, 2001).

1960 - Researcher Stella Chess reclassified the condition as Hyperactive Child Syndrome, and stated that the disorder had a biological cause (Focusonadhd.com, n.d.).

1970s - Dr. Virginia Douglas of Canada conducted research into cognitive impulsivity, including daydreaming and lack of focus. Her results indicated that the disorder was composed not only of motor and verbal impulses, but cognitive as well. This gave a great deal of insight into the condition (Martin, n.d.).

1980 - The terms Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD) were assigned to the disorder. ADD was to identify those children with inattentiveness only, and ADHD incorporated those with hyperactivity and those with inattentiveness and hyperactivity combined (FocusonADHD.com, n.d.).

1987 - Attention Deficit Disorder was recategorized as being a subdivision of ADHD; this created three subdivisions of ADHD: (a) inattentive type, (b) hyperactive type, and (c) inattentive and hyperactive combined (FocusonADHD.com, n.d.).

2001 - A 10 year study is completed in which Magnetic Resonance Imaging (MRI) scans of children with ADHD and children without the disorder were studied to determine if there is a biological cause for ADHD. The study found that children with ADHD had, on the average, 3-4% smaller brains, reinforcing the theory that ADHD is a biological disorder (Bellandi, 2002).

2002 - Strattera, which is not a stimulant, is approved by the FDA for treatment of ADHD (Strattera.com, n.d.).

APPENDIX C

School Situations Questionnaire

School Situations Questionnaire
(Barkley, 1987)

Child's name _____ Date _____

Completed by _____ Subject _____

Does this child present any behavior problems for you in any of these situations? If so, indicate how severe the problems are.

<u>Situation</u>	<u>Yes / No</u>		<u>Mild</u>							<u>Severe</u>	
	Yes	No	1	2	3	4	5	6	7	8	9
While arriving at school											
During individual desk work											
During small group activities											
During free-play time in class											
During lectures to the class											
During recess											
During lunch											
While in the hallways											
While in the bathroom											
During field trips											
During special assemblies											
While on the bus											

Any special problems not addressed above?