

**YOUTH GARDENING: OPPORTUNITIES FOR STRENGTHENING
LIFE SKILLS AND EDUCATIONAL ACHIEVEMENT WITH
SPECIAL POPULATIONS**

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Abstract

It is believed that an effective way of reducing levels of juvenile delinquency is to implement preventative programs for young children. This research explored the use of a youth gardening project as a preventative program by examining the effects on self-concept. The study involved two groups of inner city youth participating in a Department of Parks and Recreation summer program. The test group participated in gardening activities while the control group did not. Self-concept was evaluated using the Self Perception Profile for Children in a pre- and post-test format to measure any change through participation in the program. Participants were also asked to draw a picture of a garden and the test group completed a questionnaire on their gardening experience. Results indicate an increase in self-concept in the gardening group. A comparison of drawings from the two groups suggests that the gardeners have a better understanding of plant anatomy and diversity. Questionnaire responses indicate that students enjoyed gardening, felt and behaved better when gardening, and thought they learned through the garden. Many difficulties greatly reduced sample sizes for this research. Future research must find ways to overcome these issues. A survey was conducted to explore common difficulties associated with research on the benefits of horticulture programs for youth. Findings from this survey are discussed, including suggestions for improving research and directions for future studies.

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I. Introduction

Note: The chapters of this thesis were written as separate articles. Shortened versions of each article will be submitted to different journals for publication. Chapter 1 will be submitted to the Journal for Vocational Special Needs Education for publication. Chapters 2 and 3 will be submitted to HortTechnology for publication. For this reason there may be some overlap between the chapters in the information provided for justification and clarification.

More than one in four of our nation's children are considered at-risk due to multiple factors in their lives impeding normal development towards becoming responsible, self-sufficient adult members of society (McWhirter et al., 1998; Dryfoos, 1990). Producing even a fraction of this many adults who are unable to function as responsible adults will be a major burden to society. For the benefit of these youths and society as a whole, research is needed to determine which types of programs, resources, and interventions are effective in reducing risk levels and promoting the healthy development of at-risk youth.

The use of horticulture and gardening should be included in this field of study for several reasons, including the ability of plants to improve physical and psychological health. Research conducted over the past few decades has shown that humans react physiologically and psychologically to plants and nature. Ulrich and Simons (1986) found that adult subjects respond to nature scenes with lowered blood pressure, skin conductance, and muscle tension. Examination of hospital records of gall bladder surgery patients showed that those with a view of trees recovered faster, required less pain medication, and received fewer negative comments from nurses than those with a view of a wall (Ulrich, 1984). Other studies show that prison inmates having a view of nature have fewer health complaints than those without such a view (Moore, 1982; West, 1985).

Several differing theories seek to explain why exposure to plants and nature produces these types of benefits. Rachel and Steven Kaplan have been researching the effects of human interactions with plants and nature since the 1970's. Their 1998 book, *With People in Mind*, summarizes their attentional restoration theory. Through cognitive

responses to nature we are able to rest our directed attention, or attention that requires effort to maintain, by engaging fascination, which does not require effort to maintain. When directed attention is fatigued, people tend to have difficulty concentrating, make impulsive decisions, make more errors, and behave irritably (Kaplan et al., 1998). These consequences make opportunities for school children to restore directed attention important. Ulrich and Parsons (1992) claim that nature allows us to relieve stress levels through emotional responses rather than cognitive responses. Youth-at-risk and those with special needs often experience higher stress levels than their peers, making it extra important to provide these children with methods of recovery.

Recent research has found numerous benefits of including plants and nature in city planning, especially for inner-city low socioeconomic status neighborhoods, residence in which is one of the leading factors placing children at-risk. It has been shown that green space increases the usage of common areas, thereby increasing social interactions and perceptions of safety in the community (Kuo et al., 1998). Communities in which residents are isolated by fear and mistrust are less conducive to the healthy development of children than those with established social networks (Kuo et al., 1998). Another study found that reduced rates of aggression, violence, and mental fatigue are associated with higher amounts of nearby nature (Kuo and Sullivan, 2001). Children will be less likely to witness, experience, or participate in aggressive or violent acts in such neighborhoods. In research conducted with inner-city children, positive links were made between green space and levels self-discipline (Taylor et al., 2002) and attentional functioning (Taylor et al., 2001). These findings support the larger amount of primarily anecdotal evidence of the benefits of community greening (Blair, 1991; Bonham, 1992; Feenstra et al., 1999; Lewis, 1992; Patel, 1992).

A small number of individuals have long found an interest in cultivating the benefits that come from interactions with plants. The use of school gardens in Europe for the educational and moral benefits of students can be dated back to at least the 1700's (Bachert, 1979). The use of gardening for the treatment of those with mental illness also dates back to the late 1700's (Lewis, 1976).

Since the 1920's there has been a small population in this country interested in the use of horticulture to improve quality of life and the advancement of the field now known

as Human Issues in Horticulture. In 1973 The National Council for Therapy and Rehabilitation through Horticulture, now the American Horticultural Therapy Association, was formed to unite individuals involved in this field and to advance the profession of Horticultural Therapy. The People-Plant Council was formed in 1990 to “document and communicate the effect that plants and flowers have on human well-being and improved life-quality” (Relf and Madsen, 1994).

A review of pertinent literature found that across the country horticulture programs are being adapted to meet the diverse goals of youth with special needs (See Chapter 1). Of research in Human Issues in Horticulture published in the past five years, the use of horticulture in the education and correctional training of juvenile delinquents and juvenile offenders has received particular attention. Research on the impacts of such programs have shown that horticulture programs seem to be as effective at reducing recidivism rates as traditional programs (Dawson and Zajicek, 1998). Researchers and program facilitators have also reported increases in self-esteem (Dawson and Zajicek, 1998), social bond (McGuinn and Relf, 2001), delayed gratification (McGinnis, 1989), and interest in obtaining further education (Flagler, 1995).

Another topic increasingly being seen in the literature is the use of school gardens, primarily with elementary school students. Studies have shown that school gardens can be used effectively in teaching academics (Alexander et al., 1995; Canaris, 1995; Sheffield, 1992), improving attitudes towards nutrition (Lineberger and Zajicek, 2000), and in increasing the development of important life skills (Cervone, 2002; Dawson and Zajicek, 1998; Flagler, 1995; McGinnis, 1989; McGuinn and Relf, 2001; Sheffield, 1992).

Little research, however, can be found on the possible use of horticulture as a preventative measure with young at-risk populations. If horticultural programming is an effective tool for the education of elementary school populations and for the rehabilitation of juvenile delinquents, it is possible that gardening programs would also work to reduce the risk for future development of delinquent behavior in children. Many psychologists and sociologists agree that the best way to reduce the prevalence of juvenile delinquency is to put in place preventative measures, which help children develop in a healthy manner and thereby reduce the impact of risk factors (Braaten, 1999;

Dryfoos, 1990; McWhirter et al., 1998; Zigler et al., 1992). Programs should start at an early age, monitor for and address characteristics predicting development of delinquent behavior, and focus on issues placing children at risk (Braverman et al., 1994; Zigler et al., 1992). A study was implemented to explore the possible preventative effects of a horticulture program for elementary school children considered to be at-risk (See Chapter 2).

During the planning and implementation of this research, many difficulties were encountered. Coordination with busy schools and youth program facilitators was difficult and time consuming. Funding restrictions and location of the study site limited the involvement of the researcher. Finding schools or youth organizations interested and able to implement a gardening program was a challenge. The research design necessitated a control group which would not be involved in gardening but would have the same demographic make-up and life experiences as the test subjects. Obtaining permission from all necessary parties, including the university's Internal Review Board and parents of the study subjects, was also difficult. The test measurement used for the study proved to be confusing for the participants, resulting in a large number of unscorable tests. All of these factors reduced the sample population available for the study. The frequency at which school children move, change schools, or are simply absent also reduced the final numbers for the study. Believing that these problems may be inherent in this field of research, and noting the frequency of inconclusive or purely anecdotal studies in the literature, a survey was designed to collect the knowledge and experience of researchers active in this field (See Chapter 3). Through their suggestions, future research can be more successful.

Human Issues in Horticulture is a growing field. Research has begun to show evidence of many benefits youth may gain through exposure to horticulture. However, more research focusing on the issues considered important by policy makers is needed to advance interest in and support for this type of program.

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II. Gardening Programs to Benefit Exceptional Youth

OVERVIEW OF GENERAL BENEFITS

Schools and other youth-oriented service providers must continue to be flexible with the services available to help special needs youth achieve their educational goals, plan for the transition to adulthood, and enhance their overall life satisfaction. Youths with disabilities are guaranteed a free and appropriate education under the Individuals with Disabilities Education Act of 1990; each of these students are required to have an Individualized Educational Plan (IEP) outlining their present level of performance, goals, and the services to ensure an appropriate education (P.L. 101-476). While it can be challenging to find ways to meet these needs, horticulture, or the growth and cultivation of plants, has the potential to help exceptional populations reach numerous goals. This article will discuss the use of horticulture programs to meet the needs of juvenile delinquents, youth-at-risk, youth with emotional and/or behavioral disorders, learning disabilities, developmental disabilities, physical disabilities, and those being treated for psychiatric illnesses and substance abuse.

Over the past decade garden based programs have been initiated by schools, juvenile courts, hospitals, and other special care facilities to enhance the education, vocational training, and treatment of special needs youths. Benefits can be emotional, social, intellectual, and physical (Hefley, 1973). Relf (1981) divides the methods through which benefits are gained from horticultural programs into three categories: from passive interactions with plants, from actively working with plants, and from the interactions that occur with others while working with plants. Many benefits from these three categories are relevant for all special needs youth (Table 1).

Table 1. Benefits gained by exceptional youth through participation in horticulture programs.

Passive Interaction	Active Interaction	Social Interaction
Stress reduction	Vocational skills	Increased social skills
Behavior management	Academic enhancement	Therapeutic communication
Increased attentional functioning	Numerous life skills	Increased communication skills
Improved self-discipline	Learning to Sublimate	Reduced isolation
Improved decision-making	Enhanced self-esteem	Community involvement
	Behavior management	Increased social bonds
	Nutritional awareness	Learning teamwork
	Learning to nurture	
	Environmental awareness	

First, the benefits from passive interactions with plants will be discussed. Research conducted over the past few decades has shown that humans respond physiologically and psychologically to plants and nature. These physiological and psychological responses may help relieve the elevated stress levels often experienced by youth with special needs and improve behavior management. For example, Ulrich and Simons (1986) found that adult subjects respond to nature scenes with lowered blood pressure, skin conductance, and muscle tension. Other studies show that patients recover faster from surgery (Ulrich, 1984) and prison inmates have fewer health problems (Moore, 1982; West, 1985) when having a view of nature. Attentional functioning in children with ADD is improved after activities involving exposure to nature (Taylor et al., 2001), and views of nature from home helps increase levels of self-discipline in young females (Taylor et al., 2002). Kuo and Sullivan (2001) discovered that residents of inner-city apartment complexes in barren lots reported more mental fatigue, aggression, and acts of violence than did residents of similar buildings surrounded by some elements of nature such as grass or trees.

Several differing theories seek to explain why exposure to plants and nature produces these benefits. Rachel and Steven Kaplan have been studying human responses to nature since the 1970's and summarize their attentional restoration theory in their 1998 book, *With People in Mind*. Through cognitive responses to nature we are able to rest our directed attention, or attention that requires effort to maintain, by engaging fascination, or attention not requiring effort (Kaplan et al., 1998). Ulrich and Parsons (1992) claim that

nature allows us to relieve stress levels through emotional responses rather than cognitive responses. The common theme between these two theories is the ability of nature to help us recover from stress and mental fatigue. Attention span, mental capacity, and ability to make decisions all become fatigued by over stimulation in today's busy society, resulting in irritability, impulsive behavior, and reduced ability to concentrate (Kaplan et al., 1998). Children must find ways to cope with and recover from the constant bombardment of stimuli in order to make good decisions and maximize their learning potential.

The second set of benefits is obtained by through actively working with and nurturing plants. Matsuo (1992) claims that to be complete, humans need to engage in both acquiring and nurturing activities. While today's society focuses on acquisition, gardening is one activity that allows us to nurture and to acquire through this nurturing, therefore helping us to feel more complete.

Actively working with plants provides other diverse benefits that are particularly relevant for special needs youth. The flexibility and diversity present in horticulture allows students to work towards a wide range of IEP goals; activities should be chosen specifically to meet these goals. Gardening programs have been used in schools to teach numerous subjects including: math (Hersberger and Frederick, 1995), science (Bouthyette, 1992; DeMarco et al., 1999; Wagner and Fones, 1999), language arts (Wagner and Fones, 1999), cultural studies (Bowles, 1995), and many others. It can be an excellent way to introduce hands-on experiential learning into the classroom and involve numerous learning styles from Gardner's theory of multiple intelligences. Gardner holds that humans learn through numerous intelligences including linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalist (Gardner, 1999). Knowledge of and attitude towards nutrition (Lineberger and Zajicek, 2000) and the availability of nutritious foods can all be increased through raising vegetable crops. Vocational skills are also taught through horticulture and the increased employability of participants is often a major goal of such programs. The green industry continues to grow and provide jobs for those with basic knowledge of plant care and related equipment and tools. Moncarz and Reaser (2002) project that

between 2000 and 2010, over 304,000 new jobs will be created in grounds maintenance alone.

Life skills are also learned through horticultural programming. Researchers and program facilitators report increased responsibility (Cervone, 2002; Sheffield, 1992), self-discipline (McGinnis, 1989), improved behavior (McGuinn and Relf, 2001), anger management (Flagler, 1995), self-esteem (Dawson and Zajicek, 1998), and self-efficacy (Lawson et al., 1995) as some life skills that have been increased through the successful participation in caring for plants. Participants may learn sublimation, or the venting of negative emotions through constructive physical activity, which also enhances behavior management. Research has shown that participating in horticulture programs increases environmental awareness and creates a sense of stewardship (Dawson and Zajicek, 1998; McGuinn and Relf, 2001).

The third category of benefits comes from the interactions that may occur with others while participating in a horticulture program. The enhancement of social skills and integration into mainstream society are common goals for exceptional youth. Working with plants can create a relaxed, safe environment where people acknowledge one another on common ground. Communication may be more open and productive (Relf, 1981). Activities can be designed to require as much or as little interaction as desired, from collaborative teamwork to working independently but side by side to working one-on-one with only an instructor. Meaningful conversations often arise and therapists have reported that youths are able to safely discuss sensitive feelings and issues through the use of garden metaphors (Keeley and Starling, 1999; Shapiro and Kaplan, 1998).

Service-learning projects are becoming a popular way to create positive interactions between students and their community, helping to reduce isolation and learned irresponsibility and to increase social bonds (Muscot, 2000). Community beautification through gardening projects can make excellent service-learning experiences.

The flexibility of gardening makes it an excellent theme to use in efforts to achieve many goals with many different populations. Activities can be designed to meet a vast array of abilities, requirements, and settings. All of the benefits discussed above

can be applied to all exceptional youths. The remainder of the paper will discuss benefits unique to particular groups and describe existing programs designed specifically for these groups.

GROUP SPECIFIC BENEFITS

Juvenile Offenders

One emerging use of horticulture programs is as an alternative form of correctional treatment for juvenile offenders. Traditional correctional techniques focus on retribution rather than rehabilitation (Dawson and Zajicek, 1998). Failing to address the needs of these youths for proper rehabilitation and integration into society is costly to the youths themselves, their victims, and the tax payers (Bradley, 1998). Without the skills to find and maintain employment many juvenile offenders simply fall back on crime for financial support. Horticulture programs for this youth population are often formed through the collaboration of several organizations.

The HELP program in Norfolk, Virginia was created to serve juvenile offenders through collaboration between the juvenile court service, public schools, and the Norfolk Botanical Garden (Bradley, 1998). Program goals are to reduce recidivism, develop job and vocational skills, improve behavior, and to create positive interactions with the community. Participants receive ten weeks of training and experience in horticulture and receive training in skills such as anger management, coping with grief and loss, and completing job applications and interviews. Preparation for the GED exam and field trips broaden their view of possibilities for the future. Upon completion, participants receive a certification of horticultural training that can be presented to potential employers. Results from the initial pilot program indicate it was successful in reducing recidivism (Bradley, 1998). The program has recently been expanded with a new \$100,000 grant (Relf, 2003).

The Green Brigade in San Antonio Texas is another program serving juvenile offenders. Directed by the Agricultural Extension Service, the program aims to reduce recidivism by providing vocational education and improving the behavior, self-esteem, and attitudes of participants (Dawson and Zajicek, 1998). Participants, referred to the program by the Juvenile Probation Department, meet for six hours every Saturday for 16

weeks. They receive classroom instruction and complete landscaping projects to beautify the city. Facilitators have found increased self-esteem, horticultural knowledge, and environmental attitudes in participants and have noted that the program works as well as other types of probation at reducing recidivism (Dawson and Zajicek, 1998).

The New Jersey Department of Corrections and Rutgers University collaborated to build a program for youth serving time in correctional facilities with the goals of increasing their employability and personal development skills including frustration tolerance and the management of impulse behavior. Flagler (1995) notes that the program often gives the adolescents their first experience with real success. A study on the effects of the program found that over 80% said the program initiated an interest to go to college, gave them career ideas, and helped them feel they could improve their lives (Flagler, 1995).

Emotional/Behavioral Disorders

Horticulture programs for youth exhibiting problem behaviors have been created through alternative school systems. Students with emotional and behavioral disorders are typically absent more often than others, fail classes frequently, and have a dropout rate approaching 50% (Hardman et al., 2002). In horticulture programs, vocational and academic skills are taught and practiced while behavior management is enhanced. The active atmosphere of this type of instruction may benefit students who find it difficult to learn and regulate behavior in the traditional classroom setting. Academic subjects can be taught in a hands-on, practical way without drawing attention, and therefore resistance, to the instruction. Raising plants to sell teaches important business skills.

An alternative school in Blacksburg, Virginia started a horticulture program as part of their daily class schedule in 1997 (Culver, 2003). Students have been involved in every part of the project including building the greenhouse, a task requiring much teamwork. Students produce plants for sale, install landscapes, and go on field trips. A study conducted with these students found that participants had increased motivation to learn, exhibited improvement in both attendance and behavior, and showed a significant increase in social bond (McGuinn and Relf, 2001).

McGinnis (1989) gives anecdotal reports of a program in Indiana for young children hospitalized for treatment of behavioral disorders. Participants worked in the garden several times a week and held weekly group garden discussions which allowed staff greater insight into their patients' emotional and personal needs. Goals of the program included creating feelings of accomplishment, developing teamwork, practicing math and science skills, learning about nutrition, getting physical exercise, and creating positive feelings of self from donating food to the needy. Additional benefits noted were the development of delayed gratification, increased positive feelings towards the hospital, and the development of a hobby that clients could take home and which helped them better relate to family members.

Youth-At-Risk

Preventative programs have been designed to target youth-at-risk before they develop serious problem behaviors. Youths served by these programs, primarily from a low socioeconomic status, living in the inner-city, and African American, often have little opportunity to come in contact with nature and rarely have easy access to fresh produce. Community and school gardens provide a chance to explore nature, see the connection between food and the environment, enjoy fresh nutritious foods, and learn academic subjects.

The Food Project in Boston pays teens, both from the inner-city and from the suburbs, to produce food for area hungry, bridging communities and teaching skills while addressing food security issues (Cervone, 2002). Youth learn about agriculture, business, marketing, job skills, diversity, and the causes of some of society's problems such as homelessness. At-risk inner-city youth and suburban youth work together and learn from each other. In their participants, facilitators have seen growth in leadership, accountability, and ability to plan (Cervone, 2002).

Another program, the Berkeley Youth Alternatives (BYA), employs inner city youth-at-risk to design and maintain urban green spaces in their own neighborhoods (Lawson and McNally, 1995). Through collaboration with the Department of Parks and Recreation, BYA is able to pay participants, offering teens a safe environment, career training, work experience, and positive involvement in their community.

An experimental garden-based interdisciplinary program was implemented with third and fourth grade underachieving students required to attend summer school (Sheffield, 1992). Test subjects were taught through garden-related activities, including a large vegetable and flower garden while a control group received regular classroom instruction. At completion of the summer term, the test group was found to have made significantly higher academic progress as well as to have significantly higher self-esteem than the control group. Children in the garden group had no absences, skipped family trips to be at school, brought friends to see the garden, and showed increased excitement towards school. Anecdotal evidence suggested an increase in responsibility, problem solving skills, and interest in learning (Sheffield, 1992).

Youth in Treatment for Mental Illness or Substance Abuse

Horticulture programs have also had successful outcomes with young psychiatric patients and those with substance abuse problems. Psychiatric patients are often withdrawn and need stimulation to keep them active and involved with life. Working with plants can provide motivation and sensory stimulation and reduce hopelessness in adolescents who may otherwise show little interest in the world and their future (Daubert and Rothert, 1981; Hewson, 1994; Shapiro and Kaplan, 1998). Raising plants from seeds can especially create a sense of awe and curiosity to see what is changing from day to day, initiating interest in the future. By gradually switching from individual work to group work horticulture can be a good tool for pulling a withdrawn individual out of his/her shell. Mental illness can often have a negative impact on physical health, and gardening work can be a good way to integrate exercise into the treatment program (Shapiro and Kaplan, 1998).

In those seeking to overcome substance abuse, reducing vulnerability and stress and increasing levels of resistance are short term goals while increasing resiliency and self-concept are long term goals (Berry, 1975; Cornille et al., 1987). Reducing feelings of isolation through introduction to easy and appropriate social interactions is another key element for successful rehabilitation (Berry, 1975). Working with plants may help to address all of these goals.

Homewood Health in Canada uses horticultural therapy as part of a holistic program for eating disorder clients. People with either bulimia nervosa or anorexia nervosa often have a distorted body image, obsessive/compulsive behaviors, and depression and are indecisive, self-critical, agitated, and withdrawn (Hewson, 1994; Stewart, 2002). Homewood's program has shown results in developing self-nurturing and a healthy body awareness, increasing self-esteem, introducing a positive hobby, providing social activities, and generally promoting a healthy lifestyle (Stewart, 2002). While it also helps to increase physical strength often lost by an eating disorder, the staff must monitor clients to prevent excessive exercise (Stewart, 2002).

Physically Disabled

Both children who have sustained traumatic injuries and those born with a physical disability can benefit from horticulture programs. Horticulture is used, usually in a hospital setting, to provide physical therapy in a more relaxing environment that focuses on a fun activity rather than the child's injury or disability (Rothert and Daubert, 1981). Activities can be as simple or complex as necessary to meet an individual's specific needs and can target fine motor skills, gross motor skills, range of motion, coordination, balance, hand-eye coordination, and many other typical aspects of physical or recreational therapy. Because high levels of stress can cause a deterioration in one's progress by causing muscle tension and decreased levels of attention (Strauss and Gabaldo, 1998), horticulture is used as a method of coping with anxiety and stress created by the medical setting. Through caring for a plant, children can understand the care and nurturing they are receiving from hospital staff and their families (Rae and Stieber, 1976) and have the opportunity to be a caregiver rather than the receiver (Strauss and Gabaldo, 1998).

In addition to stress and anxiety, those receiving treatment for a physical disability may also feel a sense of hopelessness, which can greatly affect motivation and hope for the future (Wichrowski et al., 1998). Working in a group allows the client to observe ways that others have found of coping with a disability and gives them more hope for the future (Wichrowski et al., 1998). Activities can be designed to allow clients to vent frustration in constructive ways and to allow an outlet for self-expression and

creativity (Rothert and Daubert, 1981). Children who have sustained traumatic brain injuries may have emotional or behavioral side effects and visual/perceptual problems that may also be improved with the help of a horticulture program (Strauss and Gabaldo, 1998).

Since the 1970's the Rusk Institute of Rehabilitation Medicine has offered a horticultural therapy program to its clients (Enid A. Haupt Web Page). Originally a greenhouse conservatory was built to provide a relaxing environment in which patients could escape the sterile and stressful hospital environment. Since then the program has grown to include outdoor areas including a perennial garden and a children's play garden, all used in active physical and recreational therapy. Horticultural Therapy programs are offered to meet the needs of a variety of children, including those with acute illnesses such as cancer and epilepsy and children infected with HIV. Goals of the programs include physical and recreational therapy, stress reduction, mood enhancement, and lessons in nutrition and the basic care needed by both plants and humans in order to thrive (Enid A. Haupt Web Page).

The Horticultural Therapy program at Kluge's Children's Rehabilitation Hospital in Virginia uses gardening activities with young patients having a wide variety of injuries and disabilities (Cook, 2002). The horticulture program has been integrated into their Recreation Therapy services and is used to help patients reach physical therapy goals and improve their coordination, self-image, and behavior. Activities are tailored to meet individual needs and may be conducted indoors, outdoors, or in a small greenhouse. The program, originally conducted on a part-time volunteer basis, has been so successful that the hospital created a full-time position for a Horticultural Therapist (Cook, 2002).

Youth with Developmental Disabilities

A wide variety of developmental disabilities, each with its own specific needs, can be served through programs involving horticulture, but those with mental retardation have been the most commonly targeted to date. Children with mental retardation have trouble with abstract concepts and obtain the most from education when instructional methods are relevant and hands-on (Hardman et al., 2002). Education for children with mental retardation should strive for normalization (Hardman et al., 2002); gardening is an

activity that many people, regardless of age, race, social class, or IQ enjoy. Learned helplessness can be improved by providing opportunities for children to experience tangible successes. Increases in self-esteem and social skills can also be met by the ability to discuss a common interest (Catlin, 1998).

Transitional programs to prepare adolescents with mental retardation for supported employment, enclave employment, or sheltered workshops have long used horticulture as one of their areas of training (Relf, 1978; Dobbs and Relf, 1991; Daughtry and Relf, 1995). Many opportunities may exist for employment in the green industry for those who have learned basic horticultural skills, giving young adults an opportunity to feel more independent as they make the transition from their youth support services to the adult world. Of polled employers that have previously hired persons with mental retardation for jobs in horticulture, most were favorable towards them and noted that they were absent less often and were more motivated to work than non-disabled workers holding the same position (DeHart-Bennett and Relf, 1990).

Melwood has been serving both adolescents and adults with developmental disabilities since 1963. The organization was originally funded by a group of people who believed that people with disabilities would benefit from working with plants (Copus, 1972). Clients receive education, vocational training, and assistance in learning life skills needed for an independent lifestyle. The final goal is independent employment and Melwood has helped place many clients in horticulture related jobs (Copus, 1972). The Melwood program has continued to successfully serve its clients and has grown into a large, diversified, and well recognized service organization.

Good-Hamilton (1985) describes a vocational program in horticulture for students with mental retardation and learning disabilities offered through a public school in Pennsylvania. Attendance rates and performance standards vary based on student ability; those with the highest level of abilities attend the class for two nine-week sessions of a school year. The program is designed to provide training that will help lead to economic independence and increased social competence. Techniques applied to attain these goals include reinforcing academic subjects, practicing basic horticultural skills, teaching basic plant science concepts behind these skills, and working in groups to increase socialization. More advanced students have the opportunity to practice management

skills by planning and overseeing class activities for a week and by assuming full responsibility for raising one crop over the nine-week session.

Learning Disabled

A wide range of disabilities and specific needs fall under this category. Students with learning disabilities usually have average intelligence but need alternative forms of education to help them achieve their full potential. The standard class lecture format is often difficult for these children and incorporating interesting hands-on activities into the curriculum can increase one's capacity for maintaining attention and make academic subjects more relevant and meaningful. The flexible nature of horticulture makes it easy to adapt to the needs of each individual in a class and can provide one more tool with which to help students reach their maximum potential.

Students with learning disabilities are much less likely to pursue further education than students without learning disabilities and vocational education reduces the dropout rate and increases post school employment (Evers, 1996). The School-to-Work Opportunities Act of 1993 calls for vocational programs that combine classroom instruction with real work experience, including workplace mentoring and extra assistance for employers. Horticulture has long been included in high school vocational education offerings.

A classroom of students with learning disabilities became full participants in their education through a thematic unit focused on gardening (Jackson, 1996). They worked together to design and budget a program to fit within the parameters of a grant obtained by the teacher. Through the unit students learned math, science, language arts, and social studies. They learned social skills and the benefits of giving through service projects for residents of a rest home.

Sarver (1985) describes benefits she witnessed in her elementary students with learning disabilities during a gardening project. Her students planned, planted, and nurtured a 20 by 30 foot vegetable and flower garden. Children experiencing difficulties in verbal communication were able to enjoy success with plants, which respond to their actions rather than words. Students who normally showed resistance to structure and change saw their success in the garden enhanced by planning and structure and were

delighted to see daily changes in their plants. As they became aware of diversity and beauty in nature, they were able to appreciate it in themselves and others. Through observing the development and life cycles of plants students learned about human development and the need for nurturing. Students learned to work cooperatively and to succeed together rather than to measure their failure by another's success.

SUMMARY

There is evidence to show that horticulture is a beneficial tool in working with a wide variety of special needs youths. Benefits of horticulture programs may be emotional, social, educational, or physical (Hefley, 1973) and come from passive experiences with plants, active work with plants, and social interactions with others in the horticulture setting (Relf, 1981). Already horticulture programs have been offered by schools, court systems, community service organizations, non-profits, and other service providers; many created through the collaboration of two or more of these organizations.

Horticulture lends itself well to all kinds of settings and resource levels. Larger programs tend to have a sizeable piece of land for a garden, a greenhouse, or both, but neither of these is necessary. Depending on the extent of the program and numbers to be served, some indoor space by sunny windows or under inexpensive grow lights makes a great start. Frequency of participation and level of involvement can also be arranged to fit specific situations, but the more frequent and consistent participation is, the greater the impact will be.

Teachers and therapists with little or no knowledge of plants may feel unprepared to explore this subject, but there are many resources available, both on-line and in books, to help one plan for success. Information can be found on the best plants to use, basic plant care requirements, calendars of seasonal activities, and troubleshooting. Extension agents and Extension Master Gardeners can be invaluable in providing assistance to get a program started. To facilitate larger programs, hiring a horticulturist or Horticultural Therapist may be needed to ensure success.

Most of the research presented here has been done on a small scale or is only anecdotal in nature. Further research on the effects of horticulture programming on all of

these different special populations can help advance the field, making funding and other support more readily available.

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III. Effects of A Summer Gardening Program on the Self-concept of Children

INTRODUCTION

The term ‘at risk’ is used in many different ways. In this paper, the term will refer to youth who have multiple factors in their lives impeding normal development towards becoming responsible, self-sufficient adult members of society and who have a high potential for developing delinquent behavior. By this definition, one in four of our nation’s children are at high risk and another 25 percent are at moderate risk (McWhirter et al., 1998; Dryfoos, 1990). Producing even a fraction of this many adults who are unable to function as responsible, self-sufficient adults will be a major burden to society.

Many psychologists and sociologists agree that the best way to reduce the prevalence of juvenile delinquency is to put in place preventative measures, which help children develop in a healthy manner and thereby reduce the impact of risk factors (Braaten, 1999; Dryfoos, 1990; McWhirter et al., 1998; Zigler et al., 1992). While many programs exist targeting problem *behaviors* in youth and adolescents (Bradley et al., 1998; Finch, 1996; Flagler, 1995; McGuinn and Relf, 2001) better results may be produced through programs designed to prevent the initial development of problem behaviors. Programs should start at an early age, monitor for and address characteristics predicting development of delinquent behavior, and focus on issues placing children at risk (Braverman et al., 1994; Zigler et al., 1992). Key predictive characteristics for identifying children who may be at risk include: perceiving life options to be limited and/or grim, low expectations for education, low self-concept, poor academic performance, and early behavioral problems (Dryfoos, 1990, Browne and Rife, 1991). Factors commonly recognized as placing children at risk include: single parent homes, poor parent-child relationships, and low socioeconomic status (Browne and Rife, 1991). Low socioeconomic status itself often inherently leads to many other risk factors such as poor nutrition, limited health care, and residence in high-crime neighborhoods. Currently, 11.7 million American children, or 16.3% of all children in the US are living in poverty (Proctor and Dalaker, 2002), creating a large population to be targeted by preventative programs.

This research explored the use of a youth gardening project as a preventative program by examining the effects on self-concept. Self-concept, defined as the totality of what one considers as 'me,' encompasses every idea one has as to what constitutes one's 'self' (Byrne, 1984; Harter, 1986; Merrell et al., 1993). According to Phillips and Zigler (1980), self-concept is one of the most important developmental aspects regulating day-to-day functioning. Self-concept plays a role in determining one's affect, attitude, motivation, and many other facets of personality that in turn play a key role in determining one's successes and failures in life (Byrne, 1984; Leung and Lau, 1989; Merrell, 1993; Swayze, 1980, Taylor, 1980).

Throughout the past three decades, the link between low self-concept and the development of delinquent behavior has been explored, causing many school systems and youth programs to adopt the goal of building self-concept. However, others have warned against the artificial elevation of self-attitudes as this too can have negative outcomes (Burr and Christensen, 1992). Purposely encouraging children to focus on the importance of self may tend to create a selfishness or a preoccupation with self rather than on building connections with others (Burr and Christensen, 1992). Burr and Christensen (1992) suggest using methods that focus on building quality relationships, communication, and connections to others. While low self-concept can lead to delinquent behavior by causing children to lose motivation to adhere to behavioral expectations of adults (Kaplan, 1975; Leung and Lau, 1989), the inability to maintain and defend an artificially elevated self-concept may have the same effect (Kaplan, 1975). Programs attempting to raise self-concept should only do so to a realistic level and through valid achievement by the children.

Two ways to help children realistically raise their self-concept are to help them increase their individual success rates and learn to feel responsibility for their successes (Harter, 1986). Also, increasing social skills and the ability to relate to others promotes a healthier self-image and increases chances for success in life (Merrell, 1993). Hands-on, experiential learning through horticulture may be one way to increase self-concept by providing expanded opportunities for real success (DeMarco et al., 1999). Gardner's (1999) theory of Multiple Intelligences holds that there are many ways in which we learn beyond the linguistic and logical-mathematical ways in which traditional classrooms

teach, including spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalist intelligences. In a classroom using only the traditional format, students with a greater capacity to learn in these other ways are not able to meet their potential.

Horticulture allows children to learn through many intelligences including spatial, kinesthetic, interpersonal, and naturalistic. Children also practice teamwork, leadership, sharing, and other social skills in a fun atmosphere. A survey found that 75% of teachers using gardening in their classrooms feel the behavior of their students always improves when working and learning in the garden (DeMarco et al., 1999), while another study (Waliczek et al., 2001) reports improved interpersonal skills.

Horticultural activities can be chosen to increase learning across the curriculum by making children active participants in their own education and to ensure successful horticultural outcomes (i.e. living plants) thus reinforcing success through personal responsibilities. The hands-on nature of horticulture allows children to see and feel their responsibility for what they learn and achieve as their plants grow and to feel pride in a success that is visible to others. In addition, working with plants provides lessons on the cycle of life, exposing children in a less emotional and less threatening way to the process of reproduction, growth, and death, thus preparing them to deal with these processes in their own families and communities.

Exposure to nature, often a rarity in urban environments, has been found to reduce stress (Kaplan et al., 1998), increase self-discipline (Taylor et al., 2002), and to be crucial for some aspects of child development (Moore, 1996). The opportunity to work with adults towards a common, positive goal provides children with a comfortable and safe way to establish open communication with them.

A number of horticultural treatment programs for special groups of youth already exist. Researchers have documented ways in which participants benefit from these programs. In a limited study done with juvenile offenders in Blacksburg, Virginia, a significant increase in participants' social bonds was found (McGuinn and Relf, 2001).

Administrators of "Food from the 'Hood'" in Los Angeles have reported that 100 percent of their graduates go on to pursue higher education (Feenstra et al., 1999). Another program, targeting institutionalized delinquent adolescents, observed reduced levels of aggressive behavior (Cotton, 1975). Bradley et al. (1998), report reduced

recidivism levels and increased interest in continuing education among participants of a program for juvenile offenders in Norfolk, Virginia.

If horticulture can be used successfully to treat behavioral disorders, reduce aggressive behavior, and increase factors such as self-concept, responsibility, academic success, and positive ties to the community in youth who have already been in trouble with the law, it may have an even greater impact as a prevention tool. For example, part of the Green Brigade program in San Antonio targeting younger school children has increased participants' school attendance, academic progress in science and environmental studies, and induced both pride and responsibility.

A literature search found several different self-report measures of self-concept for primary school students. The Self-Perception Profile for Children, or SPPC (Harter, 1985), is widely used and has been validated by several studies (Bracken and Mills, 1994; Hymel et al., 1999; Merrell, 1993). It was chosen because of its multidimensional format. Although some self-concept tests calculate only one score for overall self-concept, the SPPC calculate scores for six separate aspects, or domains, of self-concept.

MATERIALS AND METHODS

The research was conducted at two locations of Virginia Department of Parks and Recreation (VDPR), programs on the grounds of Richmond's elementary schools though not affiliated with the schools. The after-school program includes an afternoon snack, time to do homework, and recreational activities including organized sports. At the test site the VDPR staff initiated a garden as part of their summer program. The control group site was another VDPR program without a garden but with similar demographic data. From data collected by VDPR, participants at both locations are almost 100% African American with an even proportion of males and females and similar age distributions between 5 and 11 years. Approximately 56% the of children live with their mothers only while 30% live with both parents and others live in diverse housing arrangements.

Approval for this research was obtained from Virginia Tech's Institutional Review Board. VDPR program facilitators obtained a signed consent form from each participant.

The study consisted of three parts: one administered as a pre-and post-test and the other two administered at the end of the study only:

1. Pre- and Posttest SPPC: Subjects at each school took the SPPC as a pre- and post-test. The SPPC questionnaire is composed of six subscales: scholastic competence, social acceptance, athletic competence, physical appearance, behavioral conduct, and global self-worth. Each subscale consists of six questions, for a total of 36 items. The first six questions on the survey include one from each subscale and the remaining questions rotate through in this same order. The questions are formatted to have children check one out of four possible answers for each question (Figure 1). They are first presented with two opposing statements about children, such as: Some kids often forget what they learn, **BUT** Other kids can remember things easily. Beside each statement are two boxes labeled ‘really true for me’ and ‘sort of true for me.’ They first must pick which statement sounds more like them, then decide how ‘true it is for them. This creates a four-point scoring scale for each question, where “really true” for the less positive statement is scored as 1 and “really true” for the more positive is scored as 4. The goal of this alternative question format is the reduction of socially desirable answering (Harter, 1985). Half of the questions, distributed randomly throughout the survey, start with the more positive statement on the left side of the page while the other half start with the less positive statement.

Figure 1. Question format of the Self-Perception Profile for Children

Really true for me	Sort of true for me	Some kids often forget what they learn.	BUT	Other kids can remember things easily.	Sort of true for me	Really true for me
<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>

2. Drawings: Children in each program were asked to draw a picture of “what the word garden means to me.” Three methods commonly used to gain insight into children

are self-report, observation, and projective measures (Klepsch and Logie, 1982). Because multiple approaches should be used when studying children (Klepsch and Logie, 1982), drawings were chosen to serve as a projective method of evaluating the effects of gardening on the children. Through their artwork, children are more likely to honestly express their thoughts than they are during an interview or other self-report measures (Klepsch and Logie, 1982).

3. Questionnaire: The third component was a questionnaire developed by the researchers and was administered to the test group only. Questions sought to determine the children's opinions of gardening, how much they felt they learned, their interest in participating in gardening again, and their perception of their own behavior while gardening. It is recognized that this type of questionnaire lends itself to giving socially acceptable answers intended to please the researcher and this factor was taken into consideration in analysis and interpretation of the data.

The SPPC pre-tests were administered in Spring 2002 before the gardening program began. Using the author's instructions (Harter, 1985), the researcher administered the survey in groups of five to six children at the program sites. The SPPC was administered verbally for those needing assistance with reading. Pre-tests were left for VDPR facilitators to administer to those students who were absent during the original session. However, only two of these were completed correctly and included in data analysis.

The researcher administered all post-tests, drawings, and questionnaires during several visits in late August and early September 2002.

Pre- and post-test SPPC's were analyzed using SPSS statistical software (SPSS 11.0). Paired t-tests and one-way ANOVAs were performed. Questionnaire responses were analyzed using SPSS to calculate frequencies and cross tabulations of responses to different questions. The children's drawings were analyzed by the researcher, who examined them for content, including: number and diversity of plants, details showing knowledge of plants and gardening, signs of human interaction, and inclusion of other wildlife.

RESULTS

Final sample sizes with useable data for both pre-test and post-test from the same person were small due to several factors, including limitations presented by the distance between the researchers and the VDPR sites (~ 200 miles) which contributed to the need for co-operative test implementation. Despite training and willingness on the part of VDPR sites, SPPC tests were only properly administered by the researcher, reducing the sample size. The SPPC test format proved to be confusing for the children and numerous subjects completed the test incorrectly. In addition, VDPR staff found it difficult to obtain permission from parents for children to be included in the study and the transient nature of students reduced the number present at post-testing. Another factor impacting final useable research data was the last minute loss of two other test sites, not connected to VDPR. One was lost due to administrative policy regarding the use of land for a garden, while the other program decided not to participate in the research. Sample sizes for the test group are as follows: SPPC, N=10; garden drawings, N=18; and questionnaire, N=21. Control group sample size was N=6 for the SPPC and N=10 for the garden drawings.

SPPC

Although the limited sample size makes it impossible to reach statistically sound conclusions, certain trends could be observed. Visual comparison of the SPPC pre- and post-test scores suggests an increase in test group scores but shows little or negative change in control group scores (Table 1), indicating that the gardening program may have had a positive impact on the self-concept of participants.

Table 1. Average pre- and post-test scores from each domain of the Self Perception Profile for Children for the test group and the control group.

Domain	Test Group Mean Score ^z		Control Group Mean Score ^z	
	Pre-test	Post-test	Pre-test	Post-test
Academic	3.183	3.283	2.917	2.694
Social	3.167	3.167	2.833	2.917
Athletic	2.800	2.992	2.639	2.278
Appearance	2.817	3.317	2.903	2.944
Behavior	2.942	3.292	3.361	3.111
Global	3.150	3.517	3.361	3.222

^zPossible scores range from 1 to 4, with 4 being the most positive.

One-way ANOVAs were performed to look for any significant differences between the scores of the test group and those of the control group, both for pretest scores (Table 2) and posttest scores (Table 3). The only significant difference found was in the post-test athletic domain.

Table 2. ANOVA comparisons of the test group and control group pre-test scores for each domain of the Self Perception Profile for Children.

Pre-test Domain	Students (No.)	Mean Score ^z	SD	Df	F	<i>P</i>
Academic						
Test Group	10	3.183	.734	1	.493	.494
Control Group	6	2.917	.736			
Social						
Test Group	10	3.167	.766	1	.636	.438
Control Group	6	2.833	.882			
Athletic						
Test Group	10	2.800	.823	1	.130	.723
Control Group	6	2.639	.933			
Appearance						
Test Group	10	2.817	.722	1	.077	.786
Control Group	6	2.903	.281			
Behavior						
Test Group	10	2.942	.772	1	1.485	.243
Control Group	6	3.361	.414			
Global						
Test Group	10	3.150	.755	1	.376	.549
Control Group	6	3.361	.464			

^zPossible scores range from 1 to 4, with 4 being the most positive.

Table 3. ANOVA comparison of the test group and control group post-test scores for each domain of the Self Perception Profile for Children.

Posttest Domain	Students (No.)	Mean Score ^z	SD	Df	F	<i>P</i>
Academic						
Test Group	10	3.283	.681	1	2.222	.158
Control Group	6	2.694	.897			
Social						
Test Group	10	3.167	.572	1	.623	.443
Control Group	6	2.917	.681			
Athletic						
Test Group	10	2.992	.438	1	7.796	.014*
Control Group	6	2.278	.584			
Appearance						
Test Group	10	3.317	.632	1	1.590	.228
Control Group	6	2.944	.443			
Behavior						
Test Group	10	3.292	.579	1	.395	.540
Control Group	6	3.111	.513			
Global						
Test Group	10	3.517	.487	1	1.239	.284
Control Group	6	3.222	.554			

^zPossible scores range from 1 to 4, with 4 being the most positive.

* Statistically significant at $P = .05$

Paired t-tests showed that there was only one statistically significant change between test group pre- and posttest scores (Table 4) and none for the control group (Table 5).

Table 4. Paired t test comparison of pretest and posttest Self Perception Profile for Children tests for the test group.

Domain	Students (No.)	Mean Score ^z	SD	Df	<i>t</i>	<i>P</i> (Two-tailed)
Academic						
Pretest	10	3.183	.735	9	-1.034	.328
Posttest	10	3.283	.681			
Social						
Pretest	10	3.167	.766	9	-.002	.998
Posttest	10	3.167	.571			
Athletic						
Pretest	10	2.800	.823	9	-1.192	.264
Posttest	10	2.991	.437			
Appearance						
Pretest	10	2.817	.722	9	-2.374	.042*
Posttest	10	3.317	.632			
Behavior						
Pretest	10	2.942	.772	9	-1.524	.162
Posttest	10	3.292	.580			
Global						
Pretest	10	3.150	.755	9	-2.070	.068**
Posttest	10	3.516	.487			

^zPossible scores range from 1 to 4, with 4 being the most positive.

*Statistically significant at *P* = .05

**Statistically significant at *P* = .1

Table 5. Paired t test comparison of pretest and posttest Self Perception Profile for Children tests for the control group.

Domain	Students (No.)	Mean Score ^z	SD	Df	<i>t</i>	<i>P</i> (Two-tailed)
Academic						
Pretest	10	2.915	.735	5	.713	.508
Posttest	10	2.693	.898			
Social						
Pretest	10	2.833	.882	5	-.300	.776
Posttest	10	2.917	.683			
Athletic						
Pretest	10	2.639	.933	5	1.051	.341
Posttest	10	2.278	.585			
Appearance						
Pretest	10	2.903	.281	5	-.180	.864
Posttest	10	2.943	.441			
Behavior						
Pretest	10	3.361	.414	5	.985	.370
Posttest	10	3.111	.514			
Global						
Pretest	10	3.361	.464	5	1.182	.290
Posttest	10	3.222	.555			

^zPossible scores range from 1 to 4, with 4 being the most positive.

Garden Drawings

Examination of both test and control group drawings for color and content (i.e. colorful flowers, smiling face on sun, people playing) completed by the researcher found that all of the drawings appear to show a garden as an attractive space. Several differences were seen, however, between the two groups. These differences can be placed in two different categories: scientific knowledge and level of interaction with nature.

Plant diversity and anatomy were inspected in each drawing (data not presented). The test group drawings (N=18) demonstrate greater diversity. The average number of different types of plants in the test group drawings was 3, with 66.7% of drawings (12) containing 3 to 5 different types of plants. Drawings by the control group (N=10) had an average of 2 different plants per picture with 40% (4) showing one plant and 50% (5) showing 2 types. Of test group drawings, 72.2% (13) included flowers, 72.2% (13) included fruits or vegetables, and 16.7% (3) included trees or shrubs. Of control group drawings, 100% (10) included flowers, 10% (1) included vegetables, and 10% (1)

included trees or shrubs. The test group also seemed to display more knowledge of the anatomy of plants. While 50% of each group drew plants missing either stems or leaves, roots were included in 55.6% (10) of test group drawings but only 20% (2) of control group drawings. Because 72.2% of test group drawings included fruits or vegetables, these drawings included more specialized plant parts than did the control group drawings.

Drawings were also examined for signs of ecology/wildlife. Only two students from the test group included signs of wildlife and none in the control group did. Weather elements were also noted. While almost all pictures included a sun and clouds, only two children, both in the control group, drew active weather such as rain.

The second category, level of interaction with nature, can be described as indications of human work and play in the garden. Both groups showed about the same amount (40% of the control group and 33.3% of the test group) of constructive human interaction in their drawings (i.e. people working or playing, garden signs). However, 30% (3) of students in the control group drew roads through the middle of the garden giving the feeling that a garden is something you drive by rather than something in which to participate. This idea was not seen in test group drawings.

Questionnaire

The questionnaire was completed by 21 children from the test group. Response rates reported here were calculated using these 21 surveys, though several were missing some answers (Table 6).

Table 6. Percent response for each question included on the questionnaire, which was administered to the test group only.

Question	Answers (%)			
	A lot	Some	Little	Not at all
1. How much did you like growing plants in the garden?	61.9	23.8	9.5	4.8
2. How much did you learn from doing things in the garden?	71.4	19.0	9.5	-
	Great	Okay	Could do better	
3. How well do you think you took care of the plants in the garden?	52.4	28.6	14.3	
4. How do you feel about your work in other school subjects?	57.1	38.1	-	
	All that you could	Most . . .	Some . . .	Very little
5. In the garden, did you feel that you learned:	52.4	38.1	4.8	-
6. In your classes at school do you feel that you learn:	71.4	9.5	9.5	4.8
	Great	Okay	I have trouble. . .	
7. When in the garden, how do you feel you get along with other kids?	76.2	14.3	-	
8. When at school, how do you feel you get along with other kids in class?	76.2	9.5	4.8	
	Better	Same	Worse	
9. Some days you did not work in the garden. On the days that you did work in the garden, did you feel:	61.9	14.3	9.5	
10. Some days you did not work in the garden. On the days that you did work in the garden, did you behave:	57.1	28.6	-	
	Yes		No	
11. Did you tell anyone else something you learned from the garden?	76.2		9.5	
12. Did you visit the garden when you were not working in it?	47.6		38.1	
13. Did you bring friends or family to visit the garden?	47.6		33.3	
14. Is this the first time you have gardened with a group of kids?	61.9		23.8	
15. Would you want to garden with a group again?	81.0		4.8	
16. Did you eat food from the garden?	38.1		47.6	
17. Have you ever had a garden at home?	33.3		52.4	
18. Would you want to have a garden at home?	81.0		-	
19. Did you grow any plants at home this year?	47.6		38.1	

In general, children's responses to the questionnaire showed that they enjoyed the program, want to participate in the program again, would like to garden at home, learned from the garden, felt better on days in which they worked in the garden, and report that while in the garden, they both behave and get along with others the same or better than they do in class.

Cross tabulations of answers for questions 7 and 8 show that 76.2% (16) feel that while in the garden they got along with other students better or the same as in class. Only 14.3% (3) reported that they got along with others worse while in the garden. A cross tabulation of questions 3 and 4, shows that 61.9% (13) of children reported that they felt the same or better about their performance in the garden than their performance in class.

Seven reported feeling worse about their work in the garden, possibly due to the fact that they had limited time to work in the garden.

CONCLUSIONS

While results from this research are statistically inconclusive, trends seen in the data suggest that group gardening may be an effective tool to raise the self-concept of children through meaningful work and achievement. In addition, they suggest that informal, group gardening programs can be useful for the education and recreation of elementary school students. While this study found a significant change in only one domain of self-concept, four other domains appeared to increase. This study also suggests that children not only perceive themselves as learning while working in a garden, but that they also report feeling better, exhibiting better behavior and enjoying themselves while learning.

As seen from the earlier studies cited and this project, much research has been inconclusive due to limited sample sizes and other factors, but together the body of research suggests that youth gardens can be an effective tool for the development of children in many ways and larger research efforts should be made to further explore these possibilities.

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IV. Effects of Youth Gardening Programs: Issues in Research Design

INTRODUCTION

An increasing amount of research is exploring the effects of horticulture programs on youth participants. Studies have examined effects of youth gardening programs on academic achievement (Alexander et al., 1995; Canaris, 1995; Sheffield, 1992), nutrition (Canaris, 1995; Lineberger and Zajicek, 2000), environmental awareness (Endoh and Morinaga, 1996; Milton et al., 1995; Skelley and Zajicek, 1998; Waliczek and Zajicek, 1998), self-esteem (Dawson and Zajicek, 1998; Sheffield, 1992; Waliczek and Zajicek, 1998), life skills (Barker, 1992; Bunn, 1986; Waliczek et al., 2001; Wotowiec, 1975), behavior (McGuinn and Relf, 2001), and other benefits. While this body of research indicates that youth gardening programs offer numerous benefits to participants, many studies to date have been purely anecdotal or inconclusive, lacking the scientific rigor to legitimately claim the suggested benefits. Large scale, scientifically valid studies are needed to secure the administrative support and funding for such programs, but research in this field has proven to have many difficult factors. Research with human subjects, especially with youth, involves many complications not present in research conducted with plants.

A few researchers have begun to publish articles addressing the types of problems inherent in this field. Predny and Relf (1998) describe some factors negatively impacting their research on intergenerational horticulture programming and suggest several planning methods to make research more successful. First, they suggest that more thorough communication with the collaborating facility would have provided the staff support that was needed to make the program a success. This includes building the program around the philosophy and goals of the facility and agreeing on a schedule that is convenient for the staff. Problems were also encountered with good-intentioned but inexperienced volunteers. Researchers should treat volunteers with respect, provide them with training on how to work with the study population, and give them a clear list of expectations (Predny and Relf, 1998). Shoemaker et al. (2000) call for the use of interdisciplinary teams to improve the outcomes of research. They also describe

numerous methodologies that have been used successfully in exploring people-plant interactions.

Without more solid research, youth gardening programs will not receive the financial and administrative support needed for continued growth. To help improve future research, a survey was conducted to pool the knowledge and experience of those experienced with research in this field.

METHODS

A survey was designed to investigate the common problems experienced by those involved in school and youth gardening research, seek techniques for overcoming the problems, and gain insight into future directions for research. Exemption status was granted by the Internal Review Board for this study. The survey (Appendix 1) was written to include a combination of closed- and open-ended questions and was pilot tested by one published researcher in this field. The survey was sent to faculty and graduate students across the country having recently participated in related research. Names were obtained through a literature search, referrals from colleagues, and an Internet search. A total of 21 researchers were identified in ten states. University departments represented include Horticulture, Agricultural Science, Plant Science, Cooperative Extension, Design and Environmental Analysis, and Health and Nutrition. Two of the researchers are employed by botanical gardens. Emails were sent to 17 of these researchers asking for their participation in the survey; contact information could not be found for the remaining four persons. Surveys were then mailed to all 17 persons with self-addressed, stamped envelopes for their return. Several weeks later, a reminder email was sent out with the survey attached electronically. It is acknowledged that all eligible participants were not identified, making the sample population somewhat biased. However, measures were taken to enlist participants from all parts of the country.

RESULTS

A total of 13 surveys of 17 (76%) were returned. All respondents report having planned and implemented research sometime between 1996 and the present.

Characteristics of Past Research

The first survey question asked respondents to list the specific topics investigated in their research. The most common topics reported are listed below (Table 1). Other areas reported by at least one respondent are fitness, garden design, risk management, special needs, teacher needs, impact of nature on well-being, behavior, and therapy.

Table 1. Percent of survey respondents who have conducted research on these aspects of youth gardening.

Topic	% of researchers studying topic
Health or nutrition	69
Environmental education	46
Self-esteem or self-concept	30
Academic achievement	23
Life skills	23

Another question determined what age groups have been included in research. The majority of respondents, 85% (11), report having done research with elementary aged children. Over one third, 38% (5), report having worked with middle school students, 23% (3) have studied high school students, and 15% (2) have done research with preschool children.

Collaborators

The survey sought to determine with whom researchers were collaborating and which of these organizations are the most supportive of youth gardening research. It was found that several organizations have offered support to a majority of research projects (Table 2). Other organizations that have collaborated with a small number of researchers include: other universities, Department of Parks and Recreation, Social Services, the Housing Authority, botanical gardens and arboreta, various grant organizations, and the horticulture industry.

Table 2. Percent of respondents who report having collaborated with these organizations in conducting research.

Collaborating Organizations	% respondents who have collaborated with
School system	85
Cooperative Extension Service	
Extension Agents	77
Master Gardeners	46
4-H clubs	30
Other university departments	54

Another survey question inquired at to where resources for gardening programs and research were obtained (data not presented). The diversity of responses to this question illustrates that resources have come from all different organizations and institutions, including: schools, university faculty, Cooperative Extension and Extension Master Gardeners, the horticulture industry, graduate students, and grant agencies.

When asked to specifically name the collaborators who had shared the most resources or assistance for research, 30% (4) named schools or teachers, 23% (3) identified other university departments, and 15% (2) each named the Extension Service and Extension Master Gardeners.

Time Needed to Conduct Research

The survey asked respondents to report the actual time used to complete their research (Table 3).

Table 3. Time survey respondents actually used to complete research.

Time to conduct research	% survey respondents*
< 1 year	40
1 – 1 ½ years	20
1 ½ - 2 years	7
> 2 years	33

* not cumulative because several researchers listed time lengths for more than one research project.

The survey then asked how much time they would suggest in order to design and plan, execute, and evaluate research. Many researchers noted that the time needed would vary greatly with the content and design of a study. However, estimated time ranges were provided on most of the surveys.

Time suggested for planning research ranged from two months to over a year (Table 4). It was noted by two respondents that extra time should be planned to allow for a pilot run of any test instrument or survey to be used in the research.

Table 4. Time lengths suggested by survey respondents to design and plan a research project.

Time needed to plan research	% respondents suggesting
2-4 months	23
6-12 months	31
1 year or more	23

Time suggested to execute research varied even more widely (Table 5). Several respondents commented that longitudinal research would better explore any long-term benefits youth may gain from horticulture programs. However, working with youth populations makes longitudinal research very difficult for several reasons; children are considered a vulnerable population and research with youth must always be approved by a university Internal Review Board as well as any other service provider that is involved with the research, such as the school system. Parental approval must also be obtained. The high mobility of children, who change teachers and schools frequently, makes it difficult to complete a long term study with large numbers of participants still involved at the end.

Table 5. Time lengths suggested by survey respondents for executing a research project.

Time needed to execute research	% respondents suggesting
Several weeks	8
6 – 12 months	15
1 – 2 years	31
2 – 5 years	31

Just over 60% of survey respondents provided an estimate of time needed to evaluate research findings (Table 6). One respondent noted that this time length was subject to change depending upon the other responsibilities of the researcher.

Table 6. Time lengths suggested by survey respondents for evaluating research results.

Time needed to evaluate research	% respondents suggesting
1 – 3 months	40
6 months	15
1 year	8

It is evident that the times suggested by survey respondents to complete all aspects of a study are longer than the times many reported allowing for their past research.

Common Problems

The survey sought to identify the key problems most frequently encountered in this field and possible ways to avoid or overcome them. Respondents were first asked to list all problems encountered in conducting their research and then to list the problem they felt was most inhibiting to their research (Table 7). Several respondents listed more than one problem as having been most inhibiting.

Table 7. Problems reported by survey respondents as frequently encountered and as most inhibiting for conducting research.

Problem	% researchers who encountered	% listing as their most inhibiting problem*
Timing\Logistics	69	13
Funding	54	23
Sufficient # of participants	46	23
Appropriate testing tools	38	8
Support of school/other organization	38	0
Obtaining parental permission	31	23
Test subjects dropping out/absent	31	23
Promised help not following through	31	8

* Not cumulative; several respondents listed more than one most inhibiting problem.

The next question requested suggestions for overcoming these difficulties. A wide range of comments was received, but three themes can be seen (data not presented). The first is planning in advance to avoid problems and remaining flexible in order to deal with any that do arise. This requires having knowledge as to what problems may be encountered and how research design can help reduce the effects. The second theme

focuses on communication and how to avoid problems by finding efficient communication techniques with all participants. The best method of communication between all collaborators, such as phone, email, or fax, should be established. All discussions should be followed by written confirmation of what was decided. All collaborators should understand from the beginning what their benefits for participation are, what their obligations are, and why it is crucial to complete their tasks in the given time frame. Researchers should also understand the workload and schedule of collaborators in order to set realistic expectations for their level of participation. Comments from the third theme suggest ways to increase collaboration with schools or other organizations by understanding their motivation for participating and offering incentives such as a pre-written garden curriculum or other supplies.

Suggestions for Research Design

When asked if future research should primarily be quantitative or qualitative, 69% (9) said that future research should include both of these methods. A small minority, 15% (2), called for quantitative, claiming that numbers have a stronger effect on administration. The same number, 15% (2), requested qualitative research noting that quantitative studies in this field are difficult because of the many confounding factors. One researcher commented that quantitative measures better articulate results while qualitative measures help us understand the real meaning of these numbers.

Gardening programs have been reported to provide many different kinds of benefits to youth participants. An open-ended question inquired as to which of these benefits future research should investigate to best stimulate growth in the use of school and youth gardens. A wide variety of answers were obtained and most respondents offered more than one subject (Table 8). Specific academic and curricular topics suggested include meeting the state Standards of Learning, achievement and accountability, reading, and comparing the learning value to the money invested. Other topics suggested by a small percentage of respondents were environmental stewardship, respect for the Earth, social skills, the value of green space, and exploring the impact of success with plants on how children feel about themselves.

Table 8. Subjects named by survey respondents to be the focus of future research in order to best promote support for youth gardening programs.

Subjects for focus of future research	% respondents suggesting*
Academic and curricular benefits	62
Health, nutrition, or fitness	24
Life skills and resiliency	24

* not cumulative

Suggestions and advice for future research was solicited through another open-ended question (data not presented). One respondent suggested that in choosing a dependent variable, future researchers should consider how that variable would influence policy and policy makers. Another recommended that research should be based on an existing theory, such as an educational, sociological, or psychological theory, in order to enhance the credibility of the research. One comment proposed that linking the goals of research to career readiness would help in soliciting funding. Planning far in advance was suggested by one respondent who mentioned the limited amount of time Masters level students have to plan, organize, and implement this type of research. It was suggested that these students would have more success by implementing research at least partly pre-planned by department faculty. One person requested more studies be conducted with a pre- and post-test design. Pre-written educational kits were again proposed to help encourage and support cooperating teachers. It was also advised that researchers work with individual teachers and schools to generate interest before going to the school board for permission to conduct research.

The last question gave respondents space to write any final thoughts or comments (data not presented). About half chose to write something, two of which reiterated the need for well-planned longitudinal studies. Another concluded that researchers must be able to show cause and effect on achievement gains to justify the time, money, and energy required by gardening programs.

CONCLUSIONS

There are many factors that confound research exploring the impacts of gardening programs with youth. Survey findings suggest that the largest problems to overcome in order to produce valid results are: issues with the timing and logistics of planning and

conducting a study, obtaining a sufficient number of subjects, and finding appropriate funding. According to survey respondents, there are three main categories of techniques to employ in planning and implementing successful research. These are early and careful planning to avoid identified possible problems, establishing and maintaining good communications with everyone involved, and providing incentives for participation.

Future researchers should allow plenty of time for the planning stage. This may be particularly difficult with studies conducted primarily by graduate students. Faculty should take into consideration the short time span allowed for design, implementation, and evaluation, particularly with Masters degree students, and guide research appropriately.

In choosing a research topic, attention should be paid to the implications of potential findings. According to several survey respondents, the most effective research seeks to report information that will be of interest to policy makers and administration. For example, school gardening research should focus on issues that are currently important to school administration, such as compliance with state Standards of Learning, time and cost efficient stimulation of academic achievement, and improving the health and nutrition of students. Research with juvenile offenders could focus on issues related to behavior management and reducing recidivism. Appropriate testing methodologies should be determined and should always be pilot tested.

The initial planning stage is crucial to the final success of a research project. At this time, effective communications must be established between all involved parties to ensure the greatest amount of support, compliance, and understanding of research techniques. Researchers should be well organized and thorough in describing both the obligations and benefits of participating in the project to all collaborators. Identifying test subjects for the research should also be a major focus early in the planning and design phase. The initial number of subjects should be sufficient to compensate for large losses. Cooperative Extension agents frequently have extensive networks already established within the school system and other community organizations, making them a good source of collaboration in obtaining adequate sample sizes.

Funding is another issue to address early. According to survey responses, funding and other resources have been obtained from many organizations (Table 9). Researchers

should know what will be needed and seek help from as many different sources as possible. Targeted sources will vary with different research goals and subject groups.

Table 9. Sources of funding and other resources for conducting research on youth gardening programs.

Sources
Boys and Girls Clubs
Cooperative Extension, including Master Gardeners and 4-H
Granting organizations
Housing Authority
Other departments within a university
Other universities
Parent Teacher Associations
Parks and Recreation
Schools
Vocational/technical schools
Horticulture industry
Division of Mental Health

Two types of research design offer the potential to generate the large scale, scientifically valid results needed to advance the support of horticulture programs for youth. Longitudinal studies are needed to evaluate the long-term effects of youth gardening programs. Finding committed collaborators to help plan and implement long-term research projects will add depth to the existing body of research. The second type of study needed in order to provide valid, generalizable results is large-scale collaborative research. Faculty from multiple universities and other organizations across the country should work together to design and implement studies in order to complete research having multiple replications, sampling that comes closer to being random, and statistically valid outcomes.

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V. Appendices

APPENDIX 1: SURVEY ON RESEARCH ISSUES

Please complete the following survey based on your experience with research in the field of horticulture programming for youth. For the 'multiple choice' type questions please mark all answers that apply and write in any 'others.' Feel free to add any additional details or comments **anywhere** on the survey. Thank you for sharing your wisdom!

1. Your research has focused on using horticulture for (check all that apply and give any details):
 - Environmental Education
 - Academic subjects
 - Risk management
 - Health or nutrition
 - Fitness
 - Special needs
 - Self-esteem/self-concept
 - Life skills (e.g. respect, responsibility, etc.)
 - Design
 - Others, please list: _____

2. The youth involved were in what level of school? (check all with which you have worked)
 - Preschool
 - K-5
 - 6-8
 - 9-12

3. In what year/s was this research conducted and what was the duration/s?
Year/s: _____
 - Less than one year
 - 1 – 1 ½ year
 - 1 ½ - 2 years
 - More than two years

4. From your experience, how long do you need to **design and plan** this type of research?

5. How long do you need to **execute** this type of research? To **evaluate**?

6. Check all with whom you have collaborated in conducting your research/designing programs:
- Individual schools
 - School Board
 - City Council
 - Other university departments (please list): _____
 - Other universities
 - Extension Service
 - 4-H
 - Boys and Girls Club
 - Girl/Boy Scouts
 - Master Gardeners
 - Volunteers (what kind?) _____
 - Parks and Recreation
 - Social Services
 - Juvenile Courts
 - Housing Authority
 - Botanical Garden/Arboreta
 - Horticulture Industry
 - Grant organizations (please name): _____
 - Others (**please list!**): _____
-
-

7. What resources did these organizations provide? Please list the corresponding collaborator from above beside each resource you check.
- Staff _____
 - Funding _____
 - Location _____
 - Identified subjects for research _____
 - Volunteers _____
 - Supplies/Materials _____
 - Knowledge/Expertise _____
 - General approval/Support _____
 - Others (please list): _____
-
-

8. Which collaborators were the most helpful or had the most resources to share?

9. Which collaborators were most **essential** in conducting your research and why?

10. What problems did you run into with your research? Please add any notes for clarification.

- Timing
- Sufficient number of participants
- Testing tools
- Obtaining permission from parents
- Obtaining support from school/other organization
- Funding
- Promised help not following through
- Test subjects dropping out/moving
- Land/water shortage
- Others (please list): _____

11. Please explain any ways you found, or would suggest, to successfully overcome these problems.
(Feel free to use more paper if necessary.)

12. Which problem was most inhibiting to your research?

13. Do you think future research in this field should be primarily quantitative or qualitative and why?

14. What areas do you think most need research in order to promote support for and growth in horticulture programming for youth?

15. Do you have any suggestions or advice for those conducting future research?

16. Please share any other thoughts you have on conducting this type of research.