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The Use of Horticulture Therapy Techniques with Four Comprehensive Development Classroom Students in Four High School Horticulture Classes

Jamie Lynn Mundy
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a thesis written by Jamie Lynn Mundy entitled "The Use of Horticulture Therapy Techniques with Four Comprehensive Development Classroom Students in Four High School Horticulture Classes." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agriculture and Extension Education.

Carrie Ann Fritz, Major Professor

We have read this thesis and recommend its acceptance:

Random G. Waters, Dennis E. Deyton

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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The Use of Horticulture Therapy Techniques with Four Comprehensive Development Classroom Students in Four High School Horticulture Classes

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Jamie Lynn Mundy
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DEDICATION

This thesis is dedicated to the love of my life, Billy Ball, for all of his love, support, and encouragement. It is a good thing we aren't married yet because divorce would have probably crossed his mind sometime during the past two years. Thank you, Billy, for always sticking by me even when I took my frustrations and stressful assignments out on you. This thesis is also dedicated to Billy's parents, Bill and Jackie, and to other family members and friends who also lent a helping hand throughout my graduate studies. Thank you all for believing in me and encouraging me to never give up. It truly has been a rough ride and the most challenging task I have ever embarked on.

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I wish to extend a special thanks to the teachers, staff, and students of the school in East Tennessee where my study was conducted. The completion of this study would not have been possible without all of you.

The completion of this thesis and my Master's Degree has definitely been one of the most challenging tasks I have ever attempted to accomplish but also one of the most rewarding. I have learned so much more about teaching and also about myself. Thank you all for your support. It will never be forgotten.

ABSTRACT

The purpose of this study was to explore people-plant interactions and discover the affects of using horticulture therapy techniques with four comprehensive development classroom (CDC) students in four high school horticulture classes. The central research question addressed during the study was, "How do horticulture therapy techniques affect cognitive abilities, emotional behaviors, and social behaviors of CDC students in high school horticulture classes?"

The researcher used a total of three different instruments in order to measure various capabilities of each child. These three quantitative instruments utilized during the study consisted of a General Horticulture Knowledge Test, an Emotions Face Test, and the Rosenberg Self-Esteem Scale. The General Horticulture Knowledge Test and the Rosenberg Self-Esteem Scale were each administered to the four student participants a total of three times. The researcher administered these tests before beginning the initial study in February, again in March, and at the conclusion of the study in May. The Emotions Face test was administered before and after horticulture activities were completed. Each of the tests was read aloud by the researcher for better understanding by the participants. Observations also played a key role in this study. Interviews were conducted orally with the two CDC teachers and the four CDC students. The CDC teachers were interviewed twice, once before the study started and once at the conclusion of the study. The four students were interviewed only once, this being at the conclusion of the study. Six teacher aides, who work with the students throughout the day, were also

involved in the study. They completed written questionnaires containing the same questions as the CDC teachers were asked in their interviews.

This study revealed that the participants had increased levels of self-esteem, positive changes in emotional behaviors, and gains in cognitive behaviors during the four month case study. The tests results combined with interviews and observations of the four student participants, two CDC teachers, and six teacher aides supported the idea that horticulture therapy techniques are beneficial to CDC students enrolled in high school horticulture classes.

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CHAPTER I

INTRODUCTION

Overview

Chapter one provides an introduction to the use of horticulture therapy techniques with four comprehensive development classroom (CDC) students in four high school horticulture classes. The chapter contains an introduction to horticulture therapy, uses of horticulture therapy, evolvement of horticulture therapy over time, need for the study, purpose and objectives of the study, scope of the study, and definition of terms.

Introduction to Horticulture Therapy

Before we begin to discuss horticulture therapy, it is first important to understand what horticulture is. Relf (1998), defined horticulture as:

> The art and science of growing flowers, fruits, vegetables, trees, and shrubs resulting in the development of the minds and emotions of individuals, the enrichment and health of communities, and the integration of the garden in the breadth of modern civilization.

In today's fast paced world, horticulture is often taken for granted. People contract their garden and yard work because they do not have time to do it themselves. People do not realize how important horticulture, particularly plants, is to their lives. We are dependant upon plants for many reasons. Actually, without plants we could not sustain life. In fact, the garden should be viewed as more than just a home for plants. The garden can be considered a supermarket, drug store, hardware store, and department store. Food, medicine, lumber, and clothes are examples of plant derived items we need on a daily

basis. These products are available to us because of horticulture. In addition to supplying us with necessities for life, plants also play an important role in maintaining our health and well-being. Plants and the care of plants can be an immediate stress reliever and can even "heal" the sick. Moreover, plants can be a friend and provide a sense of warmth in our social and spiritual lives. These many benefits can be seen through the use of horticulture therapy in several institutions.

A number of facilities across the nation are adopting the concept of using horticulture as a therapeutic tool. Horticulture therapy is used with people of all ages and in various types of institutions. Children, especially, can respond to the use of horticulture therapy because an opportunity exists for them to be creative. For example, children who participate in horticulture therapy have a sense of accomplishment because they have something to show for their work. Furthermore, children are proud of what they have done and have a sense of ownership because they have created something useful.

In today's society, children often become depressed because they feel as if no one is their friend, they have been excluded from an activity, and/or someone made a hurtful comment. Plants provide an escape for children. They can be our friend because they do not discriminate and they are patient (Bruce and Folk, 2003). Plants do not care about gender, race, or ethnicity. In addition, plants cannot talk back or make hurtful comments. Plants become our friend and provide a feeling of comfort in time of need.

Horticulture can also be a form of "therapy" for many people. As stated by the American Horticultural Therapy Association (2007b), "Horticultural Therapy blooms as a profession and a practice. Horticultural therapy (HT) is not only an emerging profession;

it is a time-proven practice. The therapeutic benefits of peaceful garden environments have been understood since ancient times."

Horticulture therapy is not only a form of medical practice; it has also become a profession for many people (Davis, 2003). Horticulture therapists receive extensive training before they are certified to practice horticulture therapy. Some of a therapist's training is in the areas of horticulture, psychology, and the medical field. Overall, horticulture therapists must possess an immense amount of knowledge of horticulture. They should be familiar with plant names and characteristics, poisonous plants, ways to adapt tools for the physically challenged, as well as horticulture activities suitable for each client. A horticulture therapist must also be aware of the conditions of each person they are working with. Patients may be children or the elderly; they may be patients in a hospital or rehabilitation facility, or even prisoners. Horticulture therapy can be administered to almost anyone.

The AHTA further states that, "Today, horticulture therapy is recognized as a practical and viable treatment with wide-ranging benefits for people in therapeutic, vocational, and wellness programs. Horticulture therapy is now taught and practiced throughout the world in a rich diversity of settings and cultures" (2007b). Horticulture therapy is primarily administered by trained professionals; however, in many instances, horticulture therapy techniques can be utilized by many people, including school teachers.

Definition of Horticulture Therapy

What is horticulture therapy? "Horticulture therapy is a process through which plants, gardening activities and the innate closeness we all feel toward nature are used as vehicles in professionally conducted programs of therapy and rehabilitation" (Davis, 2003). For secondary schools, horticulture classes are viewed by many as only an elective. Some feel that it is just another credit to help a student meet the graduation requirements. Horticulture classes could and should be looked at as a form of "therapy" for troubled teens, the physically handicapped, as well as those students with learning disabilities.

Uses of Horticulture Therapy

Horticulture therapy is widely used with people of all ages; it has proven to be beneficial for the elderly, as well as youth. While horticulture therapy is more often used with elderly patients in nursing homes and assisted living homes, it is also used in schools, prisons, hospitals, and rehabilitation centers. This type of therapy is used with people who are physically disabled; mentally ill; developmentally disabled; victims of abuse; abusers; public offenders; at-risk youth; the socially disadvantaged; the elderly; students of all ages; those with Alzheimer's, AIDS, cancer, heart disease, and depression (Bruce and Folk, 2003). Horticulture therapy is considered to have a "curing effect" on people suffering from many different diseases, emotional disorders, and physical handicaps.

Horticulture therapy is frequently used in the treatment process of many individuals. Horticulture therapy practices are used in 1) hospitals with Alzheimer's

patients to stimulate their brain activity and aid in their treatment; 2) rehabilitation centers with patients who are receiving treatment for problems such as substance abuse, depression, physical abuse, or mental illnesses; 3) facilities with the physically handicapped; and 4) the treatment of other illnesses previously mentioned. Horticulture therapy activities can be adapted for most individuals, regardless of their circumstances. For instance, many gardening activities, as well as tools, can be modified for persons who are confined to a wheelchair. These individuals can contribute more to outdoor activities if the proper adaptations are made.

Gardening, one use of horticulture therapy, can be used to stimulate a person's physical abilities. Larson and Meyer (2006) stated, "It is common for many people to feel more physically alert and healthy after gardening." They also described the garden as a place of comfort. In addition, it promotes positive self-esteem by helping people realize their strength and full capabilities. Gardening helps individuals feel a sense of pride in what they are doing and as one ages he feels a sense of accomplishment by gardening. Just as elderly benefit from gardening, so do youth. The garden acts as a safe place for youth of all ages. As stated in Larson and Meyer (2006):

> The garden is a place where youth can learn lessons of accountability, nurturing, and responsibility. The garden teaches about life, death, hope, patience, and beauty. It connects youth to the land. It provides young people a place to explore, rejoice, and learn about their connection to living things.

Being around plants and being able to do something with your hands often provides many people, young and old, with feelings of pleasure. Although horticulture therapy is usually

administered by trained professionals, its techniques can be utilized by anyone. In this study, the researcher broadens the scope of horticulture therapy and illustrates the advantages of its use with learning disabled high school students mainstreamed into horticulture classes.

Evolvement of Horticulture Therapy Over Time

Horticulture therapy has been around since the beginning of time (Davis, 2003). It was not until the late 1700s and early 1800s that horticulture therapy began being used as a form of treatment. During this time, horticulture therapy was primarily used with mentally ill patients, but at the beginning of the 1900s, horticulture therapy was broadened to include physically disabled patients. Around the year 1950, the elderly became the center of attention with many nursing homes and assisted living centers trying this new treatment modality.

According to Simson and Straus (2003), horticulture therapy has made rapid advancements in treatment since the 1970s. Kansas State University with the help of the Menninger Foundation, established the first training program, in 1971, for horticulture therapists. In 1973, a professional organization was established and years later became known as the American Horticultural Therapy Association (AHTA). As the profession has evolved, horticulture therapy was experimented on many other groups, such as people with cancer, Alzheimer's disease, and AIDS; the physically abused, substance abusers, at-risk youth, public offenders, and children.

Because horticulture therapy has proven to be effective over the years, it is generating more interest in the twenty-first century. As stated by Davis (2003):

> Centuries in the making, horticulture therapy has matured significantly. Because it is unique in its composition, nonthreatening in its appearance, flexible in its application, cost effective, and effective in its use - it occupies a necessary position within the health care realm. This position will strengthen in the future as the professional association expands the ranks of horticultural therapists through clinical practice, education, and research initiatives. Horticulture therapy's future could not be brighter!

Even though the practice of horticulture therapy has been around for centuries and the profession has been around for over 30 years, the impact of its use has just begun to be recognized. Horticulture therapy has become a discipline of great importance to health care, rehabilitation, education, and reform facilities all across the nation.

Need for the Study

Research for horticulture therapy has dealt primarily with the handicapped or elderly populations. Research done in relation to students, especially learning disabled students is relatively sparse. Since my current work environment provided a great opportunity to explore the central idea of horticulture therapy and youth, the idea of utilizing horticulture therapy with four CDC students evolved. Relf (2003) reported that "few studies have looked at the child as a participant in the garden and the perceptions children hold of the natural world in the limited context to which they respond and are able to understand". She also stated that, "Creating a garden or natural environment that meets a child's requirement for understanding and responding will provide an atmosphere for encouraging curiosity and motivating learning".

Each and every day in the classroom, as a teacher, the researcher of this study witnessed behavior problems in students which are extensions from problems at home. Some of these problems include parental divorce, poverty, physical abuse, and sexual abuse. According to Pentz and Straus (2003):

> Of the 63 million children in the United States today, approximately 15 percent suffer from emotional and behavioral problems that warrant mental health services. Of these, 3 to 8 percent, or approximately ten million children, are seriously emotionally disturbed. Untold numbers of other children are psychologically at risk and would benefit from preventative services.

In the same article, they clearly stated the significance of using horticulture therapy with youth. Being involved with nature, youth are able to learn more about the environment while at the same time develop an understanding of fostering relationships. They have the opportunity of working with other youth in a cooperative manner, learning the importance of controlling their behaviors and getting along with others. The use of horticulture therapy provides youth the opportunity to learn new skills and knowledge about gardening, as well as life in general. The success of the youth with their gardening projects encourage them to succeed in other avenues of life. They feel a sense of pride and accomplishment in what they have done and their self-esteem is increased. These feelings are transferred into other settings as well (Pentz, 2003).

The question becomes to what extent does horticulture therapy benefit youth? Specifically, how does horticulture therapy affect special-needs students mainstreamed into high school horticulture classes? A thorough investigation of horticulture therapy and psychological development of individuals would disclose how high school horticulture classes are effective tools of horticulture therapy for CDC students. With the increased use of mainstreaming taking place in schools, this study may lead to better

understanding of the development of special education as well as the special-needs and CDC students that are mainstreamed into regular classroom settings. We would also recognize how these special-needs students learn in this type of hands-on setting.

Purpose and Objectives of the Study

The purpose of the study was to explore people-plant interactions and discover the effects of using horticulture therapy techniques with four CDC students in four high school horticulture classes. The central research question addressed during the study was, "How do horticulture therapy techniques affect cognitive abilities, emotional behaviors, and social behaviors of four CDC students in four high school horticulture classes?" Specific objectives of the study were:

1. To monitor cognitive horticultural abilities, emotional behaviors, and social behaviors, primarily self-esteem of each of the four student participants;
2. To investigate how high school horticulture classes are successful tools of horticulture therapy;
3. To recognize how CDC students learn in a hands-on classroom setting;
4. To view the child as a participant in the garden and grasp the perceptions children hold of the natural world.

Scope of the Study

This study evaluated the effects of using horticulture therapy techniques on four CDC students enrolled in horticulture classes at their high school. In order for a student to be labeled as CDC, they must be mentally retarded (MR) and with physical and/or learning disabilities. According to John, a CDC teacher at the school, MR status means the students have an intelligence quotient (IQ) score of 70 or below. Potential learning disabilities include the inability to read or write, being emotionally disturbed, functionally delayed, or autistic. These students, by Tennessee law, may remain in a high school setting for additional years beyond their graduation date, but no longer than the school year of their 21st birthday.

The four students involved in the study were students already enrolled in one of the four horticulture classes taught at the school. Permission was secured from the University of Tennessee's Institutional Review Board, the county's Director of Schools, the school's principal, the four CDC students, the two CDC teachers, the six teacher aides, as well as the parents of the CDC students being used in this study.

The high school used in the study is located in a rural East Tennessee community. The school has an average of 900 students. Vocational clusters offered at the school, are family and consumer science, cosmetology, engineering, masonry, criminal justice, carpentry, health occupations, and agriculture which encompasses horticulture. Vocational trade classes are allowed no more than 25 students per class. Currently, the number of students enrolled in each vocational class at the school ranges from 10 to 25.

At the school, some CDC students are allowed to be mainstreamed into regular classroom settings for a small portion of the day. The mainstreaming of students is to

expose students to hands-on learning situations as well as the opportunity to be around normal students. Students do have the option to take the other vocational classes; however, due to the variety of hands-on activities that are performed in each horticulture class, CDC students either ask to be placed in horticulture classes or are encouraged to do so by their Individualized Educational Plan (IEP) Team.

Course offerings vary from year to year depending upon the need. Students interested in horticulture currently have four classes from which to choose. These classes include fundamentals of agriculture, greenhouse management, floral design and interior/exterior landscaping. Fundamentals of agriculture is an introductory course which covers many broad areas of plant and animal sciences in a condensed format. Greenhouse management covers the operation of the schools greenhouse where students grow a variety of flowers and vegetable plants, all of which are sold to the public at the end of each semester. Floral design focuses on assembling a variety of floral arrangements including wreaths, centerpieces, and corsages. In addition, landscaping students are responsible for the installation of landscape plants on the school's campus as well as the maintenance of these landscaped areas.

The researcher is currently the teacher of these four horticulture classes at the site being studied. She is one of two agriculture teachers at the school and is responsible for the four horticulture classes while the other teacher is responsible for the animal science and agriculture mechanics classes. The researcher has been a teacher at the school for six years and was familiar with some of the participants of the study.

The CDC students who were involved in the study are seen on a daily basis and while enrolled in horticulture class were trained in the many areas of horticulture, such as

the planting, growing, and harvesting of vegetables and flowers; landscaping; and floral design. The researcher continually educated these four CDC students about flowers and gardening, both of which are hobbies the researcher loves. In addition, the researcher is passionate about her job and loves to teach others about horticulture practices.

Definition of Terms

Following is a list of terms and their definitions used in this study:

1. **American Horticultural Therapy Association (AHTA): "**A nonprofit organization with the mission to promote and advance the profession of horticultural therapy". "AHTA has helped horticultural therapy gain acceptance as a unique and dynamic human service program" (AHTA, 2006). AHTA was originally formed in 1973 under the name of National Council for Therapy and Rehabilitation Through Horticulture (NCTRH). In 1988, its name was simplified to AHTA (Davis, 2003).
2. **Autism:** (Autistic) "A variable developmental disorder that appears by age three and is characterized by impairment of the ability to form normal social relationships, by impairment of the ability to communicate with others, and by stereotyped behavior patterns" (Merriam-Webster's Online Dictionary, 2005).
3. **CDC:** Comprehensive Development Classroom. This is a classroom designed for students who are classified as mentally retarded and have a physical disability and/or a learning disability such as being autistic, emotionally disturbed, or functionally delayed.

4. **Developmental Psychology:** Branch of psychology devoted to identifying and explaining the continuities and changes that individuals display over time (Shaffer, 1999).

5. **Emotionally Disturbed:** The state of a person's emotions being upset or troubled.

6. **Functionally Delayed:** The process of being slower than expected in developing cognitive, emotional, social, or physical functions.

7. **Horticulture: "**The art and science of growing flowers, fruits, vegetables, trees, and shrubs resulting in the development of the minds and emotions of individuals, the enrichment and health of communities, and the integration of the garden in the breadth of modern civilization" (Relf, 1998).

8. **Horticulture Therapy: "**A process through which plants, gardening activities, and the innate closeness we all feel toward nature are used as vehicles in professionally conducted programs of therapy and rehabilitation" (Davis, 1998).

9. **Individualized Education Plan (IEP):** Educational plan wrote up for students that are identified as having a handicapping condition as defined by the state of Tennessee.

10. **Learning Disability:** A type of cognitive or psychological disorder which inhibits learning.

11. **Mainstreaming:** "To place (as a disabled child) in regular school classes" (Merriam-Webster's Online Dictionary, 2005).

12. **Mentally Retarded:** "Sub-average intellectual ability equivalent to or less than an IQ of 70 that is accompanied by significant deficits in abilities (as in communication or self-care) necessary for independent daily functioning, is present from birth or infancy, and is manifested especially by delayed or abnormal development, by learning difficulties, and by problems in social adjustment delayed mental development in children" (Merriam-Webster's Online Dictionary, 2005).

13. **Physically Disabled:** A person who is crippled in some way or who has some other type of physical limitation.

14. **Special Education:** Auxiliary program to enhance the education of identified and certified handicapped students age three through twenty-one in the state of Tennessee.

CHAPTER II

LITERATURE REVIEW

Overview

Chapter two contains a review of the literature related to horticulture therapy and developmental psychology. In particular, the chapter explores the psychological development of individuals, as well as, horticulture therapy in-depth, examining the history, current research available, and the overall impact of horticulture therapy.

Psychological Development of Individuals

According to Shaffer, developmental psychology is the branch of psychology that focuses on the explanation of changes that occur in individuals over time (1999). This development process includes the changes that can take place due to both maturation and learning processes. Simply stated, changes due to maturation would be those that are going to occur to an individual as they mature because of their genetic makeup. On the other hand, the learning process involves changes which are attributable to a person's surroundings or experiences. Observations and interactions with others around us often impact our abilities and habits causing our behaviors to be altered (Shaffer, 1999). In this review of literature on psychological development, the researcher focused on cognitive, emotional, and social development theories which related to this study.

This portion of the review will examine cognitive development and ways it has been influenced by developmental psychology. Cognitive theories focus on the mental

abilities and skills of an individual. In researching cognitive theories, it is impossible to ignore the works of the Swedish psychologist, Jean Piaget. Piaget's Theory of Cognitive Development has been used extensively in various fields of research over the years and also served as a building block for other theories. According to Piaget, cognitive development occurs in four different stages (Wadsworth, 2004). These four stages are: the sensorimotor stage (birth to age 2), the preoperational stage (ages 2 to 7), the concrete-operational stage (ages 7 to 11) and the formal-operational stage (ages 11 to around 15). A broad summary of each stage was provided in the 2004 book by Barry Wadsworth, *Piaget's Theory of Cognitive and Affective Development*. The stage of sensorimotor intelligence primarily consists of sensory and motor behavior. Cognitive development can be seen through schemes, but the child actually does not yet "think" conceptually. Next the stage of pre-operational thought is represented by the development of language, concepts, and reasoning. The stage of concrete operations is distinguished by the application of logical thought to concrete problems. During the last stage, formal operations, the child is able to apply logical reasoning to all types of problems (Wadsworth, 2004).

Piaget proposed that each stage was successive of each other, therefore occurring in the exact order as presented and building upon each other. The new behaviors do not disappear with each stage but rather combine with other new behaviors from each stage (Shaffer, 1999). As said by Wadsworth (2004), Piaget's theory allowed for the fast paced as well as the slow paced. Each child moves from stage to stage, however, at different rates. In view of the four stages, one could gather that cognitive development involves large, qualitative changes rather than small, quantitative changes (Shaffer, 1999). Shaffer

also noted that according to an earlier study by Piaget, children become capable of progressively more complex cognitive abilities as their brain and nervous system matures. This allows them to create better understandings of their experiences (Shaffer, 1999).

Piaget's theory can also be applied to education and the classroom setting. Shaffer (1999) added, "popular discovery based educational programs are based on the premise that young children do not think like adults and learn best by having hands-on educational experiences with familiar aspects of their environment". This directly relates to this research study and gives us a background of children and how they react cognitively to different situations. According to Shaffer, Piaget's theory has been challenged by many since that time. Some psychologists such as Lev Vygotsky believe that social and cultural issues largely influence human development, both of which Piaget did not address. According to Kearsley (2007), Vygotsky's theory presented the idea that one does not have full cognitive development without social interaction. According to Learning Theories Knowledgebase, development precedes learning as illustrated by Piaget's theory; however, Vygotsky concluded that social learning comes prior to cognitive development (2007).

Social theories are also of much importance to developmental psychology and understanding the behaviors of children and adolescents. Thomas Parish (1987) noted in the Handbook of Adolescent Psychology that social behaviorism, Maslow's hierarchy of needs, and attribution each attempt to explain how human interactions encourage a person's attitudes and actions. In contrast to cognitive development theories, social behaviorism focuses on development stemming from environmental influences rather

than the presumption that development is pre-existing. As noted by Parish (1987), research by Arthur Staats (1968, 1975, and 1981) on social behaviorism showed that positiveness brings about positiveness and negativeness brings about negativeness. So, being exposed to positive conditions and activities encourages a person to have a positive attitude himself. The same goes for being negative. If a person is around negative behavior, that behavior is likely to wear off on them too.

In explaining Maslow's Hierarchy of Needs, there are certain needs which must be met before one's social, emotional, and moral development can advance sufficiently (Parish, 1987). Physiological needs are first on Maslow's pyramid. This includes food, water, rest, and anything a person physically needs to survive. Next, Maslow notes safety needs. This includes both physical and emotional security, such as job security, security of the family, of health and of morality. Moving up the pyramid, the next level consists of social needs such as love and belonging. People need family, friends, and relationships to make them feel they are accepted. One could experience a state of depression if this level is not met. The fourth level involves esteem needs such as respect, confidence, and achievement. Maslow felt that these four levels of needs must be fulfilled before the fifth level of self actualization could be satisfied (Parish, 1987). Psychological growth needs such as creativity, problem-solving, and morality all fall into this fifth level.

Fritz Hadler's Attribution Theory focuses on favorable and unfavorable circumstances (Parish, 1987). For example, a person who is in a stressful and unhappy environment is more likely to mimic that behavior; thus, negatively impacting that person's social, emotional, as well as moral development. On the other hand, if a person

is in a positive and happy environment, then one is more likely to develop positively. This negative or positive development is often attributed to the person or persons who facilitated that type environment. So, people responsible for positive surroundings are likely to be held in high regard for facilitating one's development.

In relation to the psychological development of people and people-plant interactions, Relf discussed various background theories that clarify why plants prove to be beneficial to humans (2003). Two of these theories are the overload and arousal theories and the early learning experiences theory as researched by Ulrich and Parsons in 1992. In looking at the overload and arousal theories, they conclude that people are often overwhelmed by "noise, movement and visual complexity" which can overpower our senses and bring about damaging levels of psychological and physiological excitement. According to Ulrich and Parsons as stated by Relf (2003), environments dominated by plants are less complex and tend to reduce excitement and therefore reduce our feelings of stress. Relf (2003) added that another theory proposed by Ulrich and Parsons was that people respond to plants based on their early learning experiences or how they were raised. For example, someone raised in East Tennessee would have a deeper appreciation and positive attitude toward plants and nature than would someone who grew up in New York City.

No single theory can provide total satisfaction into the comprehension of human development; however, these theories previously discussed by the researcher do provide a better understanding of developmental psychology which can be applied to the findings of this study.

History of Horticulture Therapy

Humans have actually been dependant on plants for thousands of years. In fact, this has been true since the beginning of time. Plants provide essential resources needed for human survival; these resources include food, shelter, medicine, and clothes (Simson and Straus, 2003). Not only do plants provide people with a means of survival but also a feeling of pleasure and personal satisfaction. As stated in Simson and Straus (2003):

> This relationship between people and plants has been taken a step further by the discipline of horticulture therapy. Horticulture Therapy is a treatment modality that uses plants and plant products to improve the social, cognitive, physical, psychological, and general health and well-being of its participants.

While horticulture therapy is a relatively young profession, the idea has actually been around for hundreds of years. According to Davis, people have found comfort in nature since the beginnings of time; however, horticulture used as a treatment modality was first recorded in ancient Egypt. Court physicians often prescribed walks in the gardens for royalty figures who were mentally disturbed. It wasn't until centuries later, during the late 1700s and early 1800s that horticulture therapy began to be accepted as a viable approach to treatment programs (2003).

During the 1800s, horticulture therapy was primarily used in the treatment of mentally ill patients. Dr. Benjamin Rush, a professor at the Institute of Medicine and Clinical Practice in Philadelphia, Pennsylvania, also noted as the "father" of psychiatry, primarily opened the door for horticulture therapy to be used in the treatment of mentally ill patients (Davis, 2003). Rush declared that farm labor had curative effects on the mentally ill. This prompted a movement of further testing inside and outside of the United States in an effort to discover additional favorable results.

The Asylum for Persons Deprived of their Reason was founded in 1813 by the Religious Society of Friends, otherwise known as Quakers. Located near Philadelphia, Pennsylvania, the institution later became known as Friends Hospital and also as the first psychiatric institution in the United States. Opening its doors in 1817, Friends made many advances toward horticulture therapy throughout the 1800s. One of the most important improvements was the addition of a greenhouse to their facility in 1879. This greenhouse became the first greenhouse built exclusively for therapeutic purposes (Davis, 2003). As a result, Friends made available the first gardening program offered to mentally ill patients (Shapiro and Kaplan, 2003).

The use of horticulture therapy was also witnessed in books and other publications. Steven Davis made mention of an 1896 book, *Darkness and Daylight or Shadows of New York Life*, which discussed the Children's Aid Society and horticulture activities used with tenement children. Davis (2003) stated that "This is one of the earliest mentions of using plants and gardening as uplifting activities for disadvantaged young people." In 1899, an article by E. R. Johnston in the Journal of Psycho-Aesthenics revealed that plants were also important to the learning processes of mentally handicapped children. In the year 1900, an additional article by G.M. Lawrence was published in the same journal, further supporting the findings of Johnston (Davis, 2003).

With the mentally ill being the primary patients served by horticulture therapy during the 1800s, additional populations would soon be served as well. As time progressed into the 1900s, horticulture therapy was introduced into physical disability settings. During World War I, 1914-1918, horticulture therapy was mainly used as a form of recreation for hospital patients. In 1919, the Menninger Foundation was founded

in Topeka, Kansas by Dr. C.F. Menninger and his son Karl. From that time to date, plants and gardening have been used with the patients on a daily basis. It wasn't until World War II, 1939-1945, that horticulture became a valid addition to the therapy and rehabilitative programs (Davis, 2003). The use of horticulture therapy with wounded soldiers during this time greatly influenced the growth of horticulture. According to the AHTA, "rehabilitative care of hospitalized war veterans in the 1940's and 1950's greatly expanded the practice of horticulture therapy" (2007b).

An even greater leap was made during the 1950s, expanding horticulture therapy to include the elderly population. According to Davis (2003), Alice Burlingame established a horticulture program in 1951 in the geriatric ward of Michigan State Hospital in Pontiac, Michigan where she worked as a psychiatric social worker. Other influences to the future success and acceptance of horticulture therapy were also important during this time. In 1959, Rusk Institute for Rehabilitative Medicine started its Glass Garden program for use with the physically disabled. This well-known institution used an attached greenhouse to house its operations (Davis, 2003). In 1960, the first book published about horticulture therapy, *Therapy Through Horticulture*, was written by Dr. Donald Watson and Alice Burlingame (Davis, 2003). Then in 1968, Rhea McCandliss, of the Menninger Clinic, conducted a research study documenting the interest in horticulture therapy programs in the United States. She surveyed 500 hospitals and found that most of the hospitals were either already implementing a horticulture therapy program or wished to start one (Davis, 2003). She also foresaw a need for trained, qualified persons to meet the demand of this rapidly growing vocation (Shapiro and Kaplan, 2003). According to Davis (2003), "These findings pointed to a profession

in the making." Shapiro and Kaplan added, "In 1971, the Menninger Foundation, together with Kansas State University, began the first student training program for horticulture therapists" (2003).

The formation of a training program brought about another important step in the creation of a profession. This was the establishment of a professional organization. In 1973, the National Council for Therapy and Rehabilitation Through Horticulture (NCTRH) became the first professional organization available for horticultural therapists (Davis, 2003). Its name was simplified in 1988 to the American Horticultural Therapy Association (AHTA). Davis (2003) stated, "…….the AHTA exists to support and to strengthen the profession and the professional". The AHTA is still very much involved in the promotion of horticulture therapy as an effective form of treatment and rehabilitation, as well as personal enjoyment. After this progress to the profession of horticulture therapy, Friends Hospital made another advancement to the horticulture therapy practice by constructing in 1991 an additional garden for their program to be used by Alzheimer's patients. This added a new group to the list of people served by horticulture therapy.

With horticulture therapy being utilized until the 1990s mainly with the mentally ill, physically disabled and the elderly, horticultural therapists have strayed out of the box to include different client groups. These groups have increased to include the young, old, able, and disabled. Some of this clientele consist of typical children; children with learning disabilities; and patients recovering from substance abuse, strokes, spinal cord injury, traumatic brain injury, developmental disabilities, cancer, Alzheimer's disease, and physical abuse.

Today, many colleges have also expanded their coursework to include a variety a classes dealing with horticulture therapy. Some of these colleges also offer horticulture therapy as Associate's, Bachelor's, and Master's degrees. While horticulture therapy is often administered by trained professional horticulture therapists, its techniques can be utilized by most anyone.

Research on Horticulture Therapy

Research in any field of study is needed to provide validity of the subject in question. The Centre for Child and Family Research researched the conclusion that available data on social and therapeutic horticulture did substantiate the success of horticulture in diverse settings; however, there was need for additional research on the use of horticulture therapy with an array of groups. Most horticulture therapy programs today in the U.S. serve the elderly population through nursing homes, assisted living facilities, or home based programs. Only a small number of horticulture therapy programs are directed at youth participants and especially learning disabled high school students (Aldridge, 2002).

Airhart, Willis, and Westrick (1987), published an article that illustrated the favorable results of using a horticulture training program with special education students unable to attend regular high schools. These students improved in their behavioral and prevocational skills as a result of horticulture therapy. With the help of parents and experienced clients, the new clients also demonstrated an improved self-image and degree of self-sufficiency.

Dobbs and Relf (1991) conducted a study at Virginia Tech University with five developmentally disabled adults and one supervisor provided by the New River Valley Workshop, Inc. The participants were employed to assist the university's grounds crew with litter removal, raking leaves, snow removal, and weeding flower beds. This dedicated and enthused group of individuals illustrated that developmentally disabled adults can function together as a team.

Epstein and Greenberger (1990) found that there can be mutual benefits from grouping people of different generations together in a horticulture therapy program. They paired younger children with physically and cognitively impaired elderly. The children learned not to fear the elderly population, while the elderly seemed to gain a sense of renewal and purpose in life from the presence of the children.

A case report by Hoffman and Castro-Blanco (1998) revealed that horticulture therapy can be used with even the youngest of children. The study used a four-year-old boy, with a speech-language impairment in addition to a variety of behavioral problems, to demonstrate the positive results of using horticulture therapy. After 30 horticulture therapy sessions in a special preschool program, the boy showed major improvements in his in-class behavior. He also developed a sense of compassion and nurturance as demonstrated by his behaviors.

According to the AHTA, "An essential component of AHTA's mission is to promote research related to the impact of horticultural therapy as a treatment modality" (2007a). The organization organized a research work group which brings researchers and educators together to collaborate on research projects and also discuss issues related to other horticulture therapy studies. Furthermore, it publishes once a year a journal entitled

the Journal of Therapeutic Horticulture that provides an immense amount of knowledge concerning horticulture therapy research and the profession.

Additional support systems have also been set up. The People-Plant Council was established in 1990 with the primary role to promote additional research on horticulture therapy. The council also encourages the documentation and publication of findings related to horticulture therapy research.

Impact of Horticulture Therapy

Plants can have direct impacts on people and their surroundings. Plants can impact people physically, psychologically, socially, and economically. Plants can have physical impacts that make a person more comfortable by purifying the air, decreasing air pollutants, providing shade, aiding in noise reduction, and hiding unattractive views. Plants also have psychological impacts on people and communities. Plants provide a setting that is enjoyable and comfortable for the participant. The physical condition of an area, such as an office or a community, provides the public with a measure of the self-worth of that area. These conditions are also symbolic of the people who live in that area. People are proud to be a part of this type of environment (Relf, 2003).

Plants also contribute to the economic value of a person's surroundings. According to Relf (2003), people are willing to pay a lot of money in order to have plants in their immediate surroundings. Property values can be increased by the property landscaping and its nearness to a park. Hotels such as Opryland show the value of plants to the tourism industry. Rooms overlooking the gardens cost more per night and have a higher occupancy rate. Plants also have a social impact on people. Community projects

such as tree planting or community gardening provide people with the opportunity to communicate, foster relationships, and become a closer community. Relf (2003) stated that "Groups, such as the Partners for Livable Places, maintain that plants are the fastest, most cost effective agents for changing negative perceptions of an area, enhancing the economic and social conditions, and improving the psychosocial health."

Plants are an important factor in people's decisions as to where to live and work. When offered a window view of either nature or urban scenes, people often chose the nature scenes (Relf, 2003). As humans, we are drawn to nature and the feelings that we feel when surrounded by plants. As can be seen from history and research, plants and horticulture therapy have had huge impacts on people. For the young, old, sick, and well, horticulture therapy is an integral part of their pursuit of happiness. Most of us use horticulture each and every day of our lives. People work in their gardens and yards on a daily basis and are not aware of the benefits they receive from this process.

The impact of horticulture therapy has been phenomenal in most facilities where it has been administered. Due to its success in application and its support from health care professionals, horticulture therapy has evolved into an alternative form of therapy for many institutions.

CHAPTER III

PROCEDURES AND METHODOLOGY

Overview

The purposes and objectives utilized in this study are outlined in this chapter. Chapter three contains descriptions of the study, including the purpose of the study, selection of the panel, development of research instruments, and data analysis.

Purpose of the Study

The purpose of this study was to explore people-plant interactions and discover the effects of using horticulture therapy techniques with four CDC students in four high school horticulture classes. The central research question addressed during the study was, "How does horticulture therapy affect cognitive abilities, emotional behaviors, and social behaviors of CDC students in high school horticulture classes?"

Specific objectives of the study were:

1. To monitor the cognitive horticultural abilities, emotional behaviors, and social behaviors, primarily self-esteem of each of the four student participants;
2. To investigate how high school horticulture classes are successful tools of horticulture therapy;
3. To recognize how CDC students learn in a hands-on classroom setting;

4. To view the child as a participant in the garden and grasp the perceptions children hold of the natural world.

Selection of the Panel

At the school, some CDC students are allowed to be mainstreamed into regular classroom settings for a small portion of the day in order to expose the students to hands-on learning situations as well as the opportunity to be around typical students. Due to the variety of hands-on activities that are done in the horticulture classes, a lot of the CDC students either ask to be placed in these horticulture classes or are encouraged to do so by their IEP Team. Since the determination had been made to focus the study on CDC students enrolled in high school horticulture classes, the researcher proceeded to get input from the CDC teachers at the school. After talking with the two CDC teachers, the decision was made to include all four CDC students which were enrolled in horticulture classes for the period of time the study would be taking place. In order to begin research, permission was secured from the University's Institutional Review Board (IRB), the school's principal, the county's director of schools, the two CDC teachers, the six teacher aides, the four CDC students, as well as the parents of each of the CDC students used in the study (See Appendices A and B).

The four students participating in the study were enrolled in one of four horticulture classes taught at the school. These four classes included fundamentals of agriculture, greenhouse management, floral design, and exterior/interior landscaping. On occasion, participants also came to the researcher's classroom other class periods during

the day. Therefore, at times all four participants may have completed activities together instead of during separate class periods. Pseudonyms were used during the study in order to protect the privacy of the participants. The four student participants were labeled as Brenda, Jennifer, Jason, and Brian. The two CDC teachers were named John and Eddie, while names for the six teacher aides were Cindy, Paige, Allison, Donna, Susie, and Danny.

The ages of these CDC students in the trial ranged from 16 to 18, with Brenda, Brian, Jennifer, and Jason being 16, 17, 18, and 18 years old, respectively. Each student was classified as being mentally retarded (MR) and having some type of learning disability. Before beginning the study, the two CDC teachers and six teacher aides were asked to describe each student's abilities and behaviors in class. According to the adult participants, Brenda was a slow learner who struggled with her reading and writing skills. Her math skills were also low, about the 2nd grade level. Coming into the study, Brenda was able to accomplish little reading and writing on her own; however, she had no physical limitations to inhibit her success in the activities. According to her CDC teachers and aides, Brenda was immature for her age. She was also shy around others, had a speech problem, and was reserved and quiet in class. However, she had a positive outlook on life and was willing to try something new. She cannot complete tasks as quickly as her peers, but never gives up until the task is completed.

Even though Brenda and Jennifer are sisters, they were quite opposite in their behaviors. As described by the CDC teachers and aides, Jennifer was negative, had a low self-esteem, was not comfortable learning new talents, and would prefer to stay in the house and watch television. Her CDC teachers stated that she enjoyed talking with her

friends and teachers at school, but was hesitant to start a conversation with someone she did not know. Her reading and writing skills were better than Brenda's, but she was still a slow learner. Like Brenda, Jennifer did not have any physical limitations which may hinder her from doing hands-on activities.

Jason had a mid to high level of self-esteem and was confident in his abilities. The two CDC teachers stated that Jason was immature in his social interaction and would not listen to instructions from his teacher. He was talkative at school, even more so than Jennifer. Jason also enjoyed being around others, especially girls, and was a likeable person. Before the study began, John, one of Jason's teachers, stated that Jason's cognitive abilities were low with math and reading skills at the 1st grade level. His teachers noted his short attention span, stating that he got bored easily and often tried to sleep in class.

Brian was hardworking and humble. Brian had the lowest IQ of the students and had very minimal reading and writing skills. He lived on a farm and contributed to chores after school and on the weekends. His self-esteem was about mid-level, but he attempted to accomplish the same tasks as everyone else in class. The only physical limitation he had was being overweight. His size slowed him down physically, but he always finished the task he started. Brian was shy, but loved to talk.

Since the four CDC students were not at grade level in their cognitive and/or behavioral development, each student can remain in high school for additional years of learning until it is decided by their IEP Team that they can proceed into the workforce. These students may remain enrolled in high school until they are 21. They may finish the

school year in which they turn 21, but may not return the following year. It is basically a year to year decision made by the student, teachers, and parents.

Development of Research Instruments

The researcher used a total of three different instruments in order to measure various capabilities of each child. These three quantitative instruments utilized during the study consisted of a General Horticulture Knowledge Test, an Emotions Face Test, and the Rosenberg Self-Esteem Scale. The General Horticulture Knowledge Test and the Rosenberg Self-Esteem Scale were each administered to the four student participants a total of three times. The researcher administered these tests before beginning the initial study in February, again in March, and at the conclusion of the study in May. The Emotions Face test was administered before and after horticulture activities were completed. Each of the tests was read aloud by the researcher for better understanding by the participants. Explanations of these instruments are given below:

General Horticulture Knowledge Test

The General Horticulture Knowledge Test was developed by this study's researcher to determine the cognitive horticulture knowledge of each student. Fifteen general horticulture questions were asked to determine what information the students knew prior to the study, and how much knowledge they gained as the study progressed. The test was given three times, prior to, during, and at completion of the study. Tests were graded by the researcher and given one point for each correct response, resulting in a possible score of fifteen. Each test was compared to assess the amount of knowledge each student gained during the study (See Appendix C).

Rosenberg Self-Esteem Scale

The Rosenberg Self-Esteem Scale was designed in 1965 by Morris Rosenberg. He developed this scale as a means of evaluating the self-esteem of adolescents. According to Rosenberg (1989), the scale was to be used with approximately 5,024 high school juniors and seniors from various high schools in the state of New York. It was designed by Rosenberg to be scored as a Guttman scale; however, it is now commonly scored as a Likert scale (See Appendix D).

Emotions Face Test

The Emotions Face Test was developed by this study's researcher to determine how the students felt at specific times during the study. The test consisted of ten faces depicting the emotions of happy, very happy, surprised, worried, sad, very sad, confused/frustrated, afraid/scared, mad/angry, and tired/sleepy. The researcher administered the tests before and after certain horticulture activities were completed inside and outside the classroom. The participants reading levels were low; therefore the researcher read each possible answer aloud each time the test was given. Before the activity, the students were asked to circle each face that showed how they felt at that time. After the activity, the researcher asked each student how they were feeling, then named each of the ten responses and circled each emotion that the participant verbally agreed with. This eliminated the possibility of any false data occurring due to any memorization which may have been retained from the test taken prior to the activity. In order to eliminate confusion between the horticulture activities and the student's personal and home life, the students were also asked to comment on why they were feeling that way. The researcher then compared the before and after effects of each activity to see if

that particular activity caused any change in the participants emotional behavior (See Appendix E).

In addition to the quantitative instruments utilized in the study, qualitative methods were also used. These qualitative methods included observations and interviews. Daily observations were made by the researcher and noted in her journal. Prior to completing the study, an informed consent letter was given to each of the participants, including the two CDC teachers, six teacher aides, four students, and parents of each student (See Appendix B). Interviews were conducted individually with the two CDC teachers as well as the four CDC students (See Appendices F and G). The CDC teachers were interviewed twice, once before the study started and once at the conclusion of the study. The four CDC students were interviewed only at the conclusion of the study. Six teacher aides, who worked with the students throughout the day, were also involved in the study by completing an interview protocol on paper. Due to some of the aides not wanting to be interviewed, they manually completed the questions listed in the interview protocol (See Appendix F). If questions arose while analyzing the results of the interview protocol, the researcher would set up a time to meet with the teacher aide to clarify the comments made by him/her.

Data Analysis

Creswell (1998) quoted work by Ely at al., 1991, "In triangulation, researchers make use of multiple and different sources, methods, investigators, and theories to provide corroborating evidence……..this process involves corroborating evidence from different sources to shed light on a theme or perspective." In this study on horticulture

therapy, the researcher utilized a mixed method approach of research. Quantitative as well as qualitative methods were utilized by the researcher. Quantitative methods included the use of three instruments in the study, while qualitative methods used included observations and interviews.

Data collection methods that were utilized for the study included written exams, interviews, and observations. The three written exams and observations were only used with the student participants. Oral interviews were conducted with the CDC teachers, as well as the students. Six teacher aides manually completed an interview protocol making notes of any observed changes in behaviors of the students. The four CDC students enrolled in horticulture classes at the school were observed, tested, and interviewed during a four month period to determine the effects of horticulture therapy on these students. In analyzing the data, the researcher looked for any changes in cognitive abilities; learned tasks; emotional behaviors; or social behaviors.

Each of the instruments used was analyzed either by scoring or by coding and categorization. The General Horticulture Knowledge Tests were scored for accuracy and examined for knowledge gained from February to March, from March to May, and overall gains from February to May. The researcher also observed activities in the classroom and horticulture lab. She made specific notes in her journal about some of the students and their reactions to certain activities. This journal was reviewed after the study was completed and student abilities and attitudes were noted. Quotes from the students were also used during the analysis to help illustrate all four of the participant's increases in cognitive abilities.

The Rosenberg Self-Esteem Scale was graded using a Likert scale approach. Each student was asked to circle one answer for each of the ten questions. There were four answers for each question which included 1) strongly agree, 2) agree, 3) disagree, and 4) strongly disagree. A certain number of points were assigned to each answer on each question. Items 1, 2, 4, 6, and 7, were scored as: Strongly Agree=3, Agree=2, Disagree=1, and Strongly Disagree=0. Items 3, 5, 8, 9, and 10, were scored as: Strongly Agree=0, Agree=1, Disagree=2, and Strongly Disagree=3. The values of each question were totaled with an overall possible score of 30. The higher the number score, the higher the self-esteem was for that person. The researcher also examined each participant's three scales, from February, March, and May for similarities and differences. At conclusion of the study, the three scales for each participant were compared to determine the effect horticulture therapy had on the student's self-esteem.

The Emotions Face Tests were coded and categorized by the specified horticulture activity. Before and after responses for each activity were compared to determine if that specific activity caused a change in the emotions felt by the students. Participant responses for each activity were determined by the researcher to be either positive or negative. Then, emotions felt before an activity and emotions felt after an activity were compared to determine if the student had a positive or negative change in emotional behavior due to the specific horticulture activities they participated in. Teacher observations and comments by the students were also used in validating the findings of these tests.

CDC teachers were interviewed both before and after the completion of the study to determine their personal observations of the students. Six teacher aides manually

completed a typed questionnaire which was the same as the interview protocol used with the CDC teachers (See Appendix F). Students were also interviewed at the end of the study to determine their overall positive and negative opinions of being in a horticulture class. An interview protocol was developed for the adult and student participants using a qualitative approach. For the adults, interviews were conducted before the study began in late February, and at the completion of the study in May. Students were only interviewed in May, at the conclusion of the study. All the interviews were analyzed by the researcher. The researcher reviewed the responses of interviewees and compiled their answers into categories of observable themes. These responses, or quotes, were used in the reporting of the results for each theme: cognitive abilities, emotional behaviors, and social behaviors.

CHAPTER IV

FINDINGS

Objective one stated that the researcher was to monitor cognitive horticultural abilities; emotional behaviors; and social behaviors, primarily self-esteem, of each of the four student participants. None of the four CDC students possessed any major physical limitations before the study. Brian however did function slower because he was overweight. In addition, Brenda had a minor handicap in her legs which would limit her from walking long distances. However, this did not affect Brenda's behavior at anytime during the study. Despite the participants not having any physical limitations, they were not very familiar with garden tools and how to complete certain garden tasks.

Cognitive Abilities

The first instrument studied by the researcher was the General Horticulture Knowledge Test (Appendix C). As described in Table 1, prior to the study, Brenda answered only five of the fifteen questions acceptable, answering ten unacceptable. Six of the ten unacceptable responses remained unacceptable on the second test given. The other four unacceptable responses before, now were answered acceptable by Brenda on the second test. Of the five responses that were answered acceptably on the first test, four remained acceptable and one response changed to an unacceptable response on the second test. For example, Brenda's answers about mulch were unacceptable, prior to and during the study. However, after the study, she knew what mulch was. In addition, she did not know how to germinate plant seeds nor was she able to list the seven main parts

Table 1

General Horticulture Knowledge Test: Responses Made by Student #1, Brenda.

Statement	Response Prior to Study	Response During Study	Response Concluding Study
1. What does Horticulture include? A. Fruits and flowers; B. Fruits, Nuts, Vegetables, Ornamental Plants and Flowers; C. Flowers and Vegetables; D. I Do Not Know	U	U	A
2. I know how to germinate plant seeds. Yes or No	U	U	A
3. I can name the 7 main parts of a flower. Yes or No	U	U	A
4. I can make a flower arrangement by myself. Yes or No	U	A	A
5. What grows in a greenhouse? A. Flowers; B. Flowers and other plants; C. Nuts; D. I do not know	A	A	A
6. Which one is a rake? (show object) A. #1, B. #2, C. #3, D. I do not know	A	A	A
7. Which one is a shovel? (show object) A. #1; B. #2; C. #3; D. I do not know	A	A	A
8. When watering plants in the greenhouse I should: A. Soak them till water runs out the bottom of the container; B. The less you water them the better; C. Only water what is dry at that time; D. I do not know.	A	A	A
9. I know what mulch is. Yes or No	U	U	A
10. What type of greenhouse do we have? A. Quonset; B. A-Frame; C. I do not know	U	A	A
11. A weed is: A. Good for the flowers; B. Something not wanted; C. I do not know.	U	U	A
12. A tulip grows from a: A. Seed; B. Bulb; C. I do not know.	U	U	A
13. I know how to transplant tomato plants. Yes or No	U	A	A
14. All flowers can grow in the sun? Yes, No, or I do not know	U	A	A
15. All flowers have to be planted every year. Yes, No, or I do not know	A	U	A

Note: A = Acceptable Answer, U = Unacceptable Answer

of a flower prior to or during the study. However, after the study she understood how to do each of these. On the other hand, she was able to identify on all three tests what a rake and a shovel were, as well as know what grows in a greenhouse. On the final test, all questions were answered acceptable, showing Brenda's obvious increase in her tested cognitive abilities.

Jennifer's results were quite similar to Brenda's. As described in Table 2, Jennifer also began the study with ten unacceptable and five acceptable answers. Of the ten unacceptable responses given, seven remained unchanged and three progressed to acceptable answers in March. For example, Jennifer did not know what mulch was nor did she know what a weed was both prior to and during the study. However, on the final test, she answered both acceptably. The five that were answered acceptably on the first test, remained correct for the second round of testing. For example, on all three tests she was able to identify both a rake and a shovel correctly and she also knew when to water plants in the greenhouse. In the end, all fifteen questions were answered acceptably by Jennifer.

As illustrated by Table 3, Jason began with six acceptable and nine unacceptable answers. Of these nine, five were changed to acceptable answers during the March testing, leaving four as unacceptable. For example, prior to the study Jason did not know how to germinate seeds or transplant tomato plants. However, he knew how to do both on the second test as well as the final test. In addition, he was not able to list the seven main parts of a flower and he did not know how to make a flower arrangement both prior to and during the study. However, on the final test, he knew how to do both. The six acceptable answers from February remained unchanged in March. On the third and final

Table 2

General Horticulture Knowledge Test: Responses Made by Student #2, Jennifer.

Statement	Response Prior to Study	Response During Study	Response Concluding Study
1. What does Horticulture include? A. Fruits and flowers; B. Fruits, Nuts, Vegetables, Ornamental Plants and Flowers; C. Flowers and Vegetables; D. I Do Not Know	U	U	A
2. I know how to germinate plant seeds. Yes or No	U	U	A
3. I can name the 7 main parts of a flower. Yes or No	U	U	A
4. I can make a flower arrangement by myself. Yes or No	A	A	A
5. What grows in a greenhouse? A. Flowers; B. Flowers and other plants; C. Nuts; D. I do not know	A	A	A
6. Which one is a rake? (show object) A. #1; B. #2; C. #3; D. I do not know	A	A	A
7. Which one is a shovel? (show object) A. #1; B. #2; C. #3; D. I do not know	A	A	A
8. When watering plants in the greenhouse I should: A. Soak them till water runs out the bottom of the container; B. The less you water them the better; C. Only water what is dry at that time; D. I do not know.	A	A	A
9. I know what mulch is. Yes or No	U	U	A
10. What type of greenhouse do we have? A. Quonset; B. A-Frame; C. I do not know	U	A	A
11. A weed is: A. Good for the flowers; B. Something not wanted; C. I do not know.	U	U	A
12. A tulip grows from a: A. Seed; B. Bulb; C. I do not know.	U	U	A
13. I know how to transplant tomato plants. Yes or No	U	A	A
14. All flowers can grow in the sun? Yes, No, or I do not know	U	U	A
15. All flowers have to be planted every year. Yes, No, or I do not know	U	A	A

Note: A = Acceptable Answer, U = Unacceptable Answer

Table 3

General Horticulture Knowledge Test: Responses Made by Student #3, Jason.

Statement	Response Prior to Study	Response During Study	Response Concluding Study
1. What does Horticulture include? A. Fruits and flowers; B. Fruits, Nuts, Vegetables, Ornamental Plants and Flowers; C. Flowers and Vegetables; D. I Do Not Know	U	U	A
2. I know how to germinate plant seeds. Yes or No	U	A	A
3. I can name the 7 main parts of a flower. Yes or No	U	U	A
4. I can make a flower arrangement by myself. Yes or No	U	U	A
5. What grows in a greenhouse? A. Flowers; B. Flowers and other plants; C. Nuts; D. I do not know	A	A	A
6. Which one is a rake? (show object) A. #1; B. #2; C. #3; D. I do not know	A	A	A
7. Which one is a shovel? (show object) A. #1; B. #2; C. #3; D. I do not know	A	A	A
8. When watering plants in the greenhouse I should: A. Soak them till water runs out the bottom of the container; B. The less you water them the better; C. Only water what is dry at that time; D. I do not know.	A	A	A
9. I know what mulch is. Yes or No	A	A	A
10. What type of greenhouse do we have? A. Quonset; B. A-Frame; C. I do not know	U	A	A
11. A weed is: A. Good for the flowers; B. Something not wanted; C. I do not know.	A	A	A
12. A tulip grows from a: A. Seed; B. Bulb; C. I do not know.	U	A	A
13. I know how to transplant tomato plants. Yes or No	U	A	A
14. All flowers can grow in the sun? Yes, No, or I do not know	U	A	A
15. All flowers have to be planted every year. Yes, No, or I do not know	U	U	A

Note: A = Acceptable Answer, U = Unacceptable Answer

test administered by the researcher, Jason answered all questions acceptable. With this perfect score, he joined Brenda and Jennifer in demonstrating increased cognitive abilities.

Table 4 explains the responses of Brian. In looking at the test prior to the study, Brian answered seven questions acceptable and eight unacceptable. Of these eight unacceptable responses, five remained unacceptable on the second test, with three changing to acceptable. For example, Brian was not familiar with how to germinate plant seeds both prior to and during the study. He also did not know what mulch was or that tulips grew from a bulb. However, on the final test he knew the correct responses for all these questions. In addition, prior to the study, Brian did not know how to make a flower arrangement; how to transplant tomato plants; or that all flowers cannot grow in the sun. However during the study in March, he was able to answer these questions acceptable. The seven acceptable responses from the first test in February remained unchanged on the second test in March. In conclusion, Brian answered all questions acceptable on the final test, illustrating an increase in horticulture knowledge and skills learned during the study.

The participant's test scores were compared to assess the amount of knowledge each student gained during the study. As shown in Table 5, the student's answers were all correct on the final test given in May. Brenda and Jennifer showed gains of ten points, or 66.7%, during the four month period. Brenda's and Jennifer's scores were 5, 8, and 15, respectively. Jason scores were slightly higher prior to and during the study. He scored 6, 11, and 15, respectively. Jason actually scored a 14 on the final test, but the researcher knew that he was aware of the correct answer to that question. Jason was

Table 4

General Horticulture Knowledge Test: Responses Made by Student #4, Brian.

Statement	Response Prior to Study	Response During Study	Response Concluding Study
1. What does Horticulture include? A. Fruits and flowers; B. Fruits, Nuts, Vegetables, Ornamental Plants and Flowers; C. Flowers and Vegetables; D. I Do Not Know	U	U	A
2. I know how to germinate plant seeds. Yes or No	U	U	A
3. I can name the 7 main parts of a flower. Yes or No	U	U	A
4. I can make a flower arrangement by myself. Yes or No	U	A	A
5. What grows in a greenhouse? A. Flowers; B. Flowers and other plants; C. Nuts; D. I do not know	A	A	A
6. Which one is a rake? (show object) A. #1; B. #2; C. #3; D. I do not know	A	A	A
7. Which one is a shovel? (show object) A. #1; B. #2; C. #3; D. I do not know	A	A	A
8. When watering plants in the greenhouse I should: A. Soak them till water runs out the bottom of the container; B. The less you water them the better; C. Only water what is dry at that time; D. I do not know.	A	A	A
9. I know what mulch is. Yes or No	U	U	A
10. What type of greenhouse do we have? A. Quonset; B. A-Frame; C. I do not know	A	A	A
11. A weed is: A. Good for the flowers; B. Something not wanted; C. I do not know.	A	A	A
12. A tulip grows from a: A. Seed; B. Bulb; C. I do not know.	U	U	A
13. I know how to transplant tomato plants. Yes or No	U	A	A
14. All flowers can grow in the sun? Yes, No, or I do not know	U	A	A
15. All flowers have to be planted every year. Yes, No, or I do not know	A	A	A

Note: A = Acceptable Answer, U = Unacceptable Answer

Table 5

General Horticulture Knowledge Test, Overall Scores and Gains of Each Participant.

Participants	***Test Scores***			***% Gains***		
	Prior to Study February, 2007	*During Study March, 2007*	*Conclusion of Study May, 2007*	*Feb. to March*	*March to May*	*Feb. to May*
Brenda	5	8	15	20.0%	46.7%	66.7%
Jennifer	5	8	15	20.0%	46.7%	66.7 %
Jason	6	11	15	33.3%	26.7%	60.0%
Brian	7	10	15	20.0%	33.3%	53.3%

Note: Scores and Percentages are Based on a Possible Score of 15.

asked the missed question orally by the researcher and he answered correctly. The researcher took this answer as correct and overrode the original answer he marked on paper. Jason's gains totaled nine points or 60.0%. Brian had the highest score at the beginning of the study with a 7. Brian then scored a 10 and finished with a perfect score of 15. He had an increase of eight points or 53.3% improvement. The final scores and percentages obtained by the participants illustrated the apparent gains of each participant. The scores show the tremendous increase in horticulture knowledge from being enrolled in one of the high school's horticulture classes.

At the conclusion of the study, each of the four participants stated that they learned how to complete tasks they had never done before. Some of these tasks included: spreading mulch with a rake, sowing seeds, transplanting tomato seedlings, transplanting flower plugs, planting flowers in container pots, and making flower arrangements. The cognitive advancements were further witnessed in the classroom by the researcher, two CDC teachers, and six teacher aides. The students illustrated an immense amount of knowledge with each assignment completed. Specific quotes by the participants also acknowledged new skills and learned tasks which they developed from the horticulture class. Brenda stated, "I have learned how to water plants and what plants to put in the sun. I can talk to plants and keep my eye on them. I have learned how to help my boyfriend's mamaw with her plants." Jennifer also concluded that she had learned new skills from being in this class. She stated, "I have learned how to plant flowers, and how to make a flower arrangement." Jason added, "I have learned how to water plants, plant flowers, haul and rake mulch, and how to cut the grass." Brian noted his learned tasks as

well, “I have learned how to grow flowers, tomatoes, pumpkins, and watermelons at my farm.”

Emotional Behaviors

The Emotions Face Test (Appendix E) provided the researcher with the overall assumption that horticulture activities had a positive impact on the four participant’s emotions during the study. The horticulture activities used to report the change in emotions of each participant included seed propagation, transplanting tomato and pepper seedlings, designing a flower arrangement, spreading mulch, weeding flower beds, selling plants to the public, and planting flowers in container pots. Most of the activities showed an improvement in student emotions. The students commented that they felt happier and more alert after completing the tasks. In some instances, the students may have circled a negative emotion before an activity began. In most instances, this emotion was changed to a positive emotion after completion of the assigned project. The researcher asked about the negative emotions in each case and the negativity was usually related to problems stemming from home or in the CDC classroom. Overall, the Emotions Face Test proved that horticulture activities had a positive influence on the emotional behaviors of each of the four participants.

As described in Table 6, Brenda showed positive emotional changes after all six of the tested horticulture activities were completed. Before the seed propagation activity, Brenda reported that she felt happy, confused/frustrated, and tired/sleepy. She said that she was frustrated about something from another class and she felt sleepy because she had just eaten lunch. She added that the activity, “Made me feel better, and I am not tired anymore.” Before transplanting tomato and pepper seedlings, Brenda noted that she felt

Table 6

Emotions Face Test. Before and After Effects of Horticulture Activities on the Emotions of Student #1, Brenda.

Name of Activity	***Emotions Felt***	
	Before Activity	***After Activity***
1. Seed Propagation	Happy, Confused/Frustrated, Tired/Sleepy	Very Happy
2. Transplant Tomato & Pepper Seedlings	Afraid/Scared, Mad/Angry, Tired/Sleepy	Very Happy, Tired/Sleepy
3. Design A Flower Arrangement to Give to Someone	Happy	Very Happy, Surprised
4. Spread Mulch/Weed Flower Beds	Tired/Sleepy	Happy
5. Customer Service/ Sell Plants To The Public	Tired/Sleepy	Happy, Sad, Tired/Sleepy
6. Plant Flowers in Container Pots	Mad/Angry, Tired/Sleepy	Very Happy, Surprised

afraid/scared because she was intimidated by other kids. She also reported that she felt mad/angry at a student from another class in school. Brenda also circled tired/sleepy before beginning the activity. After the activity, Brenda noted that she felt very happy, but was still a little tired and sleepy. She commented that the activity, "Made me feel better. I enjoyed talking with the other kids in class." Brenda really enjoyed getting to make a flower arrangement. She made a beautiful bouquet of white roses with leather leaf fern, asparagus fern, and baby's breath used as filler. Before the activity, she commented that she felt happy. After, she was noted as changing her emotions to very happy and surprised. She stated, "It made me feel good to make something for someone else. I can't believe I made something like that."

In the fourth activity, the researcher tested the activities of spreading mulch and weeding flower beds. Brenda circled the tired/sleepy face before beginning the activity, and then circled the happy face afterwards. However, she commented, "I am glad to be back inside, where it is cool. Activity number five tested the emotions felt before and after working in the greenhouse selling plants to the customers. Brenda noted she was tired/sleepy before going to the greenhouse. Upon completion of sales for the day, she remained tired/sleepy, but also felt happy and sad. Brenda commented on her responses, "The other kids in class did not talk to me today, but I did enjoy helping the customers. I am still tired but not as much as before." The last activity tested was the planting of flowers into container pots to sell. She circled mad/angry and tired/sleepy before beginning the activity. She commented that some other kids had made her mad in another class earlier in the day. After the activity, she felt very happy and surprised. She remarked, "I made new friends today. Normal kids don't usually talk to special ed kids."

In conclusion, the researcher observed that Brenda's positive changes in emotions were due to the horticulture activities in which she participated.

As described in Table 7, Jennifer showed positive emotional changes in five of the six tested horticulture activities. Before the seed propagation activity, Jennifer reported that she felt tired/sleepy and worried. She said that she was afraid that she would not do it right because she was not good at anything. After the activity, Jennifer circled happy. She said, "I am not sleepy anymore, and I did it right." Before transplanting tomato and pepper seedlings, Jennifer noted that she felt happy. After the activity she was very happy. She stated "That made me feel better, and it is more calming than class work." Jennifer also enjoyed making a flower arrangement for her mother. Before beginning the design, she felt confused/frustrated and mad/angry. When asked about her response, she said that she was confused about something from her math class and one of the students in her CDC class had been aggravating her about her having a boyfriend. Once the arrangement was finished, Jennifer changed her response to happy. She said, "That is really pretty, did I do that?"

For the fourth activity, the researcher tested the activities of spreading mulch and weeding flower beds on the school grounds. Jennifer in her domineering voice stated, "I hate this, it is too hot out here!" While she circled tired/sleepy before, she progressed to being mad/angry once we returned inside. She added, "I don't like being outside when it is so hot!" This was the only activity that showed a negative emotional change for Jennifer. The researcher feels that the temperature outside and the "prickly" holly bushes contributed to her response. Activity number five tested the emotions felt before and after working in the greenhouse selling plants to the customers. Jennifer noted she was

Table 7

Emotions Face Test. Before and After Effects of Horticulture Activities on the Emotions of Student #2, Jennifer.

Name of Activity	***Emotions Felt***	
	Before Activity	***After Activity***
1. Seed Propagation	Tired/Sleepy, Worried	Happy
2. Transplant Tomato & Pepper Seedlings	Happy	Very Happy
3. Design A Flower Arrangement to Give to Someone	Confused/Frustrated, Mad/Angry	Happy
4. Spread Mulch/Weed Flower Beds	Tired/Sleepy	Mad/Angry
5. Customer Service/ Sell Plants To The Public	Tired/Sleepy, Sad, Worried	Happy, Surprised
6. Plant Flowers in Container Pots	Mad/Angry, Tired/Sleepy	Happy

tired/sleepy as well as sad and worried before going to the greenhouse. Upon completion of sales for the day, she felt happy and surprised. Before the activity, she stated, "I am not good at helping people." Afterwards, she replied, "I knew more about those plants than I thought I did." The last activity tested was the planting of flowers into container pots to sell. She circled mad/angry and tired/sleepy before beginning the activity. She commented that she was mad at her mom about something she did to her the previous night. After the activity, she felt happy. Jennifer remarked, "I am not mad or sleepy anymore." In conclusion, the researcher observed that Jennifer's positive changes in emotions were linked to the horticulture activities in which she participated.

As described in Table 8, Jason had positive emotional changes in each of the six tested horticulture activities. Jason came into class often feeling sleepy, as can be seen in the data. Jason was a jokester, repeatedly trying to pull something on the researcher. He also frequently tried to sneak and take a nap in class. Before the seed propagation activity, Jason did report that he felt tired/sleepy but also happy. After the activity, he circled very happy and surprised. He commented, "That was fun. We got a lot done." Before transplanting tomato and pepper seedlings, Jason again circled happy along with tired/sleepy. After the activity, he was happy, surprised, but still tired/sleepy. He stated, "It was awfully warm in that greenhouse. I could have taken a nap." Before making a flower arrangement, Jason again circled happy along with tired/sleepy. After completion of the arrangement, he changed his response to very happy and surprised. He commented, "I am going to give this to my girlfriend. It is really pretty."

Jason only circled tired/sleepy before the fourth activity, the tasks of spreading mulch and weeding flower beds on the school grounds. After finishing outside, he felt

Table 8

Emotions Face Test. Before and After Effects of Horticulture Activities on the Emotions of Student #3, Jason.

Name of Activity	***Emotions Felt***	
	Before Activity	***After Activity***
1. Seed Propagation	Happy, Tired/Sleepy	Very Happy, Surprised
2. Transplant Tomato & Pepper Seedlings	Happy, Tired/Sleepy	Happy, Surprised, Tired/Sleepy
3. Design A Flower Arrangement to Give to Someone	Happy, Tired/Sleepy	Very Happy, Surprised
4. Spread Mulch/Weed Flower Beds	Tired/Sleepy	Happy, Sad
5. Customer Service/ Sell Plants To The Public	Happy, Tired/Sleepy	Happy
6. Plant Flowers in Container Pots	Happy, Tired/Sleepy	Happy

happy and sad. He said, "I am hot! I need some water." After talking with Jason, the researcher decided this was the only reason he felt sad. Before the final two activities, he felt happy as well as a little tired and sleepy. Afterwards, he circled only happy for both activities. After selling plants in the greenhouse, he commented, "I like helping them pick out what they want and carrying it to their car for them." After planting flowers in container pots, he remarked, "I like working outside." In conclusion, the researcher observed that Jason's positive changes in emotions were connected to the horticulture activities in which he participated.

As described in Table 9, Brian had positive emotional changes in each of the six tested horticulture activities. He reported that he felt tired/sleepy but also happy before the seed propagation activity. After the activity, he circled happy along with very happy and again chose tired/sleepy. He commented, "That made me feel happier and better, but I am still a little tired." Before transplanting tomato and pepper seedlings, Jason again circled happy along with tired/sleepy. After the activity, he was happy, and still a little tired/sleepy. He stated, "I am not as tired as I was before." Before making a flower arrangement, Brian was recorded as feeling mad/angry along with tired/sleepy. The researcher asked Brian why he was so mad and he replied, "I am mad because my watermelons got flooded out and I have to replant them." After completion of the arrangement, he changed his response to very happy. He commented, "I liked making that. I am going to give it to my Granny. She is in the hospital sick."

For the fourth activity, the researcher tested the activities of spreading mulch and weeding flower beds on the school grounds. This time Brian circled happy along with tired/sleepy before the activity. After finishing outside, he still felt happy. Even though

Table 9

Emotions Face Test. Before and After Effects of Horticulture Activities on the Emotions of Student #4, Brian.

Name of Activity	***Emotions Felt***	
	Before Activity	***After Activity***
1. Seed Propagation	Happy, Tired/Sleepy	Happy, Very Happy, Tired/Sleepy
2. Transplant Tomato & Pepper Seedlings	Happy, Tired/Sleepy	Happy, Tired/Sleepy
3. Design A Flower Arrangement to Give to Someone	Tired/Sleepy, Mad/Angry	Very Happy
4. Spread Mulch/Weed Flower Beds	Happy, Tired/Sleepy	Happy
5. Customer Service/ Sell Plants To The Public	Happy	Very Happy
6. Plant Flowers in Container Pots	Tired/Sleepy	Happy

the other students had complained about it being so hot outside, Brian never complained. Instead, with a smile, he said he felt happy. Brian also seemed to enjoy the customer service activity. Brian felt happy before the activity and very happy afterwards. Before the sixth activity, Brian felt tired/sleepy while afterwards he circled happy as his felt emotion. He commented, "I liked learning how to do that. I can help my Granny now." In conclusion, the researcher observed that just as Brenda, Jennifer, and Jason's positive changes in emotions were in fact due to the horticulture activities, Brian's were also.

Social Behaviors

In looking at social behaviors, the researcher measured the self-esteem levels of the participants before, during, and after the study. The researcher utilized the Rosenberg Self-Esteem Scale (Appendix D) to measure these results. The scale consisted of ten questions, all of which remained the same for each test. The participant's were asked to circle one of four responses for each statement given on the scale. The four possible responses included 1) strongly agree, 2) agree, 3) disagree, and 4) strongly disagree. In looking at each of the ten statements provided on the Rosenberg Scale, the researcher analyzed the data collected in February, then from February to March, then March to May, then finally as a whole from February to May. Any observed changes in each statement were noted and categorized by the researcher as a positive change, negative change, or no change shown.

For questions 1, 3, 4, 7, 8, and 10, a change from the left side of the scale (strongly agree) to the right side of the scale (agree, disagree, or strongly disagree) indicated a negative change in response. For questions 2, 5, 6, and 9, a change from the right therapy side of the scale (strongly disagree) to the left side of the scale (disagree,

agree, or strongly agree) indicated a positive change in responses. So, there could have been a change in the degree of the participant's response with no change in the category placement of positive or negative. Therefore, two different responses could still have been categorized the same due to two possible answers reflecting a positive change and two possible answers reflecting a negative change for each statement. For example, if a participant circled agree on any of the questions 2, 5, 6, or 9, then circled strongly agree on the next test, this would have indicated a negative degree of change. Both responses would be classified as negative, but strongly agree is even more negative than agree for these particular questions. The Rosenberg Self-Esteem Scale showed the effects on each participant's level of self-esteem which occurred from the use of horticulture therapy techniques. All four participants reported an overall positive change in at least two of the ten statements on the scales tested from February to May.

Data obtained from each of Brenda's three responses on the Rosenberg Self-Esteem Scale is shown in Table 10. After the tests were completed, the researcher labeled each response as being either positive or negative, as described in Table 11. The data obtained from Brenda prior to the study in February had nine negative responses with only one positive response. A comparison was then made between data obtained prior to the study in February and during the study in March. This showed more positive change than negative or no change at all. Brenda had eight positive changes, one negative change, and one no change from February to March. The next comparison that the researcher made was between data obtained during the study in March, and at the completion of the study in May. Of the eight positive changes shown from February to March, five resulted in negative changes, with the other three having no change. Of the

Table 10

Rosenberg Self-Esteem Scale Data Results for Student #1, Brenda.

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
1. On the whole, I am satisfied with myself.		B, C		A
2. At times, I think I am no good at all.	A, C	B		
3. I feel that I have a number of good qualities.		B	C	A
4. I am able to do things as well as most other people.	B	C		A
5. I feel I do not have much to be proud of.		A	B, C	
6. I certainly feel useless at times.	A	B, C		
7. I feel that I'm a person of worth, at least on an equal plane with others.		B	C	A
8. I wish I could have more respect for myself.	A, B, C			
9. All in all, I am inclined to feel that I am a failure.	B	A, C		
10. I take a positive attitude toward myself.		B	C	A

Note: A = data obtained prior to study, B = data obtained during the study, and C = data obtained at conclusion of the study.

Table 11

Rosenberg Self-Esteem Scale, Changes in Responses of Participant #1, Brenda.

Statement	February	March	May	February to March	March to May	February to May
1. On the whole, I am satisfied with myself.	n	p	p	P	X	P
2. At times, I think I am no good at all.	n	n	n	P	N	X
3. I feel that I have a number of good qualities.	n	p	n	P	N	P
4. I am able to do things as well as most other people.	n	p	p	P	N	P
5. I feel I do not have much to be proud of.	n	p	p	P	X	P
6. I certainly feel useless at times.	n	n	n	P	X	P
7. I feel that I'm a person of worth, at least on an equal plane with others.	n	p	n	P	N	P
8. I wish I could have more respect for myself.	p	p	p	X	X	X
9. All in all, I am inclined to feel that I am a failure.	n	n	n	N	P	X
10. I take a positive attitude toward myself.	n	p	n	P	N	P

Note: p = positive response, n = negative response, P = Positive Change, N = Negative Change, X = No Change

one negative change shown before, it resulted in a positive change and the one response that had no change before, again remained unchanged. In conclusion, from February to May, Brenda had an overall positive change in seven of the ten responses and no change in three responses.

Jennifer's responses on the Rosenberg Self-Esteem Scale are shown in Table 12. The researcher labeled each response as being either positive or negative, as described in Table 13. Data obtained from Jennifer prior to the study in February showed four positive responses along with six negative responses. In comparing the data obtained prior to the study in February and during the study in March, Jennifer had no change in three negative and two positive responses. Jennifer also had three negative responses which changed positively and two positives changed negatively. The next comparison that the researcher made was between data obtained during the study in March, and at the completion of the study in May. Of the now five positive responses illustrated in Table 13, two positives remained positive, and three positives showed negative change. Of the five negative responses, one changed positively, three responses remained negative, and one changed to a higher degree of negativity. In conclusion, from February to May, Jennifer had an overall positive change in two of the ten responses, negative changes in four responses, and four responses showing no change.

Jason's responses on the Rosenberg Self-Esteem Scale are shown in Table 14. These responses were categorized as positive or negative and are described in Table 15. Data obtained from Jason prior to the study in February had four negative responses and six positive responses. A comparison was then made between data obtained prior to the

Table 12

Rosenberg Self-Esteem Scale Data Results for Student #2, Jennifer.

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
1. On the whole, I am satisfied with myself.			B	A, C
2. At times, I think I am no good at all.	C	A, B		
3. I feel that I have a number of good qualities.		A	B, C	
4. I am able to do things as well as most other people.		A, B, C		
5. I feel I do not have much to be proud of.		B, C		A
6. I certainly feel useless at times.		A, B, C		
7. I feel that I'm a person of worth, at least on an equal plane with others.		C	A, B	
8. I wish I could have more respect for myself.		A, B	C	
9. All in all, I am inclined to feel that I am a failure.	A	B, C		
10. I take a positive attitude toward myself.			B	A, C

Note: A = data obtained prior to study, B = data obtained during the study, and C = data obtained at conclusion of the study.

Table 13

Rosenberg Self-Esteem Scale, Changes in Responses of Participant #2, Jennifer.

Statement	February	March	May	February to March	March to May	February to May
1. On the whole, I am satisfied with myself.	n	n	n	P	N	X
2. At times, I think I am no good at all.	n	n	n	X	N	N
3. I feel that I have a number of good qualities.	p	n	n	N	X	N
4. I am able to do things as well as most other people.	p	n	n	X	X	X
5. I feel I do not have much to be proud of.	p	n	n	N	X	N
6. I certainly feel useless at times.	n	n	n	X	X	X
7. I feel that I'm a person of worth, at least on an equal plane with others.	n	n	p	X	P	P
8. I wish I could have more respect for myself.	p	p	n	X	N	N
9. All in all, I am inclined to feel that I am a failure.	n	n	n	P	X	P
10. I take a positive attitude toward myself.	n	n	n	P	N	X

Note: p = positive response, n = negative response, P = Positive Change, N = Negative Change, X = No Change

Table 14

Rosenberg Self-Esteem Scale Data Results for Student #3, Jason.

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
1. On the whole, I am satisfied with myself.	A, B, C			
2. At times, I think I am no good at all.		A	B	C
3. I feel that I have a number of good qualities.	A, B	C		
4. I am able to do things as well as most other people.	A	B, C		
5. I feel I do not have much to be proud of.	A		C	B
6. I certainly feel useless at times.		A	B	C
7. I feel that I'm a person of worth, at least on an equal plane with others.	B	A, C		
8. I wish I could have more respect for myself.	A	B, C		
9. All in all, I am inclined to feel that I am a failure.		A	B, C	
10. I take a positive attitude toward myself.	A	B, C		

Note: A = data obtained prior to study, B = data obtained during the study, and C = data obtained at conclusion of the study.

Table 15

Rosenberg Self-Esteem Scale, Changes in Responses of Participant #3, Jason.

Statement	February	March	May	February to March	March to May	February to May
1. On the whole, I am satisfied with myself.	p	p	p	X	X	X
2. At times, I think I am no good at all.	n	p	p	P	P	P
3. I feel that I have a number of good qualities.	p	p	p	X	N	N
4. I am able to do things as well as most other people.	p	p	p	N	X	N
5. I feel I do not have much to be proud of.	n	p	p	P	N	P
6. I certainly feel useless at times.	n	p	p	P	P	P
7. I feel that I'm a person of worth, at least on an equal plane with others.	p	p	p	P	N	X
8. I wish I could have more respect for myself.	p	p	p	N	X	N
9. All in all, I am inclined to feel that I am a failure.	n	p	p	P	X	P
10. I take a positive attitude toward myself.	p	p	p	N	X	N

Note: p = positive response, n = negative response, P = Positive Change, N = Negative Change, X = No Change

study in February and during the study in March. This comparison showed five positive changes, three negative changes, and two responses indicating no change. The next comparison that the researcher made was between data obtained during the study in March, and at the completion of the study in May. Of the five positive changes shown from February to March, two of these resulted in a more positive degree of change, two with a negative degree of change, and one showing no change. Of the three negative changes shown before, they showed no degree of change from the last test. Of the two responses illustrating no prior change, one again remained unchanged and one had a change to the negative degree. In conclusion, from February to May, Jason had an overall positive change in four of the ten responses, four negative changes, and two responses showing no change at all.

Brian's three responses on the Rosenberg Self-Esteem Scale are shown in Table 16 and were similar to those of Jason's. As described in Table 17, Brian also began in February with six positive and four negative responses, just as Jason's results had shown. In comparison of the data obtained prior to the study in February and during the study in March, Brian's changes resulted in three being positive, one negative, and six statements having no change. In the next comparison, the researcher looked at data obtained during the study in March, and at the completion of the study in May. From the three positive changes in March, one changed to a negative degree and the other two remained unchanged. The one negative response resulted in a higher degree of negativity. Of the six responses that showed no change before, one exhibited a positive degree of change, two a negative, and three remained unchanged. Overall, from February to May, Brian

Table 16

Rosenberg Self-Esteem Scale Data Results for Student #4, Brian.

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
1. On the whole, I am satisfied with myself.	B	A, C		
2. At times, I think I am no good at all.		A, B, C		
3. I feel that I have a number of good qualities.		A, B, C		
4. I am able to do things as well as most other people.		A, B, C		
5. I feel I do not have much to be proud of.		A	B, C	
6. I certainly feel useless at times.		A, B	C	
7. I feel that I'm a person of worth, at least on an equal plane with others.		A, B	C	
8. I wish I could have more respect for myself.	A	B	C	
9. All in all, I am inclined to feel that I am a failure.		A	B, C	
10. I take a positive attitude toward myself.		A, B	C	

Note: A = data obtained prior to study, B = data obtained during the study, and C = data obtained at conclusion of the study.

Table 17

Rosenberg Self-Esteem Scale, Changes in Responses of Participant #4, Brian.

Statement	February	March	May	February to March	March to May	February to May
1. On the whole, I am satisfied with myself.	p	p	p	P	N	X
2. At times, I think I am no good at all.	n	n	n	X	X	X
3. I feel that I have a number of good qualities.	p	p	p	X	X	X
4. I am able to do things as well as most other people.	p	p	p	X	X	X
5. I feel I do not have much to be proud of.	n	p	p	P	X	P
6. I certainly feel useless at times.	n	n	p	X	P	P
7. I feel that I'm a person of worth, at least on an equal plane with others.	p	p	n	X	N	N
8. I wish I could have more respect for myself.	p	p	n	N	N	N
9. All in all, I am inclined to feel that I am a failure.	n	p	p	P	X	P
10. I take a positive attitude toward myself.	p	p	n	X	N	N

Note: p = positive response, n = negative response, P = Positive Change, N = Negative Change, X = No Change

had an overall positive change in three of the ten responses, negative changes in three additional responses, and four responses having no change.

After the analysis of the scales was completed, the researcher used the recommended Likert approach to score each test. As illustrated in Table 18, when scored using a Likert approach, the Rosenberg Self-Esteem Scales response values of each participant showed an increase in self-esteem over the four month period. The researcher also examined each participant's three scales, from February, March, and May, for similarities and differences and made a note of that as well. At conclusion of the study, the three scales for each participant were compared to determine the effect of horticulture therapy on the student's self-esteem.

Referring again to Table 18, Brenda scored a 14, 15 and 17, respectively on the Rosenberg Self-Esteem Scale, with an overall increase of three points. Jennifer also had an increase of three points overall. She scored a 15, 15, and 18, respectively. Jason scored a 13, 17, and 14 showing an increase of four points, then a drop of three points, but with an overall increase of one point. Brian showed the largest increase on the second test, with an improvement from 14 to an 18 score, but then declining to a 17 on the final test. He showed an overall gain of three points. Therefore, from the beginning of the study to the end, all participants showed a gain in overall self-esteem.

The students increase in self-esteem was also observed by the researcher, both CDC teachers, as well as the six teacher aides. Quotes from the participant's interviews also contributed to these findings. Due to the learning disabilities of the students, quotes are not all grammatically correct, but were left unchanged to avoid alterations in data

Table 18

Rosenberg Self-Esteem Scale, Overall Scores and Gains of Each Participant.

Participants	***Test Scores***			***Gains***		
	Prior to Study February, 2007	*During Study March, 2007*	*Conclusion of Study May, 2007*	*Feb. to March*	*March to May*	*Feb. to May*
Brenda	14	15	17	1	2	3
Jennifer	15	15	18	0	3	3
Jason	13	17	14	4	-3	1
Brian	14	18	17	4	-1	3

Note: Scales were scored using Likert approach, and based on a possible score of 30.

collected. Some of the quotes which indicated an increase in self-esteem consisted of the following: Brenda stated: "This class made me have more friends." She added "Makes me feel good because I can smell flowers" and also stated, "When people are mean to me, I just go to flowers because it makes me forget about everyone and what everyone says to me." Jennifer also contributed statements which confirmed the increase in self-esteem levels. She stated, "I like working with flowers because it gets you somewhere in life." Even though Jason commented, "It's a little hard and it's hard to make friends in this class," Brian felt just the opposite. Brian replied, "I have learned to talk to others." He also commented on making flower arrangements to give to others. He added, "Giving flowers to people makes them smile." Brian continued, "Makes me happy to give it to them." Data from the Rosenberg scales coupled together with the researcher's observations and quotes from the participants, showed an increase in the participants' self-esteem levels.

Success of Horticulture Therapy in the Classroom

The use of horticulture therapy techniques within the horticulture classroom allowed for those special-needs students mainstreamed into the class to receive hands-on training that related to real life. As stated by CDC teacher, John, "The horticulture classes are beneficial to the students in that it prepares them for the future. They are also given the chance to interact with typical kids, which doesn't happen often." CDC teacher Eddie added, "Overall, the horticulture class was a very positive influence on the students." Special needs children often desire to be "normal". The horticulture classroom is a great place to implement horticulture therapy techniques with these students, while at the same time providing interaction with the regular education students.

Through the horticulture therapy projects completed in class, students were given the chance to be creative and use their imagination. Although horticulture therapy is often performed by health care professionals, this study showed the success of using it in a classroom setting.

Hands-On Learning Environment

While there are many ways children learn, the four participants of this study proved the importance of a hands-on learning environment. Some children are more visual or verbal learners; however, in many instances children learn at a faster pace if allowed to actually "do" something with their hands. A child who is given the opportunity to learn by doing often retains this learned information for a greater period of time. The hands-on learning approach of the horticulture classroom used in the study provided the CDC children an opportunity to learn by doing. With all four of the children being learning disabled, a typical classroom setting would not have been as effective. As the researcher knew from experience, children with learning disabilities often struggle to learn from the classic classroom lecture approach or from book assignments. As reported by the CDC teachers John and Eddie, the reading and math competency levels of all four participants were classified as lower elementary level. In view of this, the researcher knew that a hands-on learning environment would be an ideal situation for the participants to learn. All the students demonstrated their understanding of certain activities by their overall perfect scores on the General Horticulture Knowledge Test. According to one of the six CDC teacher aides, Cindy, "A hands-on class tends to eliminate the obstacle of a learning disability, allowing the student the freedom to learn

through doing, which tends to stick with them better, because they can attach tactile experiences to the lesson."

Natural World Perceptions of Children

The researcher viewed the child as a participant in the garden to grasp the perceptions children hold of the natural world. When working with children it is essential for one to understand how a child views and communicates with his/her surroundings (Pentz and Straus, 2003). As stated by Bruce, "Not very many years ago, children grew up in a rural setting" (1999). In the past, the family farm gave children a chance to gain a connection to plants. All across the nation, these farms are being divided up to make room for new homes as well as new industry. Many children today don't receive this people-plant interaction at a young age. In today's society, children are often "given" what they want. They are not made to work for it; they just have their parents go buy it. Children must be given the chance to work with others and given a chance to succeed, whether it is in the home or at school.

In beginning the study, the researcher noticed the lack of plant knowledge and general horticulture skills of the four participants. Children often take the environment and the natural surroundings for granted, not aware of their significance to our survival, as well as our health and well-being. The researcher felt that at the conclusion of the study, all four of the participants developed an aesthetic appreciation for horticulture. As Brenda stated, "I don't know what it is, but I love flowers. If it was just me in this school I would not care because I have flowers to keep happy." Jennifer added that flowers "make the community a better and happier place." According to the CDC teacher John, participant Jason "found that he liked greenhouse class better than he thought he would."

John mentioned that Jason really did not fully understand what a person did in a greenhouse until he took the class. After a few weeks in class, Jason wanted to go to greenhouse class all the time, as CDC teacher John remembered. "Brian was the same way," as CDC teacher Eddie recalled. He added, "He was always asking me if he could go to the greenhouse because he was learning how to do things he had never done before." In view of this information, the participants seemed to grasp an awareness of the natural world and an understanding of the importance of plants in our daily lives.

CHAPTER V

SUMMARY/CONCLUSIONS/RECOMMENDATIONS

Horticulture therapy is a rapidly growing practice as well as profession. It has emerged from being used with primarily mentally ill patients to being used with numerous population groups today. Youth and the learning disabled are two groups of importance to this study. Young people are connected to nature in many ways. The garden serves as an ideal place for them to be creative and explore their surroundings. They also tend to develop a sense of responsibility for themselves. The central research question addressed during the study was, "How does horticulture therapy affect cognitive abilities, emotional behaviors, and social behaviors of four CDC students in four high school horticulture classes?"

In order to measure objective one, the researcher monitored cognitive horticultural abilities; emotional behaviors; and social behaviors, primarily self-esteem of each of the four student participants. This study revealed that the participants had increased levels of self-esteem, positive changes in emotional behaviors, and gains in cognitive abilities during the four month case study. As seen in the General Horticulture Knowledge Test, all four of the CDC students showed gains ranging from 53% to 66% during the four month study. Each of the students progressed from identifying less than half of the answers correctly to identifying all the answers correctly on the final test in May. After the study, the students were more knowledgeable about horticulture in general and were also more physically involved with projects since they understood what to do and how to do it. This test proved that horticulture therapy techniques did

significantly improve the cognitive horticultural abilities of the four CDC students used in this study.

The study also showed that the participants developed positive emotional changes due to their exposure to horticulture activities. As found in the Emotions Face Test, students responded positively to most horticulture activities completed. Students progressed from showing negative emotions, such as being tired and angry, to displaying positive emotions, such as very happy, after the activity. Positive changes in the student's emotions could be immediately seen by the researcher. This instrument proved the success of using horticulture therapy techniques with CDC students in high school horticulture classes.

The horticulture techniques used during the study also increased the self-esteem levels of each participant. As seen in the Rosenberg Self-Esteem Scale, each of the four students increased in self-esteem levels during the four month study. This illustrated that the use of horticulture therapy techniques did cause an increase in the self-esteem levels of each of the students in the study.

As stated in objective two, the researcher investigated how high school horticulture classes are successful tools of horticulture therapy. Each of the three instruments used in the study demonstrated that horticulture therapy worked for the four participants. In addition, CDC teachers noted the impact of CDC students being able to interact with other youth, particularly regular education students. The CDC students each developed relationships with regular education students, making new friends they will treasure for a long time.

In objective three, the researcher wanted to recognize how CDC students learn in a hands-on classroom setting. Each of the four participants proved that despite their learning disabilities, they can benefit from a hands-on learning environment. Test results combined with interviews and observations of student participants, teachers, teacher aides, as well as the researcher supported the idea that these four students in the study do learn better in a hands-on than in a lecture based learning environment.

Objective four stated the researcher wanted to view the child as a participant in the garden and grasp the perceptions that children hold of the natural world. After the study, the researcher concluded that each of the four CDC students developed an aesthetic appreciation for horticulture. As one student stated, "Flowers make the community a better and happier place." As observed by the researcher, each of the students grasped an awareness of the natural world and an understanding of the importance of plants in our daily lives.

In conclusion, horticulture therapy techniques did work with the four CDC students utilized in this study. The participants showed drastic advancements in each of the objectives outlined by the researcher. The study was a success and proved that horticulture therapy techniques were beneficial to the cognitive, emotional, and social behaviors of the four CDC students in as little as four months. Horticulture therapy techniques should be utilized more in high schools all across the nation to aid in the development of learning disabled students.

Upon completion of the study, the researcher hoped to be better informed as to how effective her daily job really was. The researcher felt that even though she conducted this study as part of a master's thesis requirement, the researcher's

professional effort as a high school teacher benefited as well. Now, the researcher is more in tune to the effectiveness of activities that are conducted inside and outside the classroom.

While this study suggested the success of using horticulture therapy techniques in high school horticulture classes it also broadened many people's awareness of horticulture therapy principles. This study can serve as a tool for teaching other children in similar environments. It can provide teachers, as well as others, with a greater understanding of horticulture therapy and the effects it can have on special-needs students in their personal and educational lives. The researcher feels that this study will open the door for additional studies to be conducted involving horticulture therapy and youth participants.

Further research is needed to determine the challenges of using horticulture therapy with CDC students in high school horticulture classes. Researchers should examine the possible effects of the following issues on implementing horticulture therapy techniques with CDC students in high school horticulture classes:

- Lack of commitment of regular education teachers to work with these developmentally challenged individuals;
- Lack of school resources needed to mainstream CDC students into horticulture classes;
- Lack of awareness, from regular education teachers, of each of the disabled student's normal behaviors and daily needs;
- Lack of teacher understanding of how to adapt tools for use by these individuals, as well as plant knowledge, including possible poisonous plants.

CHAPTER VI

BENEFITS OF USING HORTICULTURE THERAPY TECHNIQUES WITH CDC STUDENTS IN HIGH SCHOOL HORTICULTURE CLASSES

Overview

Chapter six is a manuscript prepared for submission to the Journal of Therapeutic Horticulture. This chapter contains an abstract, introduction, purpose of the study, methods and procedures, findings, conclusion/recommendations/questions for further study, and literature cited.

Abstract

The purpose of this study was to explore people-plant interactions and discover the effects of using horticulture therapy techniques with four comprehensive development classroom (CDC) students in four high school horticulture classes. This paper discusses the social, emotional, and cognitive benefits that surfaced from this research study. The researcher utilized three instruments in her study: a General Horticulture Knowledge Test, the Rosenberg Self-Esteem Scale, and an Emotions Face Test. It was found that the participants had increased levels of self-esteem, positive changes in emotional behaviors, and gains in cognitive abilities. The quantitative test results combined with qualitative interviews and observations from the researcher, two CDC teachers, and six teacher aides supported the idea that horticulture therapy techniques are beneficial to CDC students enrolled in high school horticulture classes.

Introduction

In today's fast paced world, horticulture is often taken for granted. People often contract their garden and yard work because they do not have time to do it themselves. People may not realize how important the growing of plants (horticulture) is to their lives. We are dependant upon plants for many reasons. Actually, without plants we could not sustain life. The garden can be considered a supermarket, drug store, hardware store, and department store. Food, medicine, lumber, and clothes are examples of plant derived items we need on a daily basis. In addition to supplying us with necessities for life, plants also play an important role in maintaining our health and well-being. Plants and the care of plants can be an immediate stress reliever and can even "heal" the sick. Moreover, plants can be a friend and provide a sense of warmth in our social and spiritual lives.

A number of facilities across the nation are adopting the concept of using horticulture as a therapeutic tool. Horticulture therapy is used with people of all ages and in various types of institutions. Children may be especially responsive to horticulture therapy because an opportunity exists for them to be creative. For example, children who participate in horticulture therapy have a sense of accomplishment because they have something to show for their work. Furthermore, children are proud of what they have done and have a sense of ownership because they have created something useful.

In today's society, children often become depressed because they feel as if no one is their friend, they have been excluded from an activity, and/or someone made a hurtful comment. Plants provide an escape for children. They can be our friend because they do

not discriminate and they are patient (Bruce and Folk, 2003). Plants do not care about gender, race, or ethnicity. In addition, plants can not talk back or make hurtful comments. Plants become our friend and provide a feeling of comfort in time of need.

Horticulture can also be a form of "therapy" for many people. As stated by the American Horticultural Therapy Association (AHTA), "Horticultural Therapy blooms as a profession and a practice. Horticultural therapy (HT) is not only an emerging profession; it is a time-proven practice. The therapeutic benefits of peaceful garden environments have been understood since ancient times" (2007b).

The AHTA further states that, "Today, horticulture therapy is recognized as a practical and viable treatment with wide-ranging benefits for people in therapeutic, vocational, and wellness programs. Horticulture therapy is now taught and practiced throughout the world in a rich diversity of settings and cultures" (2007b). Horticulture therapy is primarily administered by trained professionals; however, in many instances, horticulture therapy techniques can be utilized by many people, including school teachers.

Definition of Horticulture Therapy

What is horticulture therapy? "Horticulture therapy is a process through which plants, gardening activities and the innate closeness we all feel toward nature are used as vehicles in professionally conducted programs of therapy and rehabilitation" (Davis, 2003). For secondary schools, horticulture classes are viewed by many as only an elective. Some feel that it is just another credit to help a student meet the graduation requirements. Horticulture classes could be looked at as a form of "therapy" for troubled teens, the physically handicapped, as well as those students with learning disabilities.

Horticulture therapy is widely used with people of all ages; it has proven to be beneficial for the elderly, as well as children. While horticulture therapy is more often used with elderly patients in nursing homes and assisted living homes, it is also used in schools, prisons, hospitals, and rehabilitation centers. This type of therapy is used with people who are physically disabled; mentally ill; developmentally disabled; victims of abuse; abusers; public offenders; at-risk youth; the socially disadvantaged; the elderly; students of all ages; those with Alzheimer's, AIDS, cancer, heart disease, and depression (Bruce and Folk, 2003). Horticulture therapy is considered to have a "curing effect" on people suffering from many different diseases, emotional disorders, and physical handicaps.

Being around plants and being able to do something with your hands often provides many people, young and old, with feelings of pleasure. Although horticulture therapy is usually administered by trained professionals, its techniques can be utilized by anyone. The researcher in this study broadens the scope of horticulture therapy and illustrates the advantages of its use with learning disabled high school students mainstreamed into horticulture classes.

Even though the practice of horticulture therapy has been around for centuries and the profession for over 30 years, the impact of its use has just begun to be recognized. Horticulture therapy has become a discipline of great importance to health care, rehabilitation, reform, as well as education facilities all across the nation.

Purpose of the Study

The purpose of the study was to explore people-plant interactions and discover the effects of using horticulture therapy techniques with four CDC students in four high school horticulture classes. The central research question addressed during the study was, "How does horticulture therapy affect cognitive abilities, emotional behaviors, and social behaviors of four CDC students in four high school horticulture classes?"

Methods and Procedures

This study evaluated the effects of using horticulture therapy techniques on four CDC students enrolled in horticulture classes at their high school. The four students participating in the study were enrolled in one of four horticulture classes taught at the school. These four classes included fundamentals of agriculture, greenhouse management, floral design, and exterior/interior landscaping. On occasion, participants also came to the researcher's classroom during other class periods during the day. Therefore, at times all four participants may have completed activities together instead of during separate class periods. Pseudonyms were used during the study in order to protect the privacy of the participants. The four student participants were labeled as Brenda, Jennifer, Jason, and Brian. The two CDC teachers were named John and Eddie, while names for the six teacher aides were Cindy, Paige, Allison, Donna, Susie, and Danny. The ages of these CDC students in the trial were 16, 17, 18, and 18 years old for Brenda, Brian, Jennifer, and Jason, respectively. Each student was classified as being mentally retarded (MR) and having some type of learning disability. Since the four CDC students

were not at grade level in their cognitive and/or behavioral development, each student can remain in high school for additional years of learning until it is decided by their IEP Team that they can proceed into the workforce.

Data collection methods used for the study included written exams, interviews, and observations. Oral interviews were conducted with the CDC teachers, as well as the students. Teacher's aides manually completed an interview protocol making notes of any observed changes in behaviors of the students. In analyzing the data, the researcher looked for any changes in cognitive abilities; emotional behaviors; or social behaviors, primarily self-esteem.

The researcher used a total of three different instruments in order to measure various capabilities of each child. These three quantitative instruments utilized during the study consisted of a General Horticulture Knowledge Test, an Emotions Face Test, and the Rosenberg Self-Esteem Scale. The General Horticulture Knowledge Test and the Rosenberg Self-Esteem Scale were each administered to each student participant before beginning the initial study in February, again in March, and at the conclusion of the study in May. The Emotions Face test was administered before and after horticulture activities were completed. Each of the tests was read aloud by the researcher for better understanding by the participants.

The General Horticulture Knowledge Tests (Figure 1) were scored for accuracy of responses and examined for knowledge gained from February to March, March to May, and overall gains from February to May. The researcher also observed the participants in the classroom and horticulture lab and made specific notes in her journal about the students and their reactions to certain activities. This journal was reviewed after the

study was completed and student abilities and attitudes were noted. Quotes from the students were also used during the analysis to help illustrate the participant's increases in cognitive abilities.

The Emotions Face Tests (Figure 2) were coded and categorized by the specified horticulture activity. Before and after responses for each activity were compared to determine if that specific activity caused a change in the emotions felt by the students. Participant responses for each activity were determined by the researcher to be either positive or negative. Then, the emotions felt before an activity and then after the activity were compared to determine if the student had a positive or negative change in emotional behavior due to the specific horticulture activities they participated in. Teacher observations and comments by the students were also used in validating the findings of these tests.

The researcher utilized the Rosenberg Self-Esteem Scale to measure the self-esteem levels of the participants before, during, and after the study (See Figure 3). Each student was asked to circle one answer for each of the ten questions. There were four possible responses for each question which included 1) strongly agree, 2) agree, 3) disagree, and 4) strongly disagree. Points were assigned to each answer on each question. Items 1, 2, 4, 6, and 7, were scored as: Strongly Agree=3, Agree=2, Disagree=1, and Strongly Disagree=0. Items 3, 5, 8, 9, and 10, were scored as: Strongly Agree=0, Agree=1, Disagree=2, and Strongly Disagree=3. The values of each question were totaled with an overall possible score of 30. The higher the number score, the higher the self-esteem was for that person. The researcher also examined each participant's three results (February, March, and May) for similarities and differences.

At conclusion of the study, the three results for each participant were compared to determine the effect horticulture therapy had on the student's self-esteem.

In addition to the quantitative instruments utilized in the study, qualitative methods were also used. These qualitative methods included observations and interviews. Daily observations were made by the researcher and noted in her journal. The four students were interviewed individually at the conclusion of the study. The two CDC teachers were interviewed before the study started and at the conclusion of the study. Six teacher aides, who worked with the students throughout the day, were also involved in the study by completing an interview protocol on paper. Due to some of the aides not wanting to be interviewed, they manually completed the questions listed in the interview protocol (Figure 4). If questions arose while analyzing the results of the interview protocol, the researcher would set up a time to meet with the teacher aide to clarify the comments made by the teacher aide.

Findings

One objective of the study was to monitor cognitive horticultural abilities; emotional behaviors; and social behaviors, primarily self-esteem, of each student participants. None of the four CDC students possessed any major physical limitations before the study. Brian however did function slower because he was overweight. In addition, Brenda had a minor handicap in her legs which would limit her from walking long distances. However, this did not affect her behavior at anytime during the study.

Although the participants did not have major physical limitations, they were not very familiar with garden tools and how to complete certain garden tasks.

Cognitive Abilities

The General Horticulture Knowledge Test scores of each participant were compared to assess the amount of knowledge each student gained during the study (Table 19). The students answered all questions correctly on the final test given in May. Brenda and Jennifer had 66.7% (ten points) gains in test scores during the four month period, showing their increase in cognitive abilities. Brenda's and Jennifer's scores were 5, 8, and 15, respectively. Brenda's answers about mulch were unacceptable, prior to and during the study. However, after the study, she knew what mulch was. In addition, she did not know how to germinate plant seeds nor was she able to list the seven main parts of a flower prior to or during the study. However, after the study she understood how to do each of these. On the other hand, she was able to identify on all three tests what a rake and a shovel were, as well as know what grows in a greenhouse. Jennifer's results were quite similar to Brenda's. For example, Jennifer did not know what mulch was nor did she know what a weed was both prior to and during the study. However, on the final test, she answered both acceptably. In addition, on all three tests she was able to identify a rake and a shovel correctly and she also knew when to water plants in the greenhouse.

Jason scores were slightly higher prior to and during the study. He scored 6, 11, and 15, respectively. His scores improved 60% (nine points), thus demonstrating increased cognitive abilities. Prior to the study Jason did not know how to germinate seeds or transplant tomato plants. However, he knew how to do both on the second test as well as the final test. In addition, he was not able to list the seven main parts of a

flower and he did not know how to make a flower arrangement prior to and during the study.

Brian had the highest score at the beginning of the study with a 7. Brian then scored a 10 and finished with a perfect score of 15; a 53.3 % (eight points) improvement. Brian was not initially familiar with how to germinate plant seeds; what mulch was; that tulips grew from a bulb; how to make a flower arrangement; how to transplant tomato plants; or that all flowers cannot grow in the sun. On the final test, he knew the correct responses to all those questions, illustrating an increase in horticulture knowledge and skills learned during the study. The final scores of all participants illustrated the relative tremendous increase in horticulture knowledge gained by participating in a high school horticulture class.

At the conclusion of the study, each of the four participants stated that they learned how to complete tasks they had never done before. Some of these tasks included: spreading mulch with a rake, sowing seeds, transplanting tomato seedlings, transplanting flower plugs, planting flowers in container pots, and making flower arrangements. The cognitive advancements were further witnessed in the classroom by the researcher, two CDC teachers, and six teacher aides. Specific quotes by the participants acknowledged new skills and learned tasks which they developed. Brenda stated, “I have learned how to water plants and what plants to put in the sun. I can talk to plants and keep my eye on them. I have learned how to help my boyfriend’s mamaw with her plants.” Jennifer also concluded that she learned new skills. She stated, “I have learned how to plant flowers, and how to make a flower arrangement.” Jason added, “I have learned how to water plants, plant flowers, haul and rake mulch, and how to cut the grass.” Brian noted his

learned tasks as well, “I have learned how to grow flowers, tomatoes, pumpkins, and watermelons at my farm.”

Emotional Behaviors

The Emotions Face Test (Figure 2) demonstrated that horticulture activities had a positive impact on the four participant’s emotions during the study. The horticulture activities used to report the change in emotions of each participant included seed propagation, transplanting tomato and pepper seedlings, designing a flower arrangement, spreading mulch, weeding flower beds, selling plants to the public, and planting flowers in container pots. Most of the activities caused an improvement in student emotions. The students commented that they felt happier and more alert after completing the tasks. In some instances, the students may have circled a negative emotion before an activity began. In most instances, this emotion was changed to a positive emotion after completion of the assigned project. The researcher asked about the negative emotions in each case and the negativity was usually related to problems stemming from home or in the CDC classroom. Overall, the Emotions Face Test proved that horticulture activities had a positive influence on the emotional behaviors of each of the four participants.

Brenda showed positive emotional changes after all six of the tested horticulture activities were completed. Before the seed propagation activity, Brenda reported that she felt happy, confused/frustrated, and tired/sleepy. She said that she was frustrated about something from another class and she felt sleepy because she had just eaten lunch. She added that the activity, “Made me feel better, and I am not tired anymore.” Before transplanting tomato and pepper seedlings, Brenda noted that she felt afraid/scared because she was intimidated by other kids. She also reported that she felt mad/angry at a

student from another class in school. Brenda also circled tired/sleepy before beginning the activity. After the activity, Brenda noted that she felt very happy, but was still a little tired and sleepy. She commented that the activity, "Made me feel better. I enjoyed talking with the other kids in class." Brenda really enjoyed getting to make a flower arrangement. She made a beautiful bouquet of white roses with leather leaf fern, asparagus fern, and baby's breath used as filler. Before the activity, she commented that she felt happy. After, she was noted as changing her emotions to very happy and surprised. She stated, "It made me feel good to make something for someone else. I can't believe I made something like that."

In the fourth activity, the researcher tested the activities of spreading mulch and weeding flower beds. Brenda circled the tired/sleepy face before beginning the activity, and then circled the happy face afterwards. However, she commented, "I am glad to be back inside, where it is cool. Activity number five tested the emotions felt before and after working in the greenhouse selling plants to customers. Brenda noted she was tired/sleepy before going to the greenhouse. Upon completion of sales for the day, she remained tired/sleepy, but also felt happy and sad. Brenda commented on her responses, "The other kids in class did not talk to me today, but I did enjoy helping the customers. I am still tired but not as much as before." The last activity tested was the planting of flowers into container pots to sell. She circled mad/angry and tired/sleepy before beginning the activity. She commented that some other kids had made her mad in another class earlier in the day. After the activity, she felt very happy and surprised. She remarked, "I made new friends today. Normal kids don't usually talk to special ed kids."

In conclusion, the researcher observed that Brenda's positive changes in emotions were due to the horticulture activities in which she participated.

Jennifer showed positive emotional changes in five of the six tested horticulture activities. Before the seed propagation activity, Jennifer reported that she felt tired/sleepy and worried. She said that she was afraid that she would not do it right because she was not good at anything. After the activity, Jennifer circled happy. She said, "I am not sleepy anymore, and I did it right." Before transplanting tomato and pepper seedlings, Jennifer noted that she felt happy. After the activity she was very happy. She stated "That made me feel better, and it is more calming than class work." Jennifer also enjoyed making a flower arrangement for her mother. Before beginning the design, she felt confused/frustrated and mad/angry. When asked about her response, she said that she was confused about something from her math class and one of the students in her CDC class had been aggravating her about her having a boyfriend. Once the arrangement was finished, Jennifer changed her response to happy. She said, "That is really pretty, did I do that?"

For the fourth activity, the researcher tested the activities of spreading mulch and weeding flower beds on the school grounds. Jennifer in her domineering voice stated, "I hate this, it is too hot out here!" While she circled tired/sleepy before, she progressed to being mad/angry once we returned inside. She added, "I don't like being outside when it is so hot!" This was the only activity for which Jennifer showed a negative emotional change. The researcher feels that the temperature outside and the "prickly" holly bushes contributed to her response. Activity number five tested the emotions felt before and after working in the greenhouse selling plants to the customers. Jennifer noted she was

tired/sleepy as well as sad and worried before going to the greenhouse. Upon completion of sales for the day, she felt happy and surprised. Before the activity, she stated, "I am not good at helping people." Afterwards, she replied, "I knew more about those plants than I thought I did." The last activity tested was the planting of flowers into container pots to sell. She circled mad/angry and tired/sleepy before beginning the activity. She commented that she was mad at her mom about something she did to her the previous night. After the activity, she felt happy. Jennifer remarked, "I am not mad or sleepy anymore." In conclusion, the researcher observed that Jennifer's positive changes in emotions were linked to the horticulture activities in which she participated.

Jason had positive emotional changes in each of the six tested horticulture activities. Jason came into class often feeling sleepy, as can be seen in the following data. Jason was a jokester, repeatedly trying to pull something on the researcher. He also frequently tried to sneak naps in class. Before the seed propagation activity, Jason did report that he felt tired/sleepy but also happy. After the activity, he circled very happy and surprised. He commented, "That was fun. We got a lot done." Before transplanting tomato and pepper seedlings, Jason again circled happy along with tired/sleepy. After the activity, he was happy, surprised, but still tired/sleepy. He stated, "It was awfully warm in that greenhouse. I could have taken a nap." Before making a flower arrangement, Jason again circled happy along with tired/sleepy. After completion of the arrangement, he changed his response to very happy and surprised. He commented, "I am going to give this to my girlfriend. It is really pretty."

Jason only circled tired/sleepy before the fourth activity, the activities of spreading mulch and weeding flower beds on the school grounds. After finishing

outside, he felt happy and sad. He said, "I am hot! I need some water." After talking with Jason, the researcher decided this was the only reason he felt sad. Before the final two activities, he felt happy as well as a little tired and sleepy. Afterwards, he circled only happy for both activities. After selling plants in the greenhouse, he commented, "I like helping them pick out what they want and carrying it to their car for them." After planting flowers in container pots, he remarked, "I like working outside." In conclusion, the researcher observed that Jason's positive changes in emotions were connected to the horticulture activities in which he participated.

Brian also had positive emotional changes in each of the six tested horticulture activities. He reported that he felt tired/sleepy but also happy before the seed propagation activity. After the activity, he circled happy along with very happy and again chose tired/sleepy. He commented, "That made me feel happier and better, but I am still a little tired." Before transplanting tomato and pepper seedlings, Jason again circled happy along with tired/sleepy. After the activity, he was happy, and still a little tired/sleepy. He stated, "I am not as tired as I was before." Before making a flower arrangement, Brian was recorded as feeling mad/angry along with tired/sleepy. The researcher asked Brian why he was so mad and he replied, "I am mad because my watermelons got flooded out and I have to replant them." After completion of the arrangement, he changed his response to very happy. He commented, "I liked making that. I am going to give it to my Granny. She is in the hospital sick."

For the fourth activity, the researcher tested the activities of spreading mulch and weeding flower beds on the school grounds. This time Brian circled happy along with tired/sleepy before the activity. After finishing outside, he still felt happy. Even though

the other students had complained about it being so hot outside, Brian never complained. Instead, with a smile, he said he felt happy. Brian also seemed to enjoy the customer service activity. Brian felt happy before the activity and very happy afterwards. Before the sixth activity, Brian felt tired/sleepy while afterwards he circled happy as his felt emotion. He commented, "I liked learning how to do that. I can help my Granny now." In conclusion, the researcher observed that just as Brenda, Jennifer, and Jason's positive changes in emotions were in fact due to the horticulture activities, Brian's were also.

Social Behaviors

The researcher utilized the Rosenberg Self-Esteem Scale (Figure 3) to measure the self-esteem levels of the participants before, during, and after the study. The researcher analyzed the data collected in February, then from February to March, then March to May, then finally as a whole from February to May. The researcher was primarily looking at statements to determine if they were positive or negative responses.

After the analysis of the scales, the researcher used the Likert approach to score each test. When scored using a Likert approach, the Rosenberg Self-Esteem Scales response values of each participant showed an increase in self-esteem over the four month period (Table 20). The researcher also examined each participant's scales from February, March, and May for similarities and differences and made a note of that as well. At conclusion of the study, the three scales for each participant were compared to determine the effect of horticulture therapy on the student's self-esteem.

Brenda scored a 14, 15 and 17, in February, March, and May, respectively, on the Rosenberg Self-Esteem Scale, with an overall increase of three points (Table 20). Jennifer also had an increase of three points overall. She scored a 15, 15, and 18,

respectively. Jason scored a 13, 17, and 14 showing an increase of four points, then a drop of three points, but with an overall increase of one point. Brian showed the largest increase on the second test, with an improvement from 14, to an 18 score, but then declining to a 17 on the final test. He showed an overall gain of three points. Therefore, from the beginning of the study to the end, all participants showed a gain in overall self-esteem.

The students increase in self-esteem was also observed by the researcher, both CDC teachers, as well as the six teacher aides. Quotes from the participant's interviews also contributed to these findings. Due to the learning disabilities of the students, quotes are not all grammatically correct, but were left unchanged to avoid alterations in data collected. Some of the quotes which indicated an increase in self-esteem consisted of the following: Brenda stated: "This class made me have more friends." She added "Makes me feel good because I can smell flowers" and also stated, "When people are mean to me, I just go to flowers because it makes me forget about everyone and what everyone says to me." Jennifer also contributed statements which confirmed the increase in self-esteem levels. She stated, "I like working with flowers because it gets you somewhere in life." Even though Jason commented, "It's a little hard and it's hard to make friends in this class," Brian felt just the opposite. Brian replied, "I have learned to talk to others." He also commented on making flower arrangements to give to others. He added, "Giving flowers to people makes them smile." Brian continued, "Makes me happy to give it to them." Data from the Rosenberg scales coupled together with the researcher's observations and quotes from the participants, showed an increase in the participants' self-esteem levels.

Success of Horticulture Therapy in the Classroom

The use of horticulture therapy techniques within the horticulture classroom allowed for those special-needs students mainstreamed into the class to receive hands-on training that related to real life. As stated by CDC teacher, John, "The horticulture classes are beneficial to the students in that it prepares them for the future. They are also given the chance to interact with typical kids, which doesn't happen often." CDC teacher Eddie added, "Overall, the horticulture class was a very positive influence on the students." Special needs children often desire to be "normal". The horticulture classroom is a great place to implement horticulture therapy techniques with these students, while at the same time providing interaction with the regular education students. Through the horticulture therapy projects completed in class, students were given the chance to be creative and use their imagination. Although horticulture therapy is often performed by health care professionals, this study showed the success of using it in a classroom setting.

Hands-On Learning Environment

While there are many ways in which children learn, the four participants of this study proved the importance of a hands-on learning environment. Some children are more visual or verbal learners; however, in many instances children learn at a faster pace if allowed to actually "do" something with their hands. A child given the opportunity to learn by doing often retains this learned information for a greater period of time. The hands-on learning approach of the horticulture classroom used in the study provided the CDC children an opportunity to learn by doing. With all four of the children being learning disabled, a typical classroom setting would not have been as effective. The

researcher knew from experience that children with learning disabilities often struggle to learn from the classic classroom lecture approach or from book assignments. As reported by the CDC teachers John and Eddie, the reading and math competency levels of all four participants were classified as lower elementary level. In view of this, the researcher knew that a hands-on learning environment would be an ideal situation for the participants to learn. All the students demonstrated their understanding of certain activities by their overall perfect scores on the General Horticulture Knowledge Test. According to one of the six CDC teacher aides, Cindy, "A hands-on class tends to eliminate the obstacle of a learning disability, allowing the student the freedom to learn through doing, which tends to stick with them better, because they can attach tactile experiences to the lesson."

Natural World Perceptions of Children

The researcher viewed the child as a participant in the garden to grasp the perceptions children hold of the natural world. When working with children it is essential for one to understand how a child views and communicates with his/her surroundings (Pentz and Straus, 2003). As stated by Bruce, "Not very many years ago, children grew up in a rural setting" (1999). In the past, the family farm gave children a chance to gain a connection to plants. All across the nation, these farms are being divided up to make room for new homes and industries. Many children today don't receive this people-plant interaction at a young age. In today's society, children are often "given" what they want. They are not made to work for it; they just have their parents buy it. Children must be given the chance to work with others and given a chance to succeed, whether it is in the home or at school.

In beginning the study, the researcher noticed the lack of plant knowledge and general horticulture skills of the four participants. Children often take the environment and the natural surroundings for granted, not aware of their significance to our survival, as well as our health and well-being. The researcher felt that at the conclusion of the study, all four of the participants developed an aesthetic appreciation for horticulture. As Brenda stated, "I don't know what it is, but I love flowers. If it was just me in this school I would not care because I have flowers to keep happy." Jennifer added that flowers "make the community a better and happier place." According to the CDC teacher John, participant Jason "found that he liked greenhouse class better than he thought he would." John mentioned that Jason really did not fully understand what a person did in a greenhouse until he took the class. After a few weeks in class, Jason wanted to go to greenhouse class all the time, as CDC teacher John remembered. "Brian was the same way," as CDC teacher Eddie recalled. He added, "He was always asking me if he could go to the greenhouse because he was learning how to do things he had never done before." In view of this information, the participants seemed to grasp an awareness of the natural world and an understanding of the importance of plants in our daily lives.

Conclusions/Recommendations/Questions for Further Study

Horticulture therapy is a rapidly growing practice as well as profession. It has emerged from being used primarily with mentally ill patients to being used with numerous population groups today. Youth and the learning disabled are two groups of importance to this study. Young people are connected to nature in many ways. The garden serves as an ideal place for them to be creative and explore their surroundings.

By working in the garden, the youth also tend to develop a sense of responsibility for themselves. The central research question addressed during the study was, "How does horticulture therapy affect cognitive abilities, emotional behaviors, and social behaviors of four CDC students in four high school horticulture classes?"

The researcher monitored cognitive horticulture abilities; emotional behaviors; and social behaviors, primarily self-esteem of each of the four student participants. This study revealed that the participants had increased levels of self-esteem, positive changes in emotional behaviors, as well as gains in cognitive abilities during the four month case study. As seen in the General Horticulture Knowledge Test, all four CDC students had 53% to 66% improvement during the four month study. Each of the students progressed from identifying less than half of the answers correctly to identifying all the answers correctly on the final test in May. After the study, the students were more knowledgeable about horticulture in general and were also more physically involved with projects since they understood what to do and how to do it. The horticulture therapy techniques improved the cognitive horticultural abilities of the four CDC students used in this study.

The study also showed that the participants developed positive emotional changes due to their exposure to horticulture activities. As found in the Emotions Face Test, students responded positively to most horticulture activities completed. Students progressed from showing negative emotions, such as being tired and angry, to displaying positive emotions, such as very happy, after the activity. Positive changes in the student's emotions could be immediately seen by the researcher. This instrument further demonstrated the success of using horticulture therapy techniques with CDC students in high school horticulture classes.

The horticulture therapy techniques used during the study also encouraged an increase in self-esteem levels of each participant. As seen in the Rosenberg Self-Esteem Scale, each of the four students showed an increase in self-esteem levels during the four month study.

Each of the three instruments used in the study proved that horticulture therapy worked on the four participants. In addition, CDC teachers noted the impact of CDC students being able to interact with other youth, particularly regular education students. The CDC students each developed relationships with regular education students, making new friends they will treasure for a long time.

Each of the four participants proved that despite their learning disabilities, they can benefit from a hands-on learning environment. Test results combined with interviews and observations of student participants, teachers, and teacher aides supported the idea that these four students in the study do learn better in a hands-on learning environment.

After the study, the researcher concluded that each of the four CDC students developed an aesthetic appreciation for horticulture. As one student stated, "Flowers make the community a better and happier place." As observed by the researcher, each of the students grasped an awareness of the natural world and an understanding of the importance of plants in our daily lives.

In conclusion, horticulture therapy techniques worked with the four CDC students utilized in this study. The study showed that horticulture therapy techniques were beneficial to the cognitive, emotional, and social behaviors of the four CDC students in as

little as four months. Horticulture therapy techniques should be utilized more in high schools across the nation to help in the development of learning disabled students.

While this study proved the success of using horticulture therapy techniques in high school horticulture classes it also broadened many people's awareness of horticulture therapy principles. This study can serve as a tool for teaching other children in similar environments. It can provide teachers, as well as others, with a greater understanding of horticulture therapy and the effects it can have on special-needs students in their personal and educational lives. The researcher feels that this study can open doors for other studies to be conducted involving horticulture therapy and youth participants.

Further research is needed to determine the challenges of using horticulture therapy with CDC students in high school horticulture classes. Researchers should examine the possible effects of the following issues on implementing horticulture therapy techniques with CDC students in high school horticulture classes:

- Lack of commitment of regular education teachers to work with these developmentally challenged individuals;
- Lack of school resources needed to mainstream CDC students into horticulture classes;
- Lack of awareness, from regular education teachers, of each of the disabled student's normal behaviors and daily needs;
- Lack of teacher understanding of how to adapt tools for use by these individuals, as well as plant knowledge, including possible poisonous plants.

FIGURES AND TABLES FOR CHAPTER SIX

General Horticulture Knowledge Test

Student Name: _____
Date: _____

Circle the correct answer for each question below. If you do not know the answer, please do not guess, circle I Do Not Know.

1. *What does Horticulture include?*
   - *A. Fruits and flowers*
   - *B. Fruits, Nuts, Vegetables, Ornamental Plants and Flowers*
   - *C. Flowers and Vegetables*
   - *D. I Do Not Know*

2. *I know how to germinate plant seeds.*
   Yes *No*

3. *I can name the 7 main parts of a flower.*
   Yes *No*

4. *I can make a flower arrangement by myself.*
   Yes *No*

5. *What grows in a greenhouse?*
   - *A. Flowers*
   - *B. Flowers and other plants*
   - *C. Nuts*
   - *D. I do not know*

6. *Which one is a rake? (show object)*
   - *A. #1*
   - *B. #2*
   - *C. #3*
   - *D. I do not know*

7. *Which one is a shovel?(show object)*
   - *A. #1*
   - *B. #2*
   - *C. #3*
   - *D. I do not know*

Figure 1. *General Horticulture Knowledge Test*

8. *When watering plants in the greenhouse, I should:*
- *A.* *Soak them till water runs out bottom of the container*
- *B.* *The less you water them the better.*
- *C.* *Only water what is dry at that time.*
- *D.* *I do not know.*

9. *I know what mulch is.*
Yes *No*

10. *What type of greenhouse do we have?*
- *A.* *Quonset*
- *B.* *A-Frame*
- *C.* *I do not know*

11. *A weed is*
- *A.* *good for the flowers.*
- *B.* *something not wanted.*
- *C.* *I do not know.*

12. *A tulip grows from a*
- *A.* *seed.*
- *B.* *bulb.*
- *C.* *I do not know.*

13. *I know how to transplant tomato plants.*
Yes *No*

14. *All flowers can grow in the sun?*
Yes *No* *I do not know*

15. *All flowers have to be planted every year.*
Yes *No* *I do not know*

Figure 1 Continued.

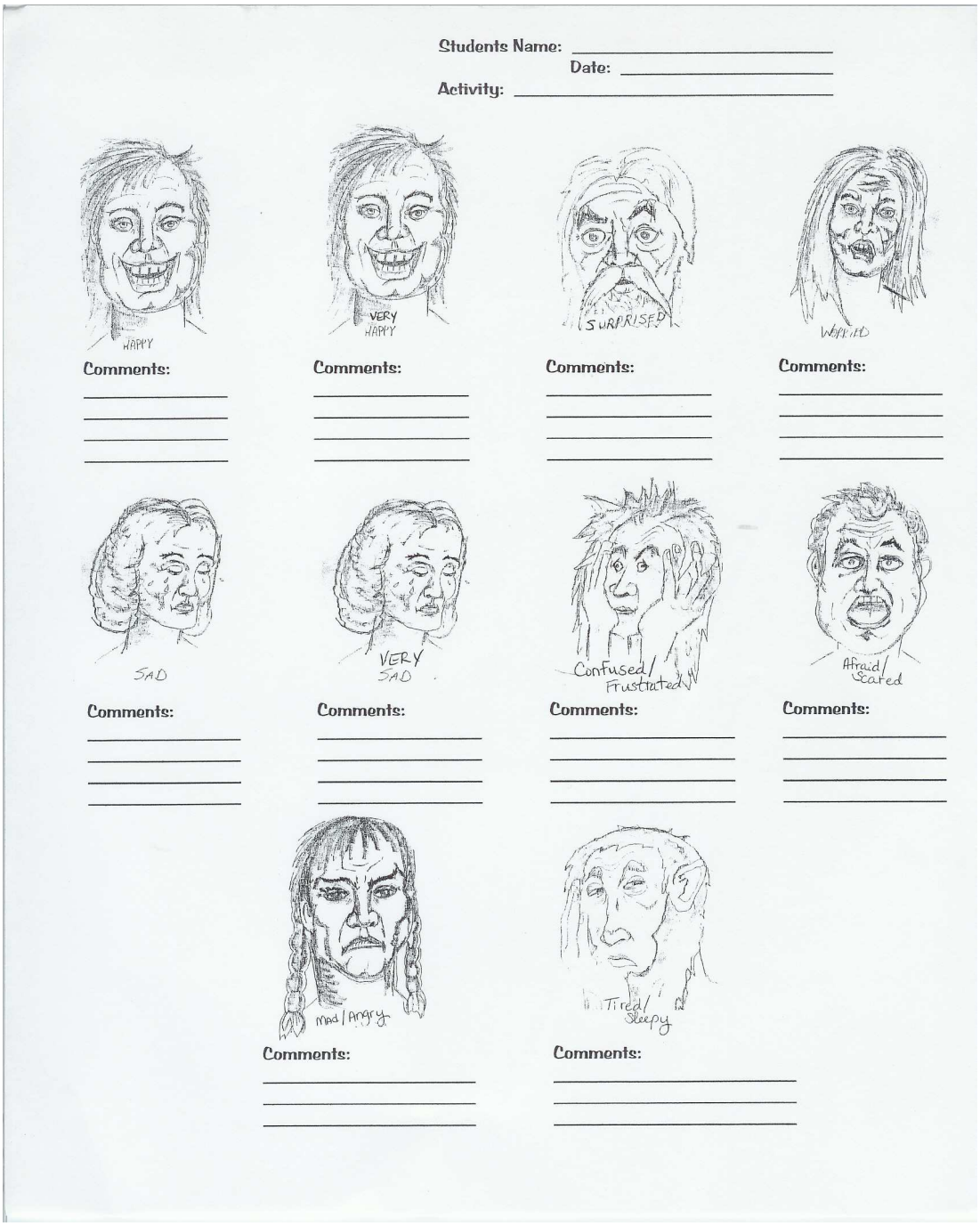

Figure 2. *Emotions Face Test*

Rosenberg Self-Esteem Scale

Name: _____

Date: _____

Instructions: *Below is a list of statements dealing with your general feelings about yourself. If you strongly agree, circle SA. If you agree with the statement, circle A. If you disagree, circle D. If you strongly disagree, circle SD.*

1.	*On the whole, I am satisfied with myself.*	*SA*	*A*	*D*	*SD*
2.	*At times, I think I am no good at all.*	*SA*	*A*	*D*	*SD*
3.	*I feel that I have a number of good qualities.*	*SA*	*A*	*D*	*SD*
4.	*I am able to do things as well as most other people.*	*SA*	*A*	*D*	*SD*
5.	*I feel I do not have much to be proud of.*	*SA*	*A*	*D*	*SD*
6.	*I certainly feel useless at times.*	*SA*	*A*	*D*	*SD*
7.	*I feel that I'm a person of worth, at least on an equal plane with others.*	*SA*	*A*	*D*	*SD*
8.	*I wish I could have more respect for myself.*	*SA*	*A*	*D*	*SD*
9.	*All in all, I am inclined to feel that I am a failure.*	*SA*	*A*	*D*	*SD*
10.	*I take a positive attitude toward myself.*	*SA*	*A*	*D*	*SD*

Figure 3. *Rosenberg Self-Esteem Scale*

Interview Protocol (Adults)

Interviewee: _____
Student Involved: _____
Date: _____

Question#1: Can you tell me more about _____ and his/her social interaction at the present time?

Question #2: Can you tell me more about _____ and his/her emotional status at the present time?

Question #3: Can you tell me more about _____ and his/her cognitive abilities at the present time?

Question #4: Can you tell me more about _____ and his/her physical abilities at the present time?

Question #5: Can you tell me more about your belief on mainstreaming CDC students into the regular education classrooms.

Figure 4. *Interview Protocol*

Interview Protocol (Adults)

Interviewee: _____
Student Involved: _____
Date: _____

Question #6: Can you elaborate on your feelings of why _____ is taking a horticulture class this year?

Question #7: Can you tell me more about the self esteem of _____ at the present time?

Question #8: Any other additional comments on _____.

Figure 4 Continued.

Interview Protocol (Adults-End of Study only)

Interviewee: _____
Student Involved: _____
Date: _____

Please elaborate on the following:

**Do you feel that hands-on classes, such as Greenhouse, Landscaping and Floral Design are important to include in a student's IEP? Why or Why not?*

**Do you feel that the horticulture classes were beneficial to the students you have in class. Please discuss the positive and negative impact it may have shown on each individual student without using their names. Please use assigned #'s (for example, #1….., and #2…..).*

Figure 4 Continued.

Table 19

General Horticulture Knowledge Test, Overall Scores and Gains of Each Participant.

Participants	***Test Scores***			***% Gains***		
	Prior to Study February, 2007	*During Study March, 2007*	*Conclusion of Study May, 2007*	*Feb. to March*	*March to May*	*Feb. to May*
Brenda	5	8	15	20.0%	46.7%	66.7%
Jennifer	5	8	15	20.0%	46.7%	66.7 %
Jason	6	11	15	33.3%	26.7%	60.0%
Brian	7	10	15	20.0%	33.3%	53.3%

Note: Scores and Percentages are Based on a Possible Score of 15.

Table 20

Rosenberg Self-Esteem Scale, Overall Scores and Gains of Each Participant.

Participants	***Test Scores***			***Gains***		
	Prior to Study February, 2007	*During Study March, 2007*	*Conclusion of Study May, 2007*	*Feb. to March*	*March to May*	*Feb. to May*
Brenda	14	15	17	1	2	3
Jennifer	15	15	18	0	3	3
Jason	13	17	14	4	-3	1
Brian	14	18	17	4	-1	3

Note: Scales were scored using Likert approach, and based on a possible score of 30.

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APPENDICES

APPENDIX A

IRB APPROVAL

THE UNIVERSITY of TENNESSEE
Institutional Review Board
Office of Research
1534 White Avenue
Knoxville, TN 37996-1529
Phone: (865) 974-3466
Fax: (865) 974-7400

02/16/2007

IRB#: 7247 B

TITLE: The use of horticulture therapy techniques on four CDC students in high school horitculture classes

Mundy, Jamie
Agricultural & Extension Education
PO Box 363
Speedwell, TN 37870

Fritz, Carrie
Agricultural & Extension Education Program
325 Morgan Hall
Campus

Your project listed above was reviewed and has been granted approval under Expedited review.

This approval is for a period ending one year from the date of this letter. Please make timely submission of renewal or prompt notification of project termination (see item #3 below).

Responsibilities of the investigator during the conduct of this project include the following:

1. To obtain prior approval from the Committee before instituting any changes in the project.
2. To retain signed consent forms from subjects for at least three years following completion of the project.
3. To submit a Form D to report changes in the project or to report termination at 12-month or less intervals.

The Committee wishes you every success in your research endeavor. This office will send you a renewal notice (Form R) prior to the anniversary or your approval date.

Sincerely,

Brenda Lawson
Compliances

APPENDIX B

PERMISSION AND CONSENT FORMS

January 30, 2007

Dear Parent, Teacher, or Aide:

I, Jamie Mundy, am conducting a study of the use of horticulture therapy techniques on four CDC students in high school horticulture classes. You have been selected as a panel member for this study because of your involvement with the students and their personal and educational lives.

This study will prove the success of using horticulture as therapy in high school horticulture classes. This study will provide others, including educators and community members, with a greater understanding of horticulture therapy and the effects it can have on special needs students in their personal and educational careers. It can serve as a tool for teaching other children in this exact or similar environment. I feel that this study will open doors for other studies to be conducted involving horticulture therapy and youth participants.

The study will last approximately four (4) months and will involve a series of three (3) interviews. You will be asked to respond to four to five open-ended questions at each interview session. We will take the answers from each interview and continue with them based upon what you feel the students have or have not progressed on.

Your participation in this study is completely voluntary. All participants will be given a pseudonym to obtain confidentiality and all statements will be referred to utilizing the pseudonym for each respondent.

If you have questions about the study, please feel free to email or call me. My email address is mundyj@k12tn.net and my telephone number is (423) 626-7474.

Your cooperation is greatly appreciated.

Sincerely,

Jamie Mundy
Horticulture Teacher at Claiborne High School
UT Graduate Student, Agricultural and Extension Education

January 10, 2007

Parent/Guardian of
<<Agriculture Student>>
<<Address>>
<<City, State, Zip>>

Dear Parent/Guardian:

Your child is currently enrolled in a horticulture course at _____ High School. Because of his/her interest in horticulture, your son/daughter is being asked to participate in a study conducted by the University of Tennessee Agricultural and Extension Education Program.

You child is being invited to become a member of the study by providing valuable information related to the impact that horticulture therapy has had on his/her personal development and education goals. This study will provide information students, teachers, educators, and community members can use to understand the impact of the horticulture classes on CDC students.

The enclosed form describes the nature of the study. The study will last approximately four months and will involve your child being interviewed by the teacher/researcher, Jamie Mundy. A pseudonym will be used to maintain confidentiality of participants.

Your child's participation is completely voluntary. However, his/her participation would be greatly appreciated. After reviewing the consent form, if you agree that your child my participate in this study, please sign one copy of the form and return it to school with your child.

Jamie Mundy, the high school horticulture teacher and a Graduate Student at the University of Tennessee, will be working on this study. If you have any questions, please feel free to contact me at mundyj@k12tn.net or (423) 626-7474.

Sincerely,

Jamie Mundy
Horticulture Teacher
UT Graduate Student

INFORMED CONSENT STATEMENT-INTERVIEW (ADULT)

The Use of Horticulture Therapy Techniques on Four CDC Students in High School Horticulture Classes

INTRODUCTION

You are invited to participate in a research study. The study will focus on the impact that horticulture therapy has on CDC students enrolled in high school horticulture classes. The study will focus on the impact that horticulture therapy has on CDC students enrolled in high school horticulture classes. The purpose of the study will be to explore people-plant interactions and discover the effects of using horticulture therapy techniques on four CDC students in high school horticulture classes. The central research question being addressed during the study is, "How does horticulture therapy affect the social, emotional, and cognitive behaviors of the CDC students in high school horticulture classes?"

Objectives of the study are:

1. To monitor the cognitive horticultural abilities, as well as the social and emotional behaviors of each of the four CDC students.
2. To investigate how high school horticulture classes are successful tools of horticulture therapy.
3. To recognize how CDC students learn in a hands-on classroom setting.
4. To view the child as a participant in the garden and grasp the perceptions children hold of the natural world.

_____ Participant's initials

INFORMATION ABOUT PARTICIPANTS INVOLVEMENT IN THE STUDY

As a participant in this study, you will be interviewed. The information gained form the interviews will be used in written research publications and a graduate thesis to describe the use of horticulture therapy techniques on CDC students. The following are the terms of participating in the study:

a. The information obtained during this project will be used to write research publications and a graduate thesis that may be read by the participant and other individuals.
b. You agree to participate in an in-depth interview and understand that the interview will last approximately thirty minutes each. There will be three interviews conducted. You will be asked to share your thoughts and opinions related to observations of any changes you notice in your child's cognitive, physical, social and emotional behaviors. How you structure that story and what information you choose to share will be up to you. It is assured that your identity will be kept confidential by using a pseudonym for your name, as well as the students' name.
c. The interview will be tape-recorded and the researcher will transcribe the tapes after the interview has taken place.
d. Real names will not be used during data collection or in the written case study.
e. The participant will receive a copy of the study before the final draft is written and negotiate changes with the researcher.
f. The participant will receive a copy of the final research report soon after completion.

RISKS

The risks are minimal for participating in this study. If you choose to share personal stories be cautioned that those stories may be included in the final written report. However, I will not share your personal stories with others and when written in the final report, a pseudonym for your name will be used.

BENEFITS

The benefit of the study is to provide information to other teachers and administrators regarding the impact horticulture therapy and hands-on learning can have on CDC students. Understanding this impact will help improve horticulture programs as well as other vocational programs for CDC students.

_____ Participant's initials

CONFIDENTIALITY

The information in the study records will be kept confidential. Data will be stored in a locked filing cabinet in Dr. Carrie Ann Fritz's office located at 325 Morgan Hall. Data will be made available only to persons conducting the study unless participants specifically give permission in writing to do otherwise. No reference will be made in oral or written reports, which could link participants to the study.

CONTACT INFORMATION

If you have any questions at any time about the study or the procedures, you may contact Jamie Mundy at (423) 626-7474 or Dr. Carrie Ann Fritz at the University of Tennessee, 325 Morgan Hall, (865) 974-4830. If you have any questions about the rights as a participant, contact Research Compliance Services of the Office of Research at (865) 974-3466.

PARTICIPATION

Participation is entirely voluntary. You may refuse to participate or discontinue participation in this research project at any time. If you decide to participate, you may withdraw from the study at anytime without penalty. If you withdraw from the study before data collection is completed your data will be returned to you or destroyed.

CONSENT

I have read the above information. I have received a copy of this form. I agree to participate in the study.

Participant's Signature _____ Date _____

Investigator's Signature _____ Date _____

INFORMED CONSENT STATEMENT-INTERVIEW (STUDENT) PARENTAL PERMISSION FORM

The Use of Horticulture Therapy Techniques on Four CDC Students in High School Horticulture Classes

INTRODUCTION

Your child is invited to participate in a research study. The study will focus on the impact that horticulture therapy has on CDC students enrolled in high school horticulture classes. The purpose of the study will be to explore people-plant interactions and discover the effects of using horticulture therapy techniques on four CDC students in high school horticulture classes. The central research question being addressed during the study is, "How does horticulture therapy affect the social, emotional, and cognitive behaviors of the CDC students in high school horticulture classes?"

Objectives of the study are:

1. To monitor the cognitive horticultural abilities, as well as the social and emotional behaviors of each of the four CDC students.
2. To investigate how high school horticulture classes are successful tools of horticulture therapy.
3. To recognize how CDC students learn in a hands-on classroom setting.
4. To view the child as a participant in the garden and grasp the perceptions children hold of the natural world.

_____ Participant's initials

INFORMATION ABOUT PARTICIPANTS' INVOLVEMENT IN THE STUDY

As a participant in this study, the child will be interviewed. The information gained form the interviews will be used in written research publications and a graduate thesis to describe the use of horticulture therapy techniques on CDC students. The following are the terms of participating in the study:

a. The information obtained during this project will be used to write research publications and a graduate thesis that may be read by the participant and other individuals.
b. You agree to allow the child to participate in in-depth interviews and understand that the interview will last approximately 30 minutes each. There will be three interviews conducted. The child will be asked to share their thoughts and opinions on their own cognitive, physical, social and emotional behaviors. How they structure that story and what information they choose to share will be up to them. It is assured that their identity will be kept confidential by using a pseudonym for their name.
c. Each interview will be tape-recorded and the researcher will transcribe the tapes after each interview has taken place.
d. Real names will not be used during data collection or in the written case study.
e. The participant will receive a copy of the study before the final draft is written and negotiate changes with the researcher.
f. The participant will receive a copy of the final research report soon after completion.

RISKS

The risks are minimal for participating in this study. The student responses will remain confidential to protect the identity of the student. No reference will be made in oral or written reports which could link participants to the study. Pseudonyms will be used for the student's name.

BENEFITS

The benefit of the study is to provide information to other teachers and administrators regarding the impact horticulture therapy and hands-on learning can have on CDC students. Understanding this impact will help improve horticulture programs as well as other vocational programs for CDC students.

_____ Participant's initials

CONFIDENTIALITY

The information in the study records will be kept confidential. Data will be stored in a locked filing cabinet in Dr. Carrie Ann Fritz's office located at 325 Morgan Hall. Data will be made available only to persons conducting the study unless participants specifically give permission in writing to do otherwise. No reference will be made in oral or written reports, which could link participants to the study.

CONTACT INFORMATION

If you have any questions at any time about the study or the procedures, you may contact Jamie Mundy at (423) 626-7474 or Dr. Carrie Ann Fritz at the University of Tennessee, 325 Morgan Hall, (865) 974-4830. If you have any questions about the rights as a participant, contact Research Compliance Services of the Office of Research at (865) 974-3466.

PARTICIPATION

Your child's participation in this study is voluntary; he/she may decline to participate without penalty. However, his/her participation would be greatly appreciated. If he/she decides to participate, he/she may withdraw from the study at anytime without penalty. If he/she withdraws from the study before data collection is completed his/her data will be returned to him/her or destroyed.

CONSENT

- ❑ I have read the above information. I have received a copy of this form. I agree to allow my child to participate in this study and to be interviewed.
- ❑ I agree to have my child interviewed and tape-recorded. All tapes will be used for transcription only and will be destroyed upon completion of the study.

Parent/Guardian Signature _____ Date _____

Investigator's Signature _____ Date _____

Student Assent Form

I. Hello, my name is Jamie Mundy. Your parents say that you are willing to help me. All you have to do is answer questions related to the effects that horticulture therapy has had on your physical, social, emotional and cognitive behaviors. The primary purpose of this study is to find out how this horticulture class has and will impact your educational and personal life. If you decide that you don't want to participate in this project anymore, all you have to do is tell me. You can just respond by saying, "I don't want to answer questions anymore." Okay? (Student's response).

II. You will be interviewed by Jamie Mundy a series of three times (January, March and May). You will be asked questions related to your horticulture skills. Each interview will take approximately 30 minutes to complete.

III. Participation in this research project will have no effect on your grade.

IV. Thank you for participating and at anytime, you can withdraw from the study.

V. If you have any questions related to the study, you may contact the Primary Investigator:

Jamie Mundy
PO Box 363
Speedwell, TN 37870
(423) 871-1900
mundyj@k12tn.net

APPENDIX C

GENERAL HORTICULTURE KNOWLEDGE TEST

General Horticulture Knowledge Test

Student Name: _____

Date: _____

Circle the correct answer for each question below. If you do not know the answer, please do not guess, circle I Do Not Know.

1. *What does Horticulture include?*
   - *A. Fruits and Flowers*
   - *B. Fruits, Nuts, Vegetables, Ornamental Plants, and Flowers*
   - *C. Flowers and Vegetables*
   - *D. I Do Not Know*

2. *I know how to germinate plant seeds.*
   Yes *No*

3. *I can name the 7 main parts of a flower.*
   Yes *No*

4. *I can make a flower arrangement by myself.*
   Yes *No*

5. *What grows in a greenhouse?*
   - *A. Flowers*
   - *B. Flowers and other plants*
   - *C. Nuts*
   - *D. I do not know*

6. *Which one is a rake? (show object)*
   - *A. #1*
   - *B. #2*
   - *C. #3*
   - *D. I do not know*

7. *Which one is a shovel?(show object)*
   - *A. #1*
   - *B. #2*
   - *C. #3*
   - *D. I do not know*

8. *When watering plants in the greenhouse, I should:*
- *A.* *Soak them till water runs out bottom of the container*
- *B.* *The less you water them the better.*
- *C.* *Only water what is dry at that time.*
- *D.* *I do not know.*

9. *I know what mulch is.*
Yes *No*

10. *What type of greenhouse do we have?*
- *A.* *Quonset*
- *B.* *A-Frame*
- *C.* *I do not know*

11. *A weed is*
- *A.* *good for the flowers.*
- *B.* *something not wanted.*
- *C.* *I do not know.*

12. *A tulip grows from a*
- *A.* *seed.*
- *B.* *bulb.*
- *C.* *I do not know.*

13. *I know how to transplant tomato plants.*
Yes *No*

14. *All flowers can grow in the sun?*
Yes *No* *I do not know*

15. *All flowers have to be planted every year.*
Yes *No* *I do not know*

APPENDIX D

ROSENBERG SELF-ESTEEM SCALE

Rosenberg Self-Esteem Scale

Name: _____

Date: _____

Instructions: *Below is a list of statements dealing with your general feelings about yourself. If you strongly agree, circle SA. If you agree with the statement, circle A. If you disagree, circle D. If you strongly disagree, circle SD.*

1.	*On the whole, I am satisfied with myself.*	*SA*	*A*	*D*	*SD*
2.	*At times, I think I am no good at all.*	*SA*	*A*	*D*	*SD*
3.	*I feel that I have a number of good qualities.*	*SA*	*A*	*D*	*SD*
4.	*I am able to do things as well as most other people.*	*SA*	*A*	*D*	*SD*
5.	*I feel I do not have much to be proud of.*	*SA*	*A*	*D*	*SD*
6.	*I certainly feel useless at times.*	*SA*	*A*	*D*	*SD*
7.	*I feel that I'm a person of worth, at least on an equal plane with others.*	*SA*	*A*	*D*	*SD*
8.	*I wish I could have more respect for myself.*	*SA*	*A*	*D*	*SD*
9.	*All in all, I am inclined to feel that I am a failure.*	*SA*	*A*	*D*	*SD*
10.	*I take a positive attitude toward myself.*	*SA*	*A*	*D*	*SD*

APPENDIX E

EMOTIONS FACE TEST

Students Name: _____

Date: _____

Activity: _____

Comments:

Comments:

Comments:

Comments:

Comments:

Comments:

Comments:

Comments:

Comments:

Comments:

APPENDIX F

INTERVIEW PROTOCOL (ADULTS)

Interview Protocol (Adults)

Interviewee: _____
Student Involved: _____
Date: _____

Question#1: Can you tell me more about _____ and his/her social interaction at the present time?

Question #2: Can you tell me more about _____ and his/her emotional status at the present time?

Question #3: Can you tell me more about _____ and his/her cognitive abilities at the present time?

Question #4: Can you tell me more about _____ and his/her physical abilities at the present time?

Question #5: Can you tell me more about your belief on mainstreaming CDC students into the regular education classrooms.

Interview Protocol (Adults)

Interviewee: _____
Student Involved: _____
Date: _____

Question #6: Can you elaborate on your feelings of why _____ is taking a horticulture class this year?

Question #7: Can you tell me more about the self esteem of _____ at the present time?

Question #8: Any other additional comments on _____.

Interview Protocol (Adults-End of Study only)

Interviewee: _____
Student Involved: _____
Date: _____

Please elaborate on the following:

**Do you feel that hands-on classes, such as Greenhouse, Landscaping and Floral Design are important to include in a student's IEP? Why or Why not?*

**Do you feel that the horticulture classes were beneficial to the students you have in class. Please discuss the positive and negative impact it may have shown on each individual student without using their names. Please use assigned #'s (for example, #1….., and #2…..).*

APPENDIX G

INTERVIEW PROTOCOL (STUDENTS)

Interview Protocol (Students)

Question #1: Can you tell me more about your experience in your horticultural class?

Question #2: What can you do now, physically, that you could not do before taking this class?

Question #3: Can you tell me more about if this class has affected your emotional or social behaviors in any way? Self-Esteem?

Question #4: Can you tell me more about what you have learned as a result of being in this class?

VITA

Jamie Lynn Mundy was born in Knoxville, Tennessee, on March 15, 1977. She grew up in the rural community of Speedwell, Tennessee attending Powell Valley Elementary School and Powell Valley High School. In May 1995, she graduated Valedictorian of her high school class, receiving an honors diploma. She continued her education at Middle Tennessee State University, where she earned a Bachelor of Science degree in Animal Science with a minor in Agriculture Education. She graduated cum laude in December of 1998.

After graduation, Jamie returned home to work on her family's farm. In 2000, she began working for a school system in rural East Tennessee as the Family Resource Director for the county. In 2001, she was given the chance to do what she had always wanted to do. Jamie began teaching agriculture education and remains employed at this same school today. She also serves as an advisor for the school's FFA chapter.

Jamie is a member of the American Horticultural Therapy Association (AHTA), National Association of Agricultural Educators (NAAE), Tennessee Association of Agricultural Educators (TAAE), National Education Association (NEA), Tennessee Education Association (TEA), Tennessee Farm Bureau, Claiborne Farmers Cooperative, Rocky Mountain Elk Foundation (RMEF), and the National Wild Turkey Federation (NWTF).