HORTICULTURAL ACTIVITIES AND DEMOGRAPHIC FACTORS INFLUENCE CHILDREN'S SELF-ESTEEM

by

Patrick Neal Williams

B.S., California Polytechnic State University,
San Luis Obispo, 1985

A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Horticulture

Kansas State University
Manhattan, Kansas

1987

Approved by:

Richard H Mattson

Major Professor

ACKNOWLEDGMENTS

I would like to express my sincere thanks to Dr. Richard H. Mattson, Department of Horticulture, who was my major advisor and a friend throughout my stay at Kansas State University. I would like to extend thanks to my committee members, Dr. Charles W. Marr, Department of Horticulture, for his assistance in data analysis and graphic presentation, and Dr. Gerald S. Hanna, Department of Administration and Foundations, for his help in obtaining and developing appropriate survey instruments.

Many thanks and love go to my family and friends for their support of me while attending Kansas State University.

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Patrick Neal Williams
Kansas State University, Manhattan

ABSTRACT

A five-month study of children gardening in the Manhattan Community Garden, Manhattan, Kansas, revealed differences in self-esteem, horticultural knowledge, and quality index of gardens. The demographic factors used in this study were age, gender, and number of children per family participating. Children without other siblings gardening had higher self-esteem, gained more horticultural knowledge, and had better appearing gardens than children with other siblings gardening.

INTRODUCTION

Within medical and vocational programs, horticultural therapy provides benefits to people with developmental disabilities, head trauma, physical and/or mental disabilities, social adjustment difficulties, or aging-related problems. In addition, horticultural therapy activities can promote the health of children or adults through wellness programs. Exercise or relaxation within a plant environment are considered to be examples of horticultural therapy used in a wellness model. For this research study, the children's garden was considered to involve both medical and wellness models.

Children from areas surrounding the Manhattan Community Garden participated in garden activities from April to September, 1987. The study statistically measured changes in self-esteem and horticultural knowledge by the children participants using a pre and post-test research design.

This research had three objectives: (1) to measure effects of gardening activities on children's self-esteem, (2) to evaluate effects of gardening activities on children's horticultural knowledge, and (3) to examine the correlation between changes in self-esteem, horticultural knowledge, and the child's garden quality index rating.

LITERATURE REVIEW

A Belgian first grade class in 1840 had a curriculum that included gardening. But at the same time they also had to demonstrate proper identification of tools, animals, flowers, propagate fruit trees, make clothes, furniture, candles, be able to knit, and prepare meals (1). In 1914, a home gardening program in Chattanooga, Tennessee had 510 children involved during the summer months on 12 acres of land. One boy produced $185 from his garden. The experience gained set standards to strive for in the future children's gardens (2).

"Food will win the war and write the Peace" and "Vitamins and vegetables for our school children and victory for America" were popular slogans during the years of World War II. The Victory Gardens encouraged young and old alike to help out with the war effort. The campaign netted an estimated 18 million gardeners each year (4). Parents played an important role in the children's garden by having a healthy attitude and believing in their children's efforts (3). The main use of the children's garden produce went into school lunch programs (4). It was believed one of the benefits of children's gardens along with producing health-building food for our armed forces and those of our Allies, was being a "natural" for helping to keep boys and girls from becoming delinquents (5). Today studies have shown that inner city neighborhoods with gardens have lower rates of vandalism. The streets are cleaner and there is a sense of community belonging with the shared experience of gardening (13).

Gardening was a way of life for school children in the early part

of the century. What has happened to those programs? In a conversation between a member of the Learning About Plants (LEAP) staff at Cornell University and a young child in the program, the staff member asked "Do trees grow?" The young child said she was sure they did. When asked where trees get their food, the child responded "I think they eat the soil, but they eat so little you really can't tell," (6). Is an important link between nature and school children on the brink of being lost?

With all of the benefits that gardening and plants give to people, it would be tragic to lose this bond. Besides being an economic benefit, gardening is conducive to good mental and physical health (8). This is the ultimate goal of therapeutic programs. Benefits may be seen in four areas--intellectual, social, emotional, and physical development (10). Gardening also fills a person with a sense of achievement no matter what the activity. The gardener receives exercise, relaxation, anticipation, creativity, and beautification (8,16). Gardening can also play a role in a person's life by substituting somewhat for nature (12). Plants have an appeal to all five human senses. The effect of living plants on mankind in a therapeutic and rehabilitation way has been known and practiced by the medical profession for at least 250 years. Historical records on the effects of "garden therapy" date back to at least 1798 (9).

Can humans cast this activity away in the race for modern technology? When a human being is under stress, it appears that the presence of plants and the opportunity for close association with them can exert a beneficial psychological effect (13). Plants may be therapeutic because they share the same life stages as humans. They are alive,

need care and nourishment, start from a seed, grow, bloom, reproduce and die. And with death does not come an end, but rather a part of the total life cycle (14).

Therapy is just one part of a cycle for betterment of the client. Through different areas and treatments, horticulture works for different population. In a study with young emotionally disturbed, autistic, and mentally retarded children in a garden setting, there was an increase of overall functioning for the children. The areas of improvement were self-esteem, awareness and responsibility for themselves, environment, and others, practical knowledge, concept of work and work experience, and communications (11). A wide range of highly skilled gardeners reported the most important benefit and satisfaction obtained from gardening was "peace and tranquility." The peacefulness is transferred among the gardeners while adding the opportunity to develop socialization around the focus of plants (14). Another study reported a significant difference between the control group and the treatment group of 4 and 5 year olds in plant stimulated activities and group cohesiveness (7).

Plants have become a part of play therapy for children in a hospital setting. Five areas plants are used for include reverse dependency, doctor/nurse play therapy, individual attention/group interaction, parent interaction, and nursing/medical staff interaction. Through a child life/play therapy program with plants, the child's psychological trauma of hospitalization is reduced, and the hospital experience can become a positive one (18). Plants are playing an important role in different areas of therapy (20), such as medical model programs and community based programs.

"Horticultural therapy is a type of adjunctive therapy that brings

one close to the soil, close to the beauty and mystery of the growth and development of living plants," as stated by Dr. Karl Menninger (20). Part of the success of horticultural therapy results from the client realizing that the plant requires care for its survival (20). Part of the success also comes from the therapeutic setting. There are three components to horticultural therapy, the client, the plant, and a therapist. All the components need to be present for a successful setting, without the horticultural therapist, the process could not occur as rapidly nor as effectively (15).

MATERIALS AND METHODS

Individual garden plots for each child in this study were provided at the Children's Garden located in the Manhattan Community Garden. Preparation for the raised earth beds began on March 21 and continued through April 11, the opening day of the gardens. Preparations included digging the raised beds, weeding, and removing Bermuda grass and broken glass. All of the supplies for the gardens were provided by Kansas State University and the University for Man, Manhattan, or the researcher, i.e. seeds, seedlings, labels, tools, water, and adult supervision. Adult supervision was provided by knowledgeable volunteers from the university's staff and students, along with members of the surrounding community.

Informed consent forms were drafted and provided to the children and volunteers to insure confidentiality in the study. The informed consent forms were approved by the Human Subjects Committee at Kansas State University. The forms were read and signed by the children's guardians before the child could begin gardening.

A total of 24 children from the community participated in this study. The age range was 5 to 13. The children made up a representative cross section from this small rural community. Children were recruited by the researcher and by local neighborhood children. They represented new and experienced gardeners, past years' gardeners, younger siblings of past gardeners, sign-ups at University for Man, and Girl Scouts working on merit badges.

The children met every Saturday morning from 8:30 am to 1:00 pm. The children could stay for the entire length or whatever time period they

wanted to garden. Adult supervision was provided every week to answer questions and help with the gardening process. Garden activities included planting, weeding, watering, harvesting, and identification of plants and insects.

Two survey tools were used to measure each child's level of self-esteem and horticultural knowledge. Survey tools were administered on a one-to-one basis by the researcher. All instructions and questions were read orally to bypass any problems associated with reading levels of the children. The first survey was the Piers-Harris Children's Self Concept Scale (17). The survey measured behavior, intellectual and school status, physical appearance and attributes, anxiety, popularity, and happiness and satisfaction. The second survey tool, The Children's Garden Survey of Knowledge, was developed by the researcher (Appendix C). This survey measured four domains: knowledge of basic terms, understanding relationships between plant parts, understanding cultural needs of plants, and demonstrating proper use of equipment.

The surveys were given during the first two weeks of each gardener's starting date and again during the last two weeks of the gardening period. With most of the children, this time interval was approximately four months.

A 30-point garden quality index rating was taken on September 10. This index took into consideration attendance, appearance of garden, number of vegetables grown, amount of weeds, and number of gardens planted.

The data was collected, and analyzed using Spearman's Correlation procedure and the Wilcoxon's signed rank test (19).

RESULTS AND DISCUSSION

Participant characteristics: Sixteen of the 24 children involved in this study completed the gardening activity. The eight children who did not finish were unable to do so for various reasons. Two families with two participants each moved from the area. Several other children became involved with summer recreational activities or lost interest. This 33% loss is not uncommon in community gardens. In 1987, approximately 25% of adult garden plots at the Manhattan Community Garden were abandoned.

Self-Esteem: The first objective measured effects of gardening activities on children's self-esteem. The normative sample mean for the Piers-Harris Survey (17), is 51.8, the standard deviation is 13.9, and the median is 53.4. In this study, as shown in Table 1, the pre-survey mean was 56.5, standard deviation was 9.4, and the median was 58.5. The post-survey mean was 57.0, standard deviation was 11.4, and the median was 55.5. Children ranked as high as the 98th percentile and as low as the 13th percentile. These self-esteem values would indicate that the study sample was slightly higher than the norm.

As shown in Table 2, the Spearman's Correlation procedures indicate high correlations between the component scores and the total Piers-Harris survey score. The correlation values of the six component scores were 0.80, 0.76, 0.38, 0.77, 0.59, and 0.66. Five component scores to total score correlation values were highly significant (0.01 level). The lowest significant correlation value of 0.38 would indicate the children were least concerned with their physical

appearance. The highest significant correlation values of 0.80, 0.77, and 0.76 indicate the children were concerned with behavior, anxiety, and intellectual and school status, respectfully. These correlations validate the Piers-Harris Survey as being a reliable measurement of children's self-esteem in this research study.

Post-survey results had no significant differences in the children's self-esteem as shown in Figure 1. Piers-Harris considers a significant difference to be greater than 10 points for an individual (17). Only two children had significant increases. Participant no. 2 increased 13 points from the 74th to 98th percentile and participant no. 9 increased 11 points from the 71st to 95th percentile. Nine children had non-significant decreases in self-esteem while five children had non-significant increases in self-esteem.

Demographic factors had no significant effects on children's self-esteem (Figure 2), but the factors did show subtle differences. Children without other siblings participating had a higher mean self-esteem level than sibling groups participating in the garden. The results placed younger siblings' mean self-esteem higher than their older siblings. This can result from extra responsibility placed on older siblings by parents to watch younger siblings. The older siblings kept watch over their younger siblings while commuting to and from the garden and while gardening. There were no differences associated with gender. This agreed with results stated in the Piers-Harris Survey (17). The younger gardeners had a slightly higher mean self-esteem at the end of gardening than did the older gardeners.

The Wilcoxon's signed rank test (19) showed no significant

differences between the pre and post survey component scores and total scores in self-esteem at the 0.05 level. (Table 4).

Participation level: These results are not surprising considering the amount of time children spent gardening. As shown in Table 1, the average child participated in about 60% of the activities over the 5-month study. At an average of 1.5 hours/week spent over the 23 weeks of the study, this meant an average gardener participated only 4 hours/month. This would not allow sufficient time to change a child's self-esteem. More than likely changes that occurred can be related to home environment, but not to rule out that gardening did have some effect on the changes in self-esteem.

This study does not show improvements of attitude toward work, gardening, and ability to get along with others. Marked changes were seen in some individuals in these areas over the 5 months. One individual changed form initially showing delinquent behavior at the gardens to volunteering and helping others with their gardens by the end of summer. This same child had a history of vandalism in the gardens, but this trait disappeared after two months of gardening and began helping the researcher. This study also does not show the improved attitudes toward food consumption at home. The parents of four children told examples of how their child now tries more fruits and vegetables, some which they would not even try before. Though self-esteem scores did not show significant differences, they were still present among the children. A different measuring device needs to be used to show subtle changes in the children, or a more structured setting needs to be used, e.g. school programs where other competitive summer activities like baseball and vacations would not interfere,

or contaminate the results.

Horticultural knowledge: The second objective measured gardening activities effect on horticultural knowledge gained. The Children's Garden Survey of Knowledge was the measurement tool used in this objective. The component scores showed high internal correlations to the total score using the Spearman's Correlation procedure (Table 3). These high correlations provide a basis for accepting the measurement tool as reliable in measuring children's horticultural knowledge in a gardening activity.

The pre-survey on horticultural knowledge had a mean score of 54.2 (Table 1), standard deviation of 17.3, and a median of 57.5. The post-survey mean score was 68.2, standard deviation of 18.2, and a median of 74.5. The children showed an average increase of 14.0 points between the pre and post-surveys. They improved proportionately across the sample of mean scores (Figure 3). This same pattern was followed closely by the garden quality index (GQI) rating scores. The correlation between horticultural knowledge and GQI was 0.34 with $p = 0.196$ using the Spearman's Correlation procedure. This does not indicate a high correlation, but shows a similar pattern between the two areas as shown in Figure 3.

The Wilcoxon's signed rank test measured significant differences between the pre and post surveys for horticultural knowledge gained. The scores were significant at $p = 0.01$ or 0.02 levels (Table 4).

Demographic factors did not show significant differences in survey scores of horticultural knowledge and GQI, but the differences followed a pattern between the two areas. The children without other sibling gardeners participating showed a higher mean score in horticultural

knowledge and GQI than the younger and older sibling gardeners (Figures 4 and 5). Older siblings had higher mean scores in horticultural knowledge and GQI than their younger siblings. Boy gardeners had higher mean scores in horticultural knowledge and GQI than did girl gardeners. The older gardeners had a higher mean score in horticultural knowledge, but the younger gardeners had a higher mean score in GQI.

Survey results showed marked increase in knowledge gained by the children gardeners over the 5-month study while participating in a non-structured learning environment. This was not expected with only an average of four hours spent in the gardens/month.

These results would indicate that non-structured learning situations may have possible uses in the school system. Children learn at high rates when they feel comfortable with the surrounding environment. Older children scored higher than younger children because of more familiarity in test procedures and completion, the learning environment, and information recall.

The Children's Garden Survey of Knowledge measured changes in knowledge gained from the gardening experience, but could not measure improvement in such areas as the special interests or enthusiasm of the children. One young girl took a special interest in all small inhabitants of the gardens from toads to grasshoppers. This child worked diligently with entomology students from Kansas State University on morning collection trips through the gardens. Once she tried to nurse an injured tomato horned worm back to health after seeing another gardener hit it with a rake. She could not see this insect as a pest, but rather as another creature that deserved the right to

live. This child was not an exception, just another gardener.

Relationships between self-esteem, horticultural knowledge, and garden quality index (GQI): The third objective measured the correlation between self-esteem, horticultural knowledge, and GQI. The Spearman's Correlation coefficient between self-esteem and horticultural knowledge was 0.11 at $p = 0.539$. For practical purposes, no significant correlation exists between the two areas. The coefficient between self-esteem and GQI was 0.40 at $p = 0.125$. This suggests some correlation between the two areas. The last correlation between horticultural knowledge and GQI has been previously mentioned.

The low correlation between self-esteem and horticultural knowledge is not surprising because the surveys measure two different domains. The two need not have high correlation for learning to take place. The next correlation between self-esteem and GQI share a common area, that of feeling about some entity. Self-esteem measures how the child feels about themselves, while the GQI indicates how the child feels about the garden through the physical effort put forth. So it is not surprising that these two areas are more closely related.

The research study showed seven children improved in self-esteem while nine children showed a decrease. All 16 of the children showed increases in amount of horticultural knowledge gained from the gardens.

Implications for future research: Had the research study extended over a longer time period, perhaps the effects of gardening on self-esteem would have been significant. More information needs to be known about the sample group, e.g. family demographics, self-esteem scores from the local school, child's interest areas, whether participation is voluntary or forced, and how the child interacts

with classmates in a school situation. Care should be given to isolate the sample group from being confounded with other long term summer recreational activities. The small fluctuations in self-esteem could have been changed with more adult supervision and one-on-one interactions. The original research plan had older adults working with children on an individual basis during the week. This could have built up a relationship with the adult and fostered a better self-image for the children. This needs to be reinstated into future studies.

In addition, a control group of children involved in other summer recreational events would be advisable.

Table 1: Initial Ratings of Self-Esteem,[1] Horticultural Knowledge,[2] and Percent Attendance

Subject	Self-Esteem Score	Horticultural Knowledge Score	Attendance (%)
1	69	54	80
2	62	76	90
3	55	46	20
4	46	19	40
5	55	70	50
6	54	26	30
7	35	59	70
8	63	54	70
9	61	40	80
10	47	57	80
11	61	61	20
12	46	64	90
13	60	34	50
14	57	71	60
15	63	58	60
16	71	78	60
Mean	56.6	54.2	59.4

[1] Piers-Harris Self-Esteem, Max. Score = 80.

[2] Horticultural Knowledge Survey, Max. Score = 97.

Table 2: Spearman's Correlation Coefficients for Piers-Harris Self-Esteem Survey

	ST	S1	S2	S3	S4	S5
S1	0.80 0.0001					
S2	0.76 0.0001	0.51 0.0031				
S3	0.38 0.0320	0.21 0.2407	0.49 0.0046			
S4	0.77 0.0001	0.65 0.0001	0.43 0.0141	0.03 0.8648		
S5	0.59 0.0003	0.38 0.0329	0.31 0.0853	-0.04 0.8306	0.60 0.0003	
S6	0.66 0.0001	0.73 0.0001	0.43 0.0138	0.24 0.1759	0.60 0.0003	0.27 0.1289

ST = Total score, S1-S6 = Component scores.

Table 3: Spearman's Correlation Coefficients for Horticultural Knowledge Survey

	HT	H1	H2	H3
H1	0.88 0.0001			
H2	0.63 0.0001	0.45 0.0102		
H3	0.73 0.0001	0.52 0.0022	0.51 0.0025	
H4	0.78 0.0001	0.56 0.0010	0.45 0.0096	0.47 0.0063

HT = Total score, H1-H4 = Component scores.

Figure 1: Comparisons of pre and post Piers-Harris Children's Self Concept survey scores for 16 participants

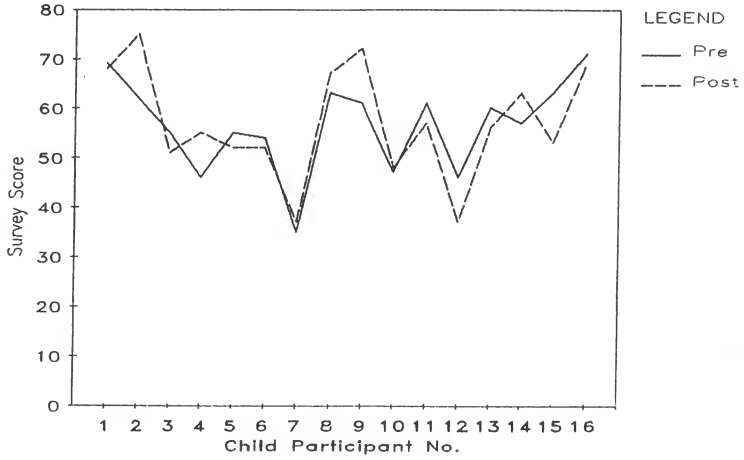


Figure 2: Self-esteem scores as related to number of family members participating (S = single child, Y = younger sibling, O = older sibling), gender (M = male, F = female), and age (≤8, >8 years).

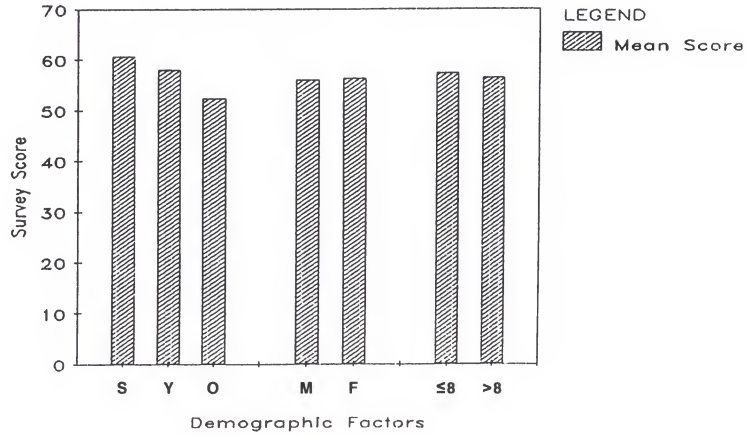


Table 4: Wilcoxon's Signed Rank Test Values (T) for Self-Esteem and Horticultural Knowledge Surveys. n = 16.

Piers-Harris Self-Esteem Survey

Domain	Changes (+)	(-)	(NC)	T Values
S1) Behavior	6	9	1	54.5c
S2) Intellectual & School Status	8	6	2	49.0c
S3) Physical Appearance & Attributes	5	7	4	23.0c
S4) Anxiety	7	6	3	35.5c
S5) Popularity	8	3	5	16.0c
S6) Happiness & Satisfaction	7	4	5	22.5c
ST) Self-Esteem Survey Total	7	9	0	67.5c

Horticultural Knowledge Survey

Domain	Changes (+)	(-)	(NC)	T Values
H1) Basic Terminology	13	2	1	8.0a
H2) Relationships of Plant Parts	9	1	6	4.5b
H3) Cultural Needs of Plants	10	2	4	8.0b
H4) Equipment Use	13	1	2	10.0a
HT) Horticultural Survey Total	16	0	0	0.0a

a significant at the 0.01 level.
b significant at the 0.02 level.
c not significant at the 0.05 level.
NC no change

Figure 3: Comparisons of garden quality index and pre and post horticultural knowledge survey scores for 16 participants

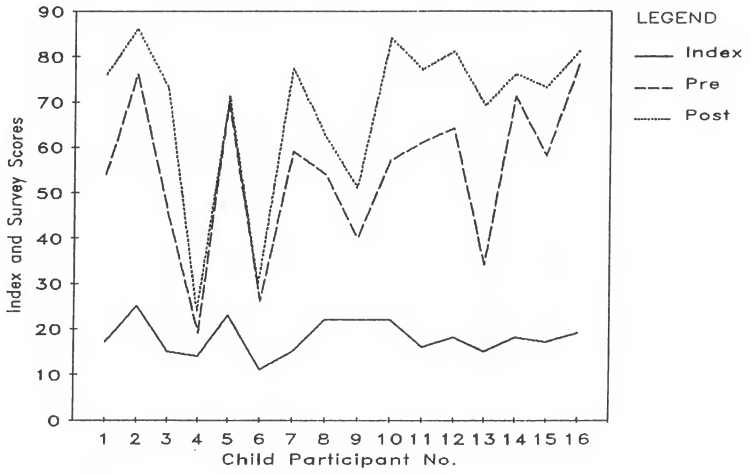


Figure 4: Horticultural knowledge scores as related to number of family members participating (S = single child, Y = younger sibling, O = older sibling), gender (M = male, F = female), and age (≤8, >8 years).

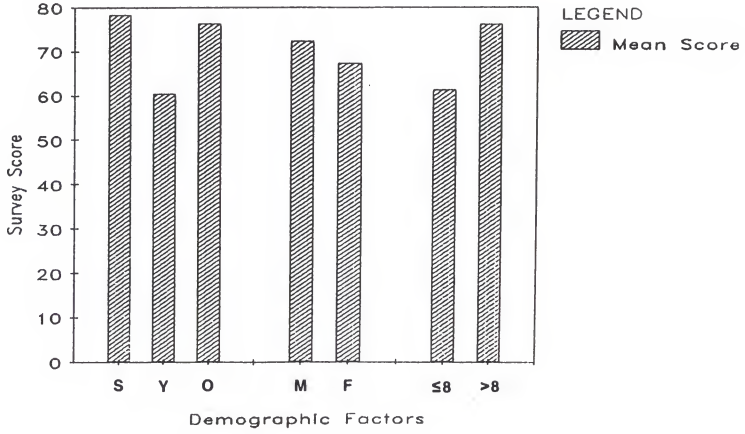
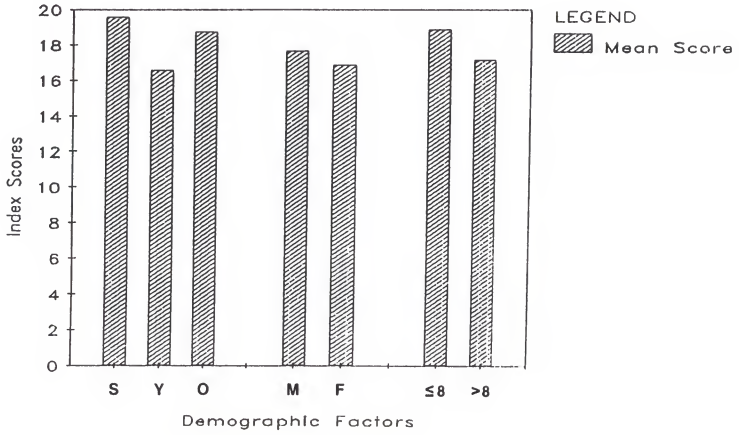


Figure 5: Garden quality index scores as related to number of family members participating (S = single child, Y = younger sibling, O = older sibling), gender (M = male, F = female), and age (≤8, >8 years).



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Appendix A

PROCEDURES TO BE USED FOR THE PROTECTION OF HUMAN RIGHTS:

Informed Consent Statement:

This research study is being conducted under the guidelines established by Kansas State University. This study will determine the benefits of children and older adults when they are working together in the garden. From May 1 to September 30, periodic evaluations will be made on how your child feels about this gardening experience. Three evaluations will be made requiring approximately 30 minutes to complete.

By cooperating, your child will help provide answers to important questions; however, your child's participation is strictly voluntary and may withdraw from the study anytime. Your child will be involved in weekly one hour gardening activities, such as, identification of plants and plant parts, plant propagation, and plant growth requirements. All activities conducted and tools used will be supervised with no immediate risk involved to your child.

Names, addresses, and data collected in this research study will be encoded, stored in separate and secure places, while being kept strictly confidential. Confidentiality is guaranteed; your child's name will not be associated in any public or private report of the results.

Your child will benefit from knowledge gained in the garden setting, interaction with an elderly individual from the community, and the opportunity to bring home fresh vegetables. However, you and your child should realize the potential risk or discomfort from sunburn, etc. could occur.

You may withdraw consent and discontinue participation for your child in the study at anytime. Patrick Williams will be glad to answer any questions that might arise and can be reached at 532-6170.

The following description of the gardening program should be read to your child:

In the Manhattan Children's Garden, at 8th and Riley Lane, this summer you can grow and take home your favorite vegetables from your own garden. You will be working with an adult gardener who will help you. About every six weeks, Pat Williams will be asking you questions on how you feel toward the garden and yourself. You may stop the program at anytime.

Consent Statement:

I, the parent of the subject, have read the above statement to my child(ren) and he/she have been fully advised of the procedures to be used in this project. We understand the potential risks involved in the project and hereby assume them voluntarily.

Subject's Name Age Parent or Legal Guardian Date

Appendix B

PROCEDURES TO BE USED FOR THE PROTECTION OF HUMAN RIGHTS:

Informed Consent Statement:

This research study is being conducted under the guidelines established by Kansas State University. This study will determine the benefits of children and older adults when they are working together in the garden. From May 1 to September 30, periodic evaluation will be made on how you feel about this gardening experience. Three evaluations will be made requiring approximately 30 minutes to complete. Weekly journal entries will be required also. You will be involved in weekly one hour gardening activities, such as, identification of plants and plant parts, plant propagation, and plant growth requirements. Gardening information will be provided as needed. All activities conducted will involve no immediate risk to you.

Names, addresses, and data collected in this research study will be encoded, stored in separate and secure places, while being kept strictly confidential. Confidentiality is guaranteed; your name will not be associated in any public or private report of the results.

You will benefit from knowledge gained in the garden setting, interaction with a child from the community, and the opportunity to bring home fresh vegetables. However, you should realize that potential risk or discomfort from sunburn, etc. could occur.

Your participation is strictly voluntary and you may withdraw from the study at anytime. Patrick Williams will be glad to answer any questions that might arise and can be reached at 532-6170.

Consent Statement:

I, the adult volunteer, have read the above statement and have been fully advised of the procedures to be used in this project. I understand the potential risks involved in the project and I hereby assume them voluntarily.

Birth Date Subject's Name Date

Appendix C

Name:_____

Children's Garden Survey of Knowledge

Section 1: Choose the answer that best completes the statement. Circle the letter next to your answer.

1. Sunlight makes plant food in which plant part?

   A. Stems
   B. Roots
   C. Leaf
   D. Flower

2. We can eat the leaf of which vegetable?

   A. Pumpkin
   B. Radish
   C. Beet
   D. Lettuce

3. Why is a flower pollinated?

   A. To make it bloom
   B. To produce seeds
   C. To make it beautiful
   D. To make more roots

4. Which tool is used to plant a bush?

   A. Shovel
   B. Rake
   C. Hand trowel
   D. Hoe

5. Which plant part attracts pollinating insects?

   A. Flowers
   B. Stem
   C. Leaf
   D. Roots

6. Which plant part lives in the soil?

   A. Roots
   B. Stem
   C. Flower
   D. Leaf

7. We can eat the roots of which vegetable?

   A. Squash
   B. Green pepper
   C. Carrot
   D. Pumpkin

8. We can eat the seed of which vegetable?

   A. Celery
   B. Corn
   C. Lettuce
   D. Onion

9. What tool is best for planting a seedling?

   A. Rake
   B. Hand trowel
   C. Shovel
   D. Hoe

10. Which seed is planted deeper?

   A. Radish
   B. Lettuce
   C. Carrot
   D. Bean

11. What tool is best for weeding?

   A. Hand trowel
   B. Hoe
   C. Rake
   D. Shovel

12. If you put mulch around a plant, it will help by:

   A. Controlling weeds
   B. Saving water
   C. Cooling soil
   D. All of the above

13. We eat the stem of which vegetable?

   A. Carrot
   B. Celery
   C. Tomato
   D. Okra

14. Roots do all but one of the following, choose the one that is not.

A. Take up water
B. Hold a plant in the soil
C. Grow on top of the soil
D. Store food

15. Which vegetable is a flower?

A. Broccoli
B. Cabbage
C. Rhubarb
D. Potato

16. Which one of the following is good for your garden?

A. Grasshoppers
B. Grubs
C. Potato beetles
D. Lady bugs

17. Which tool is best for leveling off a garden?

A. Shovel
B. Hand trowel
C. Rake
D. Hoe

18. What month is best for planting potatoes in Kansas?

A. February
B. April
C. June
D. August

19. What does a leaf do?

A. Photosynthesizes
B. Makes seeds
C. Makes flowers
D. Eats dirt

Section 2: Supply a brief statement or short answer for each question.

1. Describe how to water your garden using a hose.

2. After planting a row of seeds, what should you write on the label?

3. What is a garden plot map?

4. Why is a raised edge built around your garden plot?

5. What is the best time of day to water your garden?

6. Why should you remove extra radishes, carrots, and lettuce from your row?

7. How often should you water your garden?

Section 3: You will need to demonstrate the answers to the following questions. There will be NO written answers in this section.

1. Pick up a hoe.

2. Demonstrate the proper use of a garden hoe.

3. Show the proper way to place a rake on the ground.

4. Plant a seedling using one of the available tools.

Point values for survey sections:

Section 1: 3 pts/question.
Section 2: 5 pts/question.
Section 3: 6 pts/question.

Key to multiple choice questions, Section 1:

1. C	8. B	15. A
2. D	9. B	16. D
3. B	10. D	17. C
4. A	11. B	18. B
5. A	12. D	19. A
6. A	13. B	
7. C	14. C	

Question numbers in domains:

1. Knowledge of basic terms.

   Section 1: 2, 7, 8, 13, 15.
   Section 2: 3, 4, 5, 6.
   Section 3: none.

2. Understanding relationships between plant parts.

   Section 1: 1, 3, 5, 6, 14, 19.
   Section 2: none.
   Section 3: none.

3. Understanding cultural needs of plants.

   Section 1: 10, 12, 16, 18.
   Section 2: 7.
   Section 3: 4.

4. Demonstrate proper use of equipment.

   Section 1: 4, 9, 11, 17.
   Section 2: 1, 2.
   Section 3: 1, 2, 3.

Answers to questions in Section 2 are common sense replies. The answers in Section 3 are demonstrated.

APPENDIX D

Garden planting recommendations for growing vegetables, fruits, and vegetables based on observation at the Manhattan Community Garden children's garden.

Recommended for individual gardens:

- radishes
- leaf and head lettuce
- peanuts
- cucumbers
- snap beans
- beets
- Brussels sprouts
- New Zealand spinach
- turnips
- peas
- carrots
- cabbage
- tomatoes
- peppers
- eggplant
- kohlrabi
- cauliflower
- onions
- broccoli

Recommended for group gardens:

- cabbage
- peppers
- zucchini
- gourds
- potatoes
- strawberries
- watermelon
- okra
- popcorn
- sunflower
- tomatoes
- peanuts
- squash
- cucumbers
- sweet potatoes
- cantaloupes
- pole beans
- sweet corn
- flowers

Recommended for demonstration gardens:

- swiss chard
- rhubarb
- kohlrabi
- celery
- basil
- chives
- beets
- leeks
- parsley
- Brussels sprouts
- celeriac
- borage
- turnips

HORTICULTURAL ACTIVITIES AND DEMOGRAPHIC FACTORS INFLUENCE CHILDREN'S SELF-ESTEEM

by

Patrick Neal Williams

B.S., California Polytechnic State University,
San Luis Obispo, 1985

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Horticulture

Kansas State University
Manhattan, Kansas

1987

During a five-month study involving children at a rural community garden, measurements were made of relationships between gardening skills, self-esteem, and horticultural knowledge gained from the experience. The children ranged in age from 5 to 13 and represented a cross section from the community. Children participated in group and individual garden plot activities, and met once a week on Saturday morning under adult supervision.

Data analysis of 16 children revealed that demographic factors influence self-esteem, horticultural knowledge, and gardening skills. Children without other siblings gardening scored higher in self-esteem, horticultural knowledge, and garden quality index then did the children with other siblings gardening. The younger siblings scored higher than their older siblings in self-esteem, but lower in both horticultural related areas. Age and gender did not influence horticultural knowledge scores.

Pre and post-survey scores indicate that horticultural knowledge was significantly expanded in a non-structured learning environment. During the five-month study self-esteem scores significantly increased for two of the participants and did not change significantly for the other 14 children.