

THE FACTORS AFFECTING ELEMENTARY SCHOOL TEACHERS'
INTEGRATION OF SCHOOL GARDENING INTO THE CURRICULUM

by

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(ABSTRACT)

The purpose of this research was to identify the logistical, conceptual, educational, and attitudinal factors that affect elementary school teachers' implementation of school gardening in the curriculum. This research also sought to qualitatively describe the current application of school gardening by the study population in the elementary school curriculum, and to identify avenues in which the horticultural community can assist teachers in implementing the use of this teaching strategy.

The target population consisted of elementary school teachers who taught at schools that had received a Youth Gardening Grant from the National Gardening Association in either the 1994/95 or 1995/96 academic years. Data were collected using a School Gardening Survey which was sent to an accessible population of 315 elementary schools. From this mailing, 236 usable responses were received for analysis. The results of the survey were confirmed, and expanded upon, by personal interviews conducted with 28 teachers from the test population who used school gardening in their curriculum and taught in the Commonwealth of Virginia.

Survey and interview responses provided data for statistical analysis using the computer statistic package, Statistical Analysis System (SAS). Chi-square correlations did not provide significant relationships between factors; however, frequencies, averages and mean and mode information provided insight into the use of school gardening and the needs of teachers who are using this teaching strategy.

Survey data indicated that the most important factors that need to be present for the successful use of school gardening were logistical factors. The most essential factors were a person, or persons, who take on the responsibility for the gardening program, the availability of a site to grow plants, and adequate funding for gardening materials. In addition, the availability of gardening equipment and the support of the principal were stated to be very important to school gardening success.

Interview data indicated that the most crucial factors that need to be present for the successful use of school gardening were educational factors. Student ownership of the gardens and the integration of school gardening into the curriculum were seen as more important to school gardening success than the logistical features of school gardening. There was survey and interview consensus, however, that the lack of preparation time for school gardening activities and the lack of instructional time for learning using school gardening were factors that influence the use of this teaching strategy. There was also agreement that the logistical factors of a growing site, a water

source, the availability of gardening equipment, adequate funding, and a person who is responsible for school gardening were important to the successful use of school gardening.

Essentially all of the interviewed and surveyed teachers (99%) use school gardening as an interdisciplinary teaching method. It is the interdisciplinary nature of gardening and growing plants that allows school gardening to be used successfully within the elementary school curriculum. Study results also indicated that school gardening is used to teach students in all grade levels found in an elementary school including students in prekindergarten, special education, and “English as a Second Language” classes.

School gardening is often used to benefit students beyond standard academic achievement. Teachers use school gardening for such goals as social development, therapy, recreation, environmental awareness, community relationships, exploring diversity, and the arts. School gardening is also seen as a teaching strategy that can occur both indoors and outdoors. Teachers are not limiting their concept of gardening to an activity that must occur in the out-of-doors.

Teachers indicated that they depend primarily on their own knowledge of gardening when gardening with their students. They also rely more on their gardening knowledge than on their knowledge of science when using school gardening within the curriculum. However, these same teachers expressed a need for further education and information on the integration of gardening into the curriculum, and the horticultural aspects of gardening that can be implemented within the educational, time, facility, funding, and legal limits placed on a school situation. Teachers also requested that this education be provided as in-service training, Master Gardener training, or graduate and/or continuing education classes provided through the local institution of higher education.

The survey and interview respondents indicated that school gardening is a very effective, interdisciplinary teaching method. These teachers find that use of school gardening assists students in learning and understanding new ideas, and that student learning improves when using school gardening in the curriculum. In addition, interviewed teachers indicated that students obtain a more positive environmental ethic when gardening is used in the curriculum.

Elementary school teachers may use school gardening to improve student academic and social achievement, to provide a hands-on learning experience that reaches across the curriculum, to furnish a forum that provides opportunities to learn such positive social qualities as nurturing life and responsibility, and to encourage students to expand their appreciation for the living world around them. The interdisciplinary nature of school gardening shows promise as a teaching strategy that can be used to enhance student learning, and to expose students to the expanse of learning available through the process of growing plants.

DEDICATION

This dissertation is dedicated to my husband, Bruce, whose belief, constant support, and love inspired me to achieve a goal that I never thought possible.

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As my children look to the future, I hope that this example of my achievement will help them recognize the value of education, the rewards of persistence, and the accomplishment of hard work.

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CHAPTER I

INTRODUCTION

Background of Study

Employing school gardening as a component of an elementary school educational curriculum is not a modern concept. School gardens were commonly found as the location of activity and learning in many schools in Europe as early as the seventeenth century. School gardens came to America in the late 1800s when Henry Lincoln Clapp brought the idea of school gardening from Europe to George Putnam Grammar School in Massachusetts. School gardens were seen as a place to obtain some knowledge of horticulture and a love of nature (Bachert, 1976).

Since that time, the interest in school gardening has fluctuated depending on the social and educational climate of the existing society. The utilization of school gardening in the educational curriculum is dependent on the current theory of learning accepted by educators. How teachers understand the process of learning determines the tools and educational strategies they choose to use with their students. As learning theory changes, so do the teaching strategies and focus of the teacher. When school gardening is viewed as a useful teaching tool under the currently accepted learning theory, it is of interest to educators.

Elementary education is the cornerstone of every student's education. The federal, state, and local educational guidelines mandated for student achievement are the specifications by which teachers orient their curriculum to provide that necessary education. The methods that the teacher uses to fulfill those requirements are determined by the theory of learning and curriculum orientation to which the individual teacher adheres. Most activities or teaching strategies chosen by a teacher are selected for their usefulness in meeting mandated educational requirements.

School gardening has had many educational purposes throughout its history. However, its current use as the focus of a thematic, interdisciplinary unit used in conjunction with constructivist learning theory has resulted in an increase in teacher interest (D.Young, National Gardening Association, personal communication, October 5, 1995). Using a garden-based curriculum aids in meeting many of the academic requirements of the students, and it also offers the opportunity for students to participate, through hands-on gardening activities, in their own learning. These aspects of school gardening make it an attractive teaching tool in many elementary school situations.

Anecdotal evidence of school gardening success is well documented (Braun, 1989; Cavaliers, 1987; Dwight, 1992; Gwynn, 1988; Hanscom & Leipzig, 1994; Nelson, 1988; Pivnick, 1994; Salisbury, 1989; Sarver, 1985; Stetson, 1991; Thibault, 1994). These success stories relate the interest, enthusiasm, and achievement both teachers and students have realized by employing school gardening within the curriculum. Sheffield (1992) showed through achievement testing that under-achieving students who are taught using an interdisciplinary garden-based curriculum, do

significantly better academically than students who are taught using traditional educational methods. These students also improved significantly in their self esteem from participating in the gardening experience.

Statement of the Problem

The use of school gardening as a teaching strategy meets the criteria and philosophy of education today, but the actual implementation of a school gardening program can be time-consuming and intimidating. Success stories of school gardening experiences are found throughout educational and horticultural periodicals, but stories of the problems of school gardening implementation never make it into print. It is important to define the problems and barriers to implementing a garden-based curriculum for the future success and use of school gardening by educators. Educators who have experienced the process of using a garden-based curriculum already have traveled the road of pitfalls and triumphs on their way to using school gardening successfully with their students. In every school not every teacher participates in school gardening. Individual teachers within a school differ in their interest and motivation for using this teaching strategy. Since it is the teacher who determines which units of study are brought into the classroom, the classroom teacher is a crucial factor in the successful implementation of a school gardening program. The interest of the teacher and the usefulness of the teaching strategy are the basis for using any new program successfully within a curriculum (McCaw, 1979/80).

The participants in this study were the teachers who are actively involved in using school gardening within the curriculum. It is beneficial to learn from the experiences of those who have been through the process. These experienced, professional teachers can help others to understand the factors that will best insure the successful implementation of a school gardening program within an individual school and within an entire school system. The goal of this study is to determine the factors that will aid in the development and successful implementation of elementary school gardening in the future. The identification of these factors will also assist interested horticulturists and the horticulture industry to address teacher concerns and to focus on finding solutions to identified barriers.

Purpose of the Study

The purpose of this study is to identify those factors that affect elementary school teachers' use of school gardening within the classroom curriculum. Data related to the successful implementation of school gardening within the elementary school curriculum will be collected and analyzed. Data analysis will determine those factors that need to be addressed by educators if they are to use school gardening successfully within their curriculum.

Research Questions

Ham and Sewing (1988) conducted a study to determine the barriers to environmental education within the elementary school curriculum. Environmental education and the use of a

school garden curriculum are interrelated in many subject areas, and they face many of the same problems because of their focus on learning by using the living world. School gardening meets many of the criteria of an environmental education program (Pivnick, 1994). It is therefore useful to refer to the descriptions of environmental education barriers, as described by Ham and Sewing, in defining the areas of inquiry for elementary school teachers considering the use of garden-based education and horticulture in the classroom. These four areas of inquiry are:

Logistical Factors. The objective of this area of inquiry was to determine the relative importance of logistical barriers to conducting school gardening activities. What are those areas that teachers perceive as the biggest roadblocks to the implementation of a garden-based curriculum? These roadblocks may include such factors as administrative support, funding, availability of curricular materials, class size, the availability of outside help, time for preparation, time for classroom implementation, and safety.

Conceptual Factors. The objective of this area of inquiry was to determine teachers' perceptions of the definition of school gardening and its place in the public school curriculum. Do they see it as solely a forum for the teaching of science, math and environmental issues alone, or do they see it as multidisciplinary? How do teachers perceive the use of a garden-based curriculum in their classrooms?

Educational Factors. The objective of this area of inquiry was to determine how teachers perceive their preparation and training to implement a garden-based curriculum. How do teachers perceive their ability and knowledge to use gardening as part of their curriculum? How do teachers feel about their qualifications for implementing the use of a garden and growing plants in their classrooms? What additional help would the teachers be interested in acquiring?

Attitudinal Factors. The objective of this area of inquiry was to determine teachers' attitudes toward the use of a garden-based curriculum. Has the use of a garden-based curriculum assisted in student learning and meeting the educational goals of the students in the past? Was this program viewed in a positive or negative manner?

These four areas of inquiry were used as the basis for the development of the research questions. These questions determined the research methodology and focus of this study. The study research questions were:

1a. What are the factors that are essential to the successful implementation of school gardening into an elementary school curriculum as determined by educators who are currently using school gardening in their curriculum?

1b. What logistical features of school gardening need to be addressed for the successful implementation of school gardening into the elementary school curriculum?

2a. How do teachers perceive the use of a garden-based curriculum in their classroom?

2b. Is school gardening being used as the focus of interdisciplinary educational or thematic units in the elementary school classroom, or is it being used primarily to teach science?

3. What are the educational needs of teachers who are using school gardening in the curriculum? How do teachers feel about their qualifications for implementing the use of gardens and growing plants in their classrooms?

4. What are the attitudes of teachers who are using school gardening in their curriculum as to the effectiveness of school gardening as a teaching strategy?

Need and Significance of the Study

Interest in school gardening is increasing as the benefits of its use in an interdisciplinary curriculum are becoming positively described in the current educational journals. Educators who have implemented school gardening as part of their curriculum laud its benefits as a forum for student participation in the learning process (Cavaliere, 1987; Dwight, 1992; Hanscom & Leipzig, 1994; Salisbury, 1989; Sarver, 1985; Stetson, 1991). Ocone and Pranis (1990) state that “gardening enlivens learning by offering a hands-on approach to seeking information and to learning skills and concepts. Children become observers, questioners, doers, and problem solvers” (p. viii).

The growing of living plants in and out of the classroom allows students to observe and experiment with the aspects of plants and horticulture that can be expanded across the curriculum. Growing plants involves learning about the environment, botany, science, math, and nutrition. Growing plant activities and horticulture can also be used to teach language arts, history, geography, art, and music. The garden and gardening experiences provide a forum for students to investigate the interconnectedness that exists, both currently and historically, between man and the growing world.

Additionally, growing plants also demands that the students show the positive attributes of responsibility, caring, and nurturing for the success of the growing project. Relf (1992) described how a student's familiarity with plants and the growing process will benefit future involvement in gardening, positive earth stewardship, and a personal sense of well-being.

The outcome of this interest in school gardening is increased inquiry by educators into the practical implementation of school gardening, at any level of sophistication, within the confines of a classroom, and an educational system (AHS Symposium, 1993). A thorough investigation of the parameters that define a successful school gardening program is essential to the future growth of school gardening as a part of the elementary school curriculum. Many educators have experienced the positive impact that gardening has on student learning and self-esteem, but the evidence is scattered and not usefully defined. Consolidation of information by educators who have successfully used school gardening will benefit all who are interested in gardening with children in an educational setting.

This study makes a significant contribution to the fields of elementary education, horticulture, and environmental education. A consolidation of factors as described by knowledgeable educators will lend structure to any school garden experience. This information should make possible specific recommendations toward reducing or eliminating barriers that constrain school gardening efforts. Solving or diminishing some of these problems may increase the acceptability of using school gardening in the curriculum. This study will provide the framework and focus for successful school gardening.

Assumptions

The following assumptions were made for the purpose of this study:

1. The elementary schools that applied for and received a Youth Gardening Grant from the National Gardening Association are schools that have a defined interest in using school gardening

within the curriculum of their schools for one or more classes. It is also assumed that they have utilized school gardening for at least one academic year.

2. Factors do indeed exist which are critical to the successful implementation of school gardening into the elementary school curriculum, and the identification of these factors will be useful to schools that have not received a National Gardening Association Youth Gardening Grant.

3. A survey is an appropriate research instrument to request information on school gardening from elementary school teachers who are using school gardening as a teaching strategy.

4. The use of personal interviews of teachers at schools that use school gardening is an appropriate method to confirm and expand the information received from the survey results.

Delimitation of the Study

The scope of this study was restricted to elementary schools that have previously implemented school gardening into their curriculum and are recipients of a Youth Gardening Grant from the National Gardening Association. Subjects who participated in the survey were from the United States. The teacher interviews were limited to schools located in the Commonwealth of Virginia. Although it is not possible to generalize the results of this study to the general population of elementary schools, the information gleaned from this study will be useful to any elementary school interested in using school gardening in their curriculum. This study did not address economic, social, and ethnic factors which would be relevant to the situations of individual elementary schools.

In addition, the data collected in both the survey and the interviews was limited by the questions asked. Extensive, detailed information from each elementary school was beyond the scope of this study. The information utilized by this study was restricted to the years 1994 through 1997, and may not be applicable to the current social and political situation.

This study does, however, provide insight into the implementation of school gardening. It describes the experiences of schools that have attempted school gardening, and it will become a school gardening guide for other elementary schools to use for their own benefit.

Definitions of Terms

Garden-Based Curriculum: an interdisciplinary curriculum in which all subjects are taught by way of growing plants and learning in a garden. Gardening can be the basis for problem solving in mathematics, designing experiments in science, studying the growth of civilization in history, developing interpersonal skills in social studies, understanding good nutrition in health, discovering the beauty of nature in art, and providing the theme for reading, writing, and spelling mastery. Sheffield (1992) maintains that “all disciplines are taught as the children create and tend their garden” (p. 9). “Real-life activities form better educational experiences than synthetically contrived ones” (Poplin, 1988, p. 401).

Thematic Unit: an interdisciplinary curriculum developed around a central theme. Fredericks, Meinbach, and Rothlein (1993) state that “a thematic approach to learning combines structured, sequential, and well-organized strategies, activities, children’s literature, and materials to expand a particular concept” (p. 6). Thematic units are unique in that the flexibility of their design allows

them to respond to the various, and often changing, interests, abilities, aptitudes, and attitudes of individual children.

School Gardening: the use of growing plants and horticulture as an educational strategy and learning tool in an educational setting. The gardening activities can involve growing plants indoors or outdoors in a variety of ways that differ with every learner's circumstances. Plants are grown in such places as windowsills, under grow-lights, in containers, around flag poles, in terrariums, or in ordinary, plowed garden plots. Barker (1992) states that school gardening is "An experiential gardening program for students sponsored by a school as an extension of the curriculum" (p. 9).

Interdisciplinary Curriculum: a curriculum that involves or joins two or more branches of learning. Based on the concept that knowledge is interconnected, and subject matter is presented to demonstrate this interrelationship. Activities and teaching strategies integrate fields of knowledge resulting in an understanding of the material that is both meaningful and relevant.

Whole Language: the practical implementation of a philosophy of teaching which views the learner as an active participant in the learning process. Reading, writing, listening, and oral communication are the devices used to find out about our world. They are not solitary activities, rather they are the tools for learning. In *Whole Language* Judith Newman (1985) explains the link between school learning and real life experiences when she states that "in a whole language classroom an emphasis on learning facts is replaced with opportunities for solving problems and making links between school learning and the children's everyday lives" (p. 137).

Chapter Summary

This chapter dealt with the reasons for the current increased interest in using school gardening within an elementary school curriculum. Individual teachers' understanding of learning theory and curriculum design determine how they would implement and use school gardening. Many educators have had success using a garden-based curriculum, but the processes by which they implemented their curriculum has not been defined. The valuable experiences of these educators need to be tapped to benefit other teachers who would like to use school gardening in their own curriculum. This study investigated the factors that determine the successful implementation of school gardening into an elementary school curriculum.

Plan of Presentation

This study is organized into six additional chapters. Chapter Two is a review of the literature on educational theories of learning, interdisciplinary curriculum, hands-on learning, school gardening, people and plant relationships, and environmental education. Chapter Three describes the research questions, research design, the survey population, and the research instruments. Chapter Four discusses the development of the questions used in the school gardening survey and in the personal interviews as they relate to the research questions of this study. Chapter Five contains the research data obtained from the teacher surveys and personal interviews. Chapter Six presents an analysis and interpretation of the research data obtained from

the teacher surveys and personal interviews. The results as they relate to each research question are discussed. Chapter Seven concludes with a study summary and recommendations for further research on the use of school gardening in the elementary school curriculum. Appendices follow that include the survey instrument and the interview instrument.

CHAPTER II

LITERATURE REVIEW

Introduction

This chapter presents a review of the literature concerning the interrelationships between school gardening, learning theory, and elementary education. Section one focuses on several theories of learning currently used in elementary school education. Section two describes interdisciplinary curriculum design, the construction of thematic units, and the whole language classroom. Section three focuses on the use of hands-on learning within the elementary classroom. Section four discusses the use of school gardening within the elementary school curriculum. Section five reviews the beneficial relationship that exists between people and plants. The final section describes the interrelationship between school gardening and environmental education.

Learning Theory

“Training is everything. The peach was once a bitter almond;
cauliflower is nothing but cabbage with a college education.”
- Mark Twain

The memories of “good, old-fashioned school days” are memories of desks in straight rows, sitting quietly for fear of the sharp rap of the ruler, listening to the teacher explain your lesson, reading the textbook, and late nights studying for the test on Friday. This traditional classroom existed due to the influences of social learning theory and behaviorism as described by learning psychologists Albert Bandura, B.F. Skinner, John Watson, and others. Learning was believed to occur by natural stimulus and response. Miller (1993) asserts that “the evidence mounted that children learn new behaviors by imitating others and that the effect of environmental influences is cognitively mediated” (p. 229).

Psychologists of the early 1900s adhered to the understanding that learning was a passive experience. It was understood that children can passively receive information and that they can construct a new behavior by listening to another person or simply by reading. Children were also seen as self-regulatory which allowed them to observe behaviors occurring around them which lead to reward or punishment. They then could use these observations as a source of information to help them define rules, evaluate their performance, set goals, and decide in which situations to use the observed behavior (Chance, 1988).

The role of the teacher in the traditional classroom is that of a model who can serve as an instructor and motivator. The teacher’s job is to present new information, correct students’ misunderstandings, and to demonstrate skills. The traditional teacher determines what will be learned, when it shall be learned, where it will be learned, and who will be the learner.

Academic subjects are taught as separate entities in the traditional classroom, so that reading is taught at reading time, and math concepts are taught at math time, etc. Subjects are not related to one another, and they are learned independently from each other. Children's learning is assessed by testing that involves memorization of new information after the material has been presented in the classroom.

Dissatisfaction with this explanation of cognitive development and learning inspired a closer look at the works of psychologists who were defining learning in contrasting ways. In the 1920s, Swiss psychologist Jean Piaget observed the learning processes of his own children. A detailed accounting of his observations led to the development of a stage theory of learning. Miller (1993) paraphrases Piaget's observation that "children's knowledge of the world changes as their cognitive system develops. As the knower changes, so does the known. . . experience is always filtered through the child's current ways of understanding" (p. 36).

Piaget described the process of knowing as occurring in stages. Each stage is a period of time in which the child's thinking and behavior reflects a certain kind of basic mental organization. Every child passes from one stage to another until he or she reaches a final period of achievement. The stages proceed in a particular order, and no stage can be skipped. As a child moves through a stage, or to another stage, he or she strives to maintain a state of equilibrium which is brought about by learning. A child constructs meaning through assimilation and accommodation (Raines & Canady, 1990).

Piaget observed that children have a natural need to explore, hypothesize, test, and evaluate. They inherently seek stimulation rather than passively wait for it. They are constantly changing as they try to maintain an equilibrium within themselves and with the environment. His observations determined that as children become aware of new ideas and concepts, they try to accommodate new knowledge to reach cognitive equilibrium. Movement through each stage is caused by physical maturation, experience with physical objects, social experience, and equilibration. Thought becomes increasingly organized and builds on the structure of the previous stage (Piaget, 1951).

Piaget's work contradicted the idea that children are passive learners. He proposed an entirely different understanding of learning. His theory provided the impetus for work that viewed learning in a significantly different light than previously accepted. Piaget observed that learning is a process, not a state, and that learning requires the active participation of the person involved (Miller, 1993).

In the 1930s Russian psychologist Lev Vygotsky also delved into the questions of how learning occurs. Vygotsky did not focus on the child, rather he looked at the child with respect to the context in which the child exists. A child was not seen as a constant, unchanging organism operating in a void. Miller's (1993) interpretation of Vygotsky's work includes the observation that "the mind is inherently social" (p. 375). Robertson (1994) also concluded that "individual learning does not occur in a social, political, or historical vacuum" (p. 29).

Vygotsky observed that it is the child within the social, cultural, and historical context that defines learning. In addition, because a child is an active part of the learning process, he or she will directly affect that context. He viewed children and their context as interdependent entities which could not be viewed independently.

Vygotsky recognized that there is a distance between a child's actual developmental level, as determined by independent problem solving, and a higher level of potential development, as determined through problem solving under adult guidance or in collaboration with a more capable peer. This distance he called the "zone of proximal development." The learner becomes personally involved as he or she moves through this distance with the aid of qualified persons. The learner actively constructs new knowledge based on previous knowledge and life experiences (Vygotsky, 1978). The role of the teacher is to guide the learner through the zone of proximal development and to help the student look at new ways of thinking. Vygotsky (1978) states that "the path from object to child and from child to object, passes through another person" (p. 30).

The role of the learner is to participate actively in the construction of new meaning. Shapiro (1994) states that "valuing the idea that knowledge is constructed by the learner guides educators in the development of resources and in the presentation of experiences for learning that take into account the learner's role in making knowledge his or her own" (p. 5). Emphasis on "experiences of learning" has supported the belief that relevant, interactive learning experiences promote learning within the students' social context, versus independent learning experiences that have little or no relevance to the student.

For a person to have knowledge he or she must have the ability to use the information in meaningful ways and to incorporate thoughts, feelings, and interpretation. By valuing the social construction of knowledge, we emphasize the importance of working together to develop knowledge. Learning is a social development, and it takes on relevance through the experience of comparing one's thoughts and ideas with others in such activities as group work and class discussions (Shapiro, 1994). It is these findings of Vygotsky, Piaget, and others that has resulted in a constructivist theory of learning that envelopes the many facets of the active learner.

Until recently, social learning theory and behaviorism has been a major force in classroom arrangement, curriculum design, learning assessment, and teachers' expectations of student learning and behavior. Dissatisfaction with the results of learning based on this theory has led to a wider acceptance of constructivist learning theory and active learning. Retaining the successful aspects of a behavioristic curriculum, educators have moved on to accept constructivism as the dominant explanation of learning in children. DeVries and Zan (1995) stated that:

Constructivist education is a developmentally appropriate approach to early education, inspired by Piaget's theory that the child constructs knowledge, intelligence, personality, and social and moral values. This approach has been defined in terms of activities that appeal to children's interests, encourage experimentation in the physical world, and foster perspective taking and cooperation in the social world (p. 5).

The constructivist understanding of learning has resulted in a changing perspective regarding the role of the learner. Educators now view the learner as an active participant in learning rather than a passive participant. This theory of learning understands that process is more important than product, which results in less emphasis on finding the "correct answers." Taking risks in learning is promoted, and errors are used as a strategy to further learning. Learning is also directly related to the learner's prior knowledge and individual context, and it is made relevant when it is related to the real life of the learner. In view of these facts, each person's construction of meaning is individual and unique to that person, as every person differs in his or her previous life experiences and views on reality.

Interdisciplinary Curriculum

“The ideal curriculum is one in which maximum coherence is achieved, and segmentation is minimized.”

- Phoenix, 1964

The consequence of this shift in accepted learning theory has led to changes in elementary school classroom management, elementary curriculum design and assessment, and the teacher's expectations of student behavior and learning. Newman (1985) states in *Whole Language: Theory in Use* that “as we came to understand that meaning is socially constructed and context-dependent, we realized that learning must involve collaboration, collaboration between students and teachers. . .and among students themselves” (p. 4). This results in changes in classroom management and the structure of the learning environment. Students need ample opportunity for sharing with one another, for exchanging information, for discussing ideas, solving problems, and receiving feedback from others. Some subject matter and learning calls for students to engage in quiet seatwork, but the classroom can also be a lively place where students actively engage in learning as they are guided by their teacher and interact with other students.

In the constructivist classroom the student often leads the inquiry into new learning through questions and interests that are inspired by classroom experiences. Fredericks, Meinbach and Rothlein (1993) stated that “a child-centered curriculum is more meaningful than a teacher-directed one. When students are given opportunities to make their own decisions and select learning activities according to their needs and interests, learning is much more productive” (p. 3). Watson and Konicek (1990) demonstrate student led inquiry with the following story:

For nine winters, experience had been the children's teacher. Every hat they had worn, every sweater they had donned contained heat. “Put on your warm clothes” parents and teachers had told them. So when they began to study heat one spring day, who could blame them for thinking as they did?

“Sweaters are hot,” said Katie.

“If you put a thermometer inside a hat, would it ever get hot! Ninety degrees, maybe,” said Neil.

“Leave it there a long time, and it might get to a hundred. Or 200.”

Christian added.

If Deb O'Brien had begun her lesson on heat in the usual way, she might never have known how nine long Massachusetts winters had skewed her student's thinking. Her fourth-graders would have learned the major sources of heat, a little bit about friction, and how to read a thermometer. By the end of two weeks, they would have been able to pass a simple test on heat. But their preconceptions, never having been put on the table, would have continued, coexisting in a morass of conflicting ideas about heat and its behavior.

O'Brien began with the simple question, “What is heat?” Using journals and the chalkboard to record their ideas, the students, with help, wrote down their “best thinking so far” on the subject of heat. Heat came from the sun, they wrote. And from bodies. But when Katie spoke about the heat in sweaters, everyone else agreed.

Sweaters were very hot. Hats, too. Even rugs got “wicked hot,” the children said. Sensing the first of many naive conceptions, O’Brien stopped them and said the magic words in science, “Let’s find out.”

For two whole days the testing went on. Experience, that most deceptive of teachers, had to be met head on. With their teacher’s help, Christian, Neil, Katie, and the others placed thermometers inside sweaters, hats, and a rolled-up rug. When the temperature inside refused to rise after 15 minutes, Christian suggested that they leave the thermometers over night. After all, he said, when the doctor takes your temperature, you have to leave the thermometer in your mouth a long time. Folding the sweaters and hats securely, the children predicted three-digit temperatures the next day.

When they ran to their experiments first thing the next morning, the children were baffled. They had been wrong. Now they’ll change their minds, and we can move on, O’Brien thought. But experience is an effective, if fallible, teacher. The children refused to give up. “We just didn’t leave them in there long enough” Christian said. “Cold air got in here somehow,” said Katie. And so the testing went on. . . .

For the third day in a row in O’Brien’s classroom the children rushed to their experiments as soon as they arrived. The sweater, the sleeping bag, and the hat were unwrapped. Once again the thermometers uniformly read room temperature. . . Their own theory was clearly on the ropes, but they had no new theory with which to replace it. She (O’Brien) decided to offer them a choice of two possible statements (which explained the properties of heat) . . . and so they were convinced by their own testing that ‘warm clothes’ aren’t really warm and that the heat that seems to come from them actually comes from the warm bodies they envelop.

“How can we test this new theory?” O’Brien asked. Immediately Neil said, “Put the thermometers in our hats when we’re wearing them.” And so the children went out to recess that day with an experiment under their hats (p. 672 - 679).

The teacher in this story, and in the constructivist classroom, is no longer the primary decision maker and model who has all the “right answers.” The teacher’s role is that of a guide who assists learning by providing the tools for learning. DeVries and Zan (1995) state that “the constructivist integration of academics involves the creation of active situations in which children pursue their own interests and purposes. . . people always invest more time, energy, and attention in what interests them” (p. 12).

The elementary school curriculum has also changed. No longer are subjects taught independent of each other, but rather the new information that is presented to students is interdisciplinary and multidimensional. As Orstein and Hunkins (1993) indicated, “student’s curriculum experiences should be such that they see life’s wholeness and continuity in activity. Students should see that every concrete entity is experienced within a context of wider relationships and possibilities” (p. 283). For example, mathematics, literature, and social studies are related to a science experiment, or music and art are an integral part of a newly introduced work of fictional literature. The interconnection between subject areas adds perspective, understanding, context, and relevance to new learning.

Thematic teaching units are a practical application of constructivist theory in the classroom. These units integrate new subject matter across the curriculum and are open to the utilization of various materials and processes. A thematic unit is designed to center on a central topic or theme. All relevant subject areas are related and integrated into the study of this central focus. Teachers organize objectives around the theme and use a variety of materials to extend learning and make it more meaningful as students make associations with real-life purposes, problems, and needs (Roberts, 1993).

The holistic nature of thematic units breaks down artificial curricular boundaries and integrates the entire curriculum. In addition, they are responsive to individual student's needs and are capable of change according to individual abilities and daily events. Each unit provides various opportunities for students to engage in decision making, critical thinking, and creativity. Thematic units offer an opportunity for each child to become actively involved in the construction of his or her knowledge as he or she explores a topic area (Fredericks, et al, 1993).

One of the more important aspects of thematic units is that students begin to understand the "why" of what they are learning. The integration of subjects provides a forum for students to understand the relevance of new material and allows its meaning to be more easily transferred. Also, there is "ownership" to learning because the student helps decide what shall be learned. Students are encouraged to take risks, make mistakes, ask questions, and reflect upon the answers or results. Thematic units also encourage collaborative and cooperative learning, self-direction and individual inquiry, and facilitate responsible learning (Newman, 1985).

In Reinsmith's (1993) *Ten Fundamental Truths About Learning* a discussion of how children learn coincides with basic constructivist thought and the underlying structure of a thematic unit. Reinsmith states that authentic learning comes through trial and error, and students will learn only what they have some proclivity for or interest in. He also asserts that no one will formally learn something unless that person believes he or she can learn it, and that learning cannot take place outside an appropriate context. It is Reinsmith's belief that real learning connotes use. In the classroom and in life the more learning is like play, the more absorbing it will be, and for authentic learning to happen, time should occasionally be wasted, tangents pursued, and side-shoots followed up. He also believes that traditional tests are very poor indicators of whether an individual has really learned something. A thematic unit that incorporates to some degree learning activities based on these points will adhere to the strictures of constructivist learning theory.

Assessment of students' learning in a thematic unit is done throughout the learning process and provides students with opportunities to perform, create, or produce end products. Rather than a paper and pencil exam at the end of a unit, assessment often involves the students in self-evaluation, making it authentic and meaningful. Assessment is viewed as an integral part of the teaching and learning process rather than as an end point. These various forms of assessment require more time and effort on the part of the teacher. However, assessment that has its focus on key conceptual ideas and problem-solving skills rather than on the memorization of facts is more meaningful and useful to the learner (Reichel, 1994).

The whole language approach to teaching is another integrated curriculum that adds meaning and relevance to the language arts. Newman (1985) states that "whole language activities are those which support students in their use of all aspects of language; students learn

about reading and writing while listening; they learn about writing from reading and gain insights about reading from writing” (p. 7). Whole language is not a method of instruction, but rather it is a perspective on teaching and learning. Teachers view reading and writing as a process of constructing meaning from interacting with printed material and relating the information to what one already knows. The skills of reading and writing are learned through active participation in the reading and writing process.

Whole language is an integrated, constructivist curriculum. Success with whole language has given credence to the effectiveness of an integrated curriculum that is child-centered and requires active learning. Raines and Canady (1990) state that “the child develops logical thought from numerous sensory and perceptual encounters and interactions with the physical world. Language then is used by the child as she acts upon the physical world, observes actions, and clarifies reactions. For young thinkers, language naturally accompanies activity, and it is used to formulate questions and to reflect upon the actions they have experienced” (p. 212).

Thematic units and the whole language approach to teaching are ways that educators have incorporated the constructivist theory of learning into practical applications in the classroom. Each of these teaching methods speaks to the parameters described by Klein and Merritt (1994) who list four main components of a successful constructivist lesson or unit: (a) Introduction of a real life problem by the students or teacher for the students to resolve; (b) student-centered instruction facilitated by the teacher; (c) productive group interaction during the learning process; and (d) authentic assessment and demonstration of student progress. New subjects are made relevant and meaningful because they are related to other subjects within an interdisciplinary curriculum. New information is given context by relating it to what is already known.

Hands-On Learning

“Tell me, and I forget.
Show me, and I remember.
Involve me, and I understand.”
- Chinese proverb

Constructivist learning theory and the stress placed on active learning have resulted in an increased emphasis on hands-on learning experiences in the classroom. Instead of reading material from a book, students participate in experiences that allow them to handle, examine, and comprehend new concepts by “doing.” Since knowledge acquisition is a constructive process, hands-on experiences in the classroom are vital to understanding (Bonja, 1986; Lumpe & Merritt, 1994; Martin, 1983; Mechling & Oliver, 1983). Piaget placed elementary aged children, ages 7 to 15, in the Concrete Operational developmental stage. He found that thinking or mental operations are tied to concrete experiences. Miller (1993) described Piaget’s observations that children learn as they manipulate and experience new ideas first hand through their senses. Hands-on learning is a mechanism to help children understand new ideas in a meaningful way so that they develop concepts and understanding that are relevant and useful in their lives. Riley (1979) supplied the definition that “learning from seeing, touching, experiencing [means that] to

interpret reality, children must experience their surroundings through imagination and discovery” (p. 21).

The easy way to teach any topic is the traditional way, based on the textbook, which follows the sequence of first assign the text, next review the text, test, discuss the test, then assign the next chapter. Students wonder why they did not quite understand the material and why they cannot remember it the next week, and teachers ponder why student performance is not satisfactory. The use of experiential learning has been shown to decrease or eliminate the frustrations of both students and teachers and to increase understanding and transference of new material and ideas (Martin, 1983). Hands-on learning changes the educational focus from the textbook to the experience. Combining content and facts, which requires reading, and inquiry and process, which requires doing, will provide meaning and context to new ideas and understandings (Bonja, 1986; Watson & Konicek, 1990).

Science learning has been at the center of the hands-on learning discussion because of the natural “fit” between the two areas (Feldkamp-Price, Rillero & Brownstein, 1994; Martin, 1983; Mechling & Oliver, 1982, 1983). Hands-on learning in science is defined by Lumpe and Oliver (1991) “as any science lab activity that allows the student to handle, manipulate or observe a scientific process. . .and are differentiated from other common methods of instruction, such as lecture and demonstration, by the criterion that students interact with materials” (p. 345). Students are guided through activities and units of study that continually reinforce the concepts of inquiry and/or discovery learning (Bonja, 1986). Hands-on experiences also provide excellent opportunities to go beyond the obvious and extend thinking and problem solving to a higher level (Beisel, 1991). Mechling and Oliver (1983) stated that “science classes need hands-on activities if learning is to progress beyond mere fact-cramming” (p. 42).

Johnson and Johnson (1979) explained that the emphasis on hands-on experiences in science also has led to increased opportunities for students to work together in groups to “explore, share information, generate alternative ideas, invent tests to try out each other’s ideas, and sharpen inferences through discussion” (p. 26). Students are dependent on each other to solve problems and investigate ideas, so they must communicate effectively, cooperate, and learn to accept alternative methods and ideas. Therefore, in addition, hands-on learning experiences are also effective ways to develop necessary interpersonal skills.

We can easily imagine students actively involved in laboratory experiments or dissecting plants as hands-on learning in science. These hands-on opportunities allow the students to use their own mental processes to discover concepts and principles for themselves. The opportunities for “learning by doing” in science are unlimited due to the nature of the subject. Mechling and Oliver (1982) acknowledged that knowledge acquired by hands-on learning is valuable “but the knowledge of scientific facts, concepts, and principles hold little value unless children build that knowledge on their own experiences and apply them to their own lives. Inquiry or process provides the experiences” (p. 34). Johnson and Johnson (1979) observed that hands-on science learning in a cooperative setting resulted in greater scientific achievement; divergent thinking and effective problem solving; positive attitudes toward science, the teacher, and each other; intrinsic motivation; positive self-esteem; and effective social skills. Salisbury stated that “young children are naturally curious about the world around them and every time a child wonders why or how in an attempt to understand and enjoy their world they are engaged in science” (p. 6).

We also cannot look at hands-on experiences as independent of other learning. There is a great depth to the learning that takes place when students engage in this type of educational experience. Students must have the base of knowledge necessary to participate in the hands-on learning experience. This knowledge base is provided by society, family, teachers, and classroom learning. The learning that takes place during a hands-on activity builds on prior knowledge, and the hands-on activity itself reinforces knowing and understanding.

In the field of science, Lumpe and Oliver (1991) described hands-on experiences as multidimensional in nature. The first dimension is the Inquiry Dimension. Science is known as an inquiry-based subject, and hands-on experiences that promote inquiry lead the student to discover principles and concepts. The second dimension is the Structure Dimension which centers around the involvement of students in making decisions concerning the design and planning of an activity's procedures. Unfortunately, student involvement in many science activities is often limited by the step-by-step nature of the activity itself. A procedural approach to a hands-on activity does not increase student problem-solving ability or facilitate higher level thinking. Student-guided organization to the area of inquiry lends itself to higher levels of thinking and learning.

The third dimension is the Experimental Dimension which outlines the type of manipulation involved and the conclusions that are drawn from the results of a hands-on activity. This is true scientific experimentation which depends on the interdependent and interactive relationship between theories and experiments. Experiments engage students in high level problem solving and show them the true essence of science.

The case of Mrs. O'Brien and the students "hats that made heat" concept described student-guided experimentation. This is a true example of the experimental, structural, and inquiry dimensions of hands-on learning (Watson & Konicek, 1990). Student-guided inquiry requires that the teacher act as a facilitator. Learning does not always mean searching for the "right" answer, but rather the learning process itself is the knowledge acquired (Beisel, 1991). Riley (1979) supplies the definition that "learning from decision making [student-guided learning] is to make the complex and numerous decisions required of them as adults. Children must begin when they are very young to believe that they are capable of deciding" (p. 35).

It is important, however, not to limit hands-on learning to the field of science, but to recognize that experiential learning in other fields is equally effective. The multi-dimensional structure that exists with hands-on learning in science is just as relevant to experiential learning in other subject areas. The natural fit between hands-on activities and literature, for example, may not be as evident, but the learning and understanding that hands-on experiences in literature provide are identical to those in science. Any subject acquires relevancy, and there is an increase in comprehension, when students are provided with opportunities to experience learning.

School Gardening

It's a magical world,
Mother Nature's domain,
With millions of wonders to see,
And to hear and to smell,
And to taste and to touch;
So many fine places to be!

Without Mother Nature
There wouldn't be grass,
Or puddles, or mud good for squishing.
There wouldn't be sunshine,
Or icy cold lakes
On the day that you want to go fishing.

Mother Nature plants flowers
And oversees trees
And cares about each living creature.
Remember her words
And learn of her ways
Mother Nature's an excellent teacher.
- Stryker and Bingham

Interest in using plants, horticulture, and gardening within the elementary curriculum is increasing as educators become aware of the plethora of opportunities that are incorporated in these topic areas. Horticulture and gardening are the practical applications of a multitude of basic sciences (Bouthyette, 1991/92). However, the use of the constructivist theory of learning, and the resulting emphasis on integrating the curriculum and hands-on learning, allows these topics to leave the "science arena." Plants and growing plants can be used as a focus for any number of educational subjects. Horticulture, plant growth, and gardening can be integrated into every subject area of the elementary school curriculum. Horticultural practices and gardening in the classroom can also be used by educators to meet state-mandated requirements in multiple subject areas (Cavaliers, 1987; Barron, 1993; Dwight, 1992; Gwynn, 1988; Markle, 1991; Nelson, 1988; Salisbury, 1989; Stetson, 1991).

An indication of this interest in school gardening is found from information obtained by the National Gardening Association as a result of their Youth Gardening Grant program. Over the four years from 1991 through 1994, the number of grant applications doubled with each successive year (D.Young, National Gardening Association, personal communication, October 5, 1995). The American Horticulture Society (AHS) has also received an overwhelming response from educators interested in school gardening programs and the use of horticultural practices in the classroom (Heffernan, 1994). In addition, a 1995 survey of Virginia teachers indicated a high

level of interest in the use of school gardening programs. Many of the responding teachers requested additional training in this subject area (Dobbs, 1995).

Garden-based curricula have been successfully developed as interdisciplinary thematic units based in constructivist theory (Monk, 1995; Sheffield, 1992). Examples of these curricula are *Growlab*, developed by the National Gardening Association and based on the process of gardening indoors under grow-lights (Pranis & Cohen, 1990), and *Lifelab*, developed by the Life Lab Science Program, Inc. and based on gardening in an outdoor garden (Jaffe & Appel, 1990). Using school gardening as the central focus of a thematic unit allows the teacher to expand into other subject areas to provide relevancy and meaning to what is being learned. Nelson (1988) describes how a school-yard garden helped tie subjects together in the students' minds. Prior to using a school-yard garden she states, "they are unable to apply practically what they have learned in one subject to another. Student's learning becomes pigeonholed. . .it can stifle the desire for additional education since, in the student's mind, none of it relates to real life" (p. 23). "We tried to connect the garden to as many different aspects of learning as possible. . .the students use the garden to cross content lines" (p. 24).

Horticulture and plants are found in history, geography, science, music, art, nutrition, literature, writing, physical education, social studies, and mathematics. In a thematic unit based on gardening, the teacher centralizes the gardening experience around a subject of interest. Thibault (1994) based a gardening thematic unit on multiculturalism; Sheffield (1994) on our international heritage; Canaris (1995) on nutrition and a "snack garden"; Marturano (1995) on four regional native American tribes; and, Thompson and Marcoux (1996) on Colonial America. Additional activities reach out across the curriculum and integrate the unit of study. Braun, Kotar and Irick (1989) state that:

Gardening is a pleasurable human activity that can help young learners develop positive attitudes towards social studies topics such as the world of work, caring for the environment, and developing relationships with the elderly. Additionally, the garden, as associated activities, can be an integrating focus that facilitates the acquisition of concepts and skills across the disciplines (p. 20).

Constructivist learning theory suggests hands-on learning as an effective strategy to teach and relate new information to students. By actively participating in their learning, students construct knowledge within the framework of their existing knowledge. By their very nature, growing and nurturing plants and using horticultural practices provide real-life, hands on experiences that contribute to the understanding of any chosen topic area.

Felkamp-Price, Rillero, and Brownstein (1994) suggest that choosing the best hands-on activities in science requires that a teacher answer the following questions:

- Does the activity provide meaningful, accurate science learning?
- Is the activity worth the time it takes?
- Is the activity worth the money (time and energy) it costs?
- How difficult is the activity?
- Does the activity work?

Although these questions directly relate to hands-on science, they also can be asked of school gardening and its effectiveness as a hands-on learning experience. These questions are answered by numerous, positive research-based and anecdotal descriptions in the educational

literature. This commentary described teacher, student, and school experiences with school gardening and promotes the use of school gardening as a hands-on learning experience:

Does the activity provide meaningful, accurate learning? “The Peabody Individual Achievement Test was used to measure gains in academic achievement. The experimental group (the gardening students) out-performed the control group (the non-gardening students) in all areas: general information, reading recognition, reading comprehension, total reading, mathematics, spelling and written language” (Sheffield, 1992, p. 116 - 117).

Is the activity worth the time it takes? “During the process of growing our garden, the learning experiences were varied, valuable, and rewarding. . .I encourage readers to try this garden project with their classes, whatever ages they may teach” (Monk, 1995, p. 9). “In a relatively short time, our garden project provided tangible evidence to all the children that they could succeed in school” (Marturano, 1995, p. 30).

Is the activity worth the money (time and energy) it costs? “The focus of early childhood education is on the development of the whole child; we do not limit ourselves to the cognitive or academic domain. With this focus, nature education has invaluable resources to offer. Experiences in the out-of-doors tend to be rich in opportunities for nurturing growth in all of the developmental domains, including adaptive, aesthetic, cognitive, communication, sensiomotor, and socioemotional” (Wilson, p. 4).

How difficult is the activity? “Creating and maintaining a school garden might not be as difficult a task as one would think. . .the kinds of problems that would be encountered in constructing and protecting a school-yard garden are not insurmountable. A gardening curriculum can be easily adapted to any grade level by varying skill level and concept complexity” (Braun, et al., 1989, p. 20, 22).

Does the activity work? “How did the (school garden) project turn out? It was wonderful, a truly memorable learning experience for students and teachers” (Marturano, 1995, p. 26).

The work of Barbara Sheffield (1992) confirms that the use of a garden-based curriculum is an effective way to increase learning and comprehension and to increase self-esteem in underachieving elementary students. Using an interdisciplinary garden-based curriculum based on a Heritage Garden, these students explored the continents of Africa, Europe, South America, and native North America. Using standardized testing for knowledge acquisition and changes in self-esteem, Sheffield found significant increases in both, as compared to the control class who were taught under traditional methods.

School gardening should not be viewed as an additional subject for incorporation into the already packed elementary curriculum. Teachers are saturated with teaching requirements, and they are very confined by the limited amount of time they have to work with the students (Ebeling, 1977). Gardening is not an extra subject to be taught in addition to reading, writing, and arithmetic. Rather, teachers need to realize that school gardening is a teaching strategy that provides them with an opportunity to meet the established Standards of Learning of individual school districts in an interesting and exciting way (Braun, et al., 1989).

Teachers are also the beneficiaries of a multitude of sources of information on gardening with children provided by the professional horticulture community. Information can be accessed through horticulture periodicals (Waters, 1993), Cooperative Extension and 4-H programs

(Whiren, 1995), Master Gardeners (Alexander, et al., 1995), private education companies (Lucas, 1995), garden clubs, garden centers, arboretums, and botanical gardens (Bowles, 1995), and horticulture associations and societies (Heffernan, 1995; Pranis & Cohen, 1990; Ocone & Pranis 1983; Stiles, et al., 1994). In addition, horticultural therapy programs provide information on gardening with special needs children (Relf & Dorn, 1995). Educational periodicals and journals are also excellent sources of structured activities using plants and gardening for learning (Gerber, 1995; Griffin, 1992; Johnson, Wright, & Alexander, no date; Simpson, 1988; Smith, 1991; Smith, 1995; Sunal & Sunal, 1991).

People-Plant Relationships

“I remember planting flowers and vegetables last year. We planted purple flowers, radishes, peppers, spinach, and gladiolus. I really liked picking the vegetables. . .it made me feel good.”

-Kellen, 5th grade

“Gardening is making the world beautiful with flowers. My dream garden is no clay soil, a pond with a fountain, trees, lots of flowers and a bench. I want flowers all around me!”

- Hillary, 7th grade

“Because our school served very poor students; most on welfare, some homeless, this gardening project was a ‘light’ in a very dark tunnel. It was therapeutic and helped many students work out anger and anxieties. One student rarely spoke in class but would speak to the plants. It also helped our volunteer and teaching staff. One teacher did not know strawberries grow on little plants, she thought they grew on trees!”

- elementary school teacher in Oklahoma

Unlike a thematic unit based on dinosaurs or puppets, school gardening provides the additional benefit of furnishing an opportunity for students to participate in the real, living world. In the garden students must be responsible, they must care for and nurture living things, and they must respect the living systems in which we all exist. But there is a personal aspect of gardening that is much more difficult to quantify, the unique relationship between the plants and the person. Plants have a physiological impact on humans that may be genetic in origin. People have a need and a preference for natural settings which provide for emotional, psychological, and physical needs (Relf, 1992). It has been found that varied natural settings are essential for children’s physical and emotional healthy development (Olds, 1989). The plant and human relationship transcends the act of simply gardening.

Lewis (1977) asks the question, “What is it about plants that encourages people to respond to them?” (p. 7). He answers this question by listing a few of the attributes of plants that require a response from the gardener:

- Plants are alive.
- Plants are dependent upon the gardener for care if they are to survive.
- Plants are non-threatening.
- Plants are non-discriminating. They respond to the care that is given to them, not to the particular attributes of the gardener.
- Plants provide a peaceful setting. Their growth is steady and progressive.
- Plants are predictable; they grow from seedling to maturity as anticipated.
- Plants visibly respond to the care of the gardener.

These attributes of plants take away some of the fear and anxiety that other school activities can induce in a student. Neer (1990) gardened with children with severe physical handicaps and other disabilities, although most were learning near their normal age level. “Teachers have seen some remarkable changes in students after a year [of gardening]. A teenage girl who is totally blind has more relaxed, spontaneous speech and can talk about her feelings more comfortably in the garden than in the classroom. A small group of junior high students often bicker among themselves in school, but offer help to each other while tending the garden. Five youngsters and their families have started container gardens at home” (p. 69).

A 1989 National Gardening Association Survey of households across the United States assessed the importance that people placed on plants and gardening in their lives. Attitudes toward plants and the role that plants play in an individual's sense of well being were evaluated across various demographic areas and between gardeners and non-gardeners. The results of this survey confirmed that people's responses to plants generalize over wide groups, and that people have a significant desire for nature in their lives. People are aware of the sense of well being derived from plants and gardening (Relf, McDaniel, & Butterfield, 1992). Skelsey and Huckaby (1973) feel that “gardening is also the perfect antidote to a too-fast, too-complex world. It is like no other project, no other hobby. In fact, ‘project’ and ‘hobby’ do not define it well at all. Gardening is a way of life - a state of mind” (p. 13).

Kaplan (1973) identified gardening as a source of important psychological benefits. Nature is an essential component of gardening, and people have a strong need for nature. Naperud (1975) asked children to identify their “favorite places” and found that there is a strong natural dimension in children’s most valued environments. Also, there is a strong active orientation towards nature in young children.

Gardening requires continuing contact and cannot be approached without a modicum of commitment. Gardening is also an easily accessible leisure activity. Kaplan’s (1973) study found that people who garden received aesthetic pleasure from plants, and gardening provided an opportunity to relax. It also provided a sense of accomplishment and was perceived as a valuable way to spend time. Introducing children to the leisure activity of gardening is an additional benefit to any school gardening experience.

Unique to the gardening experience, is that it provides students with the opportunity to nurture life by caring for and tending plants. When children garden, they must foster, care, and invest a part of themselves into the maintenance and growth of plant life (Matsuo, 1990). Green (1994) designed a curriculum that encouraged nurturing behavior in two’ to seven-year-old children. She stated that nurturing is not only tending to the growth and needs of another living thing, but it is also learning to be helpful to others, learning to gain attention from others in a positive way, learning to compliment rather than criticize others, showing tolerance for others and

their differences, and being able to express sorrow when actions or words have hurt another. These types of prosocial behaviors must be learned (Mussen, 1977). Garden activities and the interaction with growing plants reinforces the learning of these affective behaviors.

In caring for plants, children must be “responsible for” and “respond to” a living thing. Children have few situations in which to be guided in this affective kind of learning, and the gardening experience is in a singular position to help children learn responsibility (Clark, 1977). The students who are learning through gardening are participating in a project that depends almost entirely on the their own efforts. Neglect of any kind is quickly evident by changes in plant growth and yield, but positive actions in the garden supply vegetables for eating, flowers for picking, and beauty for beholding. Monk (1995) utilized an integrated gardening curriculum when teaching first grade students. She observed that:

A sense of ownership with responsibility emerged as one of the values they learned. Some children planted things at home, sharing their experiences with family and friends. Through such shared experiences, the children learned to work together as their learning and discovery continued (p. 9).

Children who participate in a garden-based activity must also cooperate and work together. Sarver (1985) observed that “the children discovered that they prospered in an environment where others did well also. That is, they were successful in proportion to the success of others” (p. 395). In the school setting it is rare for a single student to have his or her own garden to care for. In most cases the students participate in gardening as a group, or in small groups. The students learn to assist each other and cooperate in all aspects of gardening from deciding what seeds to order to helping each other stake tomato plants.

Gardening has been shown to increase self esteem in underachieving elementary students (Sheffield, 1992). Barker (1992) interviewed students involved in The Hilltop gardening program in Bloomington, Indiana. These students stated that the experience of gardening caused them to feel the personal qualities of satisfaction and pride. They also felt that the gardening activity gave them a sense of being needed and valued, as well as a sense of ownership and belonging. Lewis (1977) states that because “the gardener has a personal investment in the garden, it becomes an extension of himself. The garden is a visible representation of his individuality which enhances his self-image, helping to create self-esteem” (p. 7). Pivnick (1994) also asserts that:

When they see the first shoots poke through the ground and the first buds appear, and later when they share their harvest with family and friends, they have a feeling of exhilaration and pride. For it is their handiwork, their decisions, their hard work that has helped to create the bounty that they are reaping. This tangible outcome gives students a feeling of self-worth, the value of which cannot be underestimated in developing a concern for others and for nature. (p. 8).

Planting a school garden requires the participating gardeners to make a myriad of decisions. In a student-led inquiry, the gardening students are the decision makers. Using garden catalogs, visiting garden centers, reading library text, and focusing on the intent of their garden, students must cooperate, discuss, evaluate, and come to conclusions on what will be planted in the garden. This is just the beginning of a long process of decision-making that starts at planting and ends with the harvest. As students are given the opportunity to make their own decisions, they are not only given that responsibility, but they will also deal with their decisions for a long period of time as their garden grows through the season. Jensen and Hughston (1979) state that:

In social interaction children must solve problems among themselves; these experiences result in improved reasoning. . .and a child learns that his own ideas are as valuable and important as others. The child must learn to give and take and must learn that compromise is a necessary and acceptable way of solving problems (p. 15).

Working in a school garden with a group of students often requires the assistance of additional help to manage the gardening activities and student behavior. This help can come in the form of volunteer parents, senior citizens, garden club members, Master Gardeners, or interested community members. This inter-generational interaction leads to better communication and understanding between generations (Sarver, 1985). Older students can also assist younger students with their gardening projects. Cross-age tutoring has been shown to benefit both the tutors and those they are helping with significant academic gains and enhanced self-esteem (Smith & Burrichter, 1993).

The gardening experience can also provide opportunities for students to share and communicate with students from other schools who are participating in the same experience. Writing and computer skills improve as students at schools around the nation communicate with each other through letters and the Internet. Shelton (1994) suggests trading leaves with schools from other states to see the variety of plant life in different geographic regions. The National Gardening Association advocates computer communication to share growing ideas and experiences via e-mail or chat rooms on the Internet. These are but a few of the activities in which young gardeners can share.

Gardening also allows children to take a close look at the growing world around them. Nature is filled with endless variety and beauty that often goes unnoticed. Gardening requires that the gardener pay attention, and in doing so they “stop and smell the roses” as they attend to the different sights, smells and textures that abound in nature. Sarver (1985) found that when working with learning-disabled students that “preserving and enhancing beauty in the garden was the underlying motivation for many of their contributions.” (p. 394)

Environmental Education and the Outdoor Classroom

“A child’s world is fresh and new and beautiful, full of wonder and excitement. It is our misfortune that for most of us that clear-eyed vision, that true instinct for what is beautiful and awe-inspiring, is dimmed and even lost before we reach adulthood. If I had influence with the good fairy who is supposed to preside over the christening of all children I should ask that her gift to each child in the world be a sense of wonder so indestructible that it would last throughout life as an unfailing antidote against the boredom and disenchantment of later years, the sterile preoccupation with things that are artificial, the alienation from the sources of our strength.”
- Rachel Carson, 1956

Plants are important to a person's enjoyment of life and to his or her psycho-social well being, but they are also essential to each person's actual existence on this earth. Plants are absolutely

fundamental to the existence of mankind as a source of food, clothing, shelter, energy and clean air. Plants play a crucial role in the “cycle of life” which defines the health of natural ecosystems. Without plants, life cannot exist on this planet.

Unfortunately, people are being less aware of plants as populations move away from an agrarian society into urban and suburban communities. People now have less contact with plants because they have ceased to participate in the growing and processing of their own food. As people are less involved in the raising of their own food, they become less aware of the important role plants play in the feeding, sheltering, and continuance of existing and future generations. Also, the lives of children have become more controlled and structured. Children spend much less time outside the home without the direct supervision of adults. As childhood becomes more restricted, the opportunities to interact with and experience nature become even more critical (Francis, 1995).

Less contact with the environment and the living world leads to a concern for the education of environmentally conscious youth. A survey by Relf, McDaniel, and Butterfield (1992) found that despite environmental education in our schools, less than 50% of the respondents (46%) believed that the natural world is essential to their well being. However, Campbell (1996) revealed that activity-based environmental instruction that allowed for interaction between students and living systems resulted in an increase in positive attitudes toward the environment. This study indicates that hands-on environmental education programs are effective in changing students’ environmental attitudes. This poses the question as to the effectiveness and the usage of current environmental education programs.

Due to our increasing concern for the environment, environmental education has become an important facet of elementary education. Environmental educators focus their research on the attributes and parameters of effective environmental education in the elementary classroom. The goals of environmental educators are to instill positive cognitive changes in children concerning an understanding of the environment and affective changes that create positive environmental attitudes (Crompton & Sellar, 1981). Swan (1974) indicated that while environmental education is concerned with the biophysical environment and its associated problems, it ultimately is concerned with mankind. Due to the fact that we educate people, not environments, an environmental educator must have not only a basic understanding of the environment, but also a basic understanding of people. Any theory of environmental education, therefore, must rise from the blending of these two bodies of knowledge.

Some of the environmental education research results have defined the characteristics of an effective environmental education curriculum. Howie (1974) found that a combination of classroom instruction followed by hands-on activities in the out-of-doors, and then followed by classroom review is the most effective way to handle outdoor experiences. Jaus (1984) tested elementary students at third and fifth grade levels to determine that minimal instruction in environmental education is effective in producing highly positive attitudes toward the environment, and these positive attitudes are retained over time. Robertson (1994) reviewed constructivist learning theory in the light of environmental education objectives and concluded “constructivist research promises to illuminate environmental education research and pedagogy across each of the four commonplaces of education: learner, teacher, curriculum, and milieu” (p. 29). Monroe and Kaplan (1988) found that “learning by doing may not be the most effective strategy for teaching environmental problem-solving skill. . .because of the limitations of

exploring fewer major issues, the unknown degree of project success, and the potential classroom and community constraints” (p. 38).

Environmental education research has also shown that interacting with nature at a young age leads to positive affective environmental behavior and attitudes in later years. Tanner (1980) examined the lives of environmental activists to determine what factors influenced their lives to lead them to positive environmental attitudes. He found that the common factor in all of the lives studied was frequent interaction with natural areas in their formative years and positive influences from parents and teachers.

Milton, Cleveland and Bennett-Gates (1995) used a Park/School cooperative program to show that outdoor learning releases children from the pressures of reading, writing, and teacher approval, to discover new interests and capabilities within themselves and a positive attitude toward responsible environmental behavior. Harvey (1989-90) determined that vegetative school landscapes used as a teaching resource enhanced knowledge of botany and fostered beneficial attitudes to the environment. Crompton and Sellar (1981) reviewed the environmental education literature available to conclude that “outdoor education experiences facilitate positive affective development. . .and that student’s self concept is enhanced; peer socialization and racial integration are facilitated; and teacher-student relationships are improved” (p. 28).

Teachers are in a unique position as facilitators of environmental education. Hart (1993) states his opinion that being with adults in a garden is more important than doing their own gardens. Children need to learn to understand, reflect on, and respect nature, because it is not something they come upon naturally. Good role models that respect the environment are the best teachers. Additionally, Wals (1994) and Simmons (1994) found there are differing perceptions of nature and the environment between urban, rural, and suburban youth that predisposes them to differing interpretations of environmental issues. It is the context in which the education takes place and the prior experiences of the learner that provide the framework for their connections with the environment. However, Simmons (1993) determined that teachers are interested in teaching outdoor environmental education, but a very small percentage of these teachers ever takes their class outside. These teachers stated that despite their interest, they do not know how to use the outdoors effectively.

Pivnick (1994) allowed that a garden is an ideal place for environmental education to take place. School gardens answer many of the problems identified in environmental research. One-time field trips to natural areas are not as effective as interactions with the environment on a daily or weekly basis. Regular interaction with the living environment provides a greater understanding of environmental issues. School gardens are accessible to the students on a daily basis so that students can have an ongoing, everyday relationship with nature. Gardens also provide a format around which teachers can evolve the curriculum. Gardens allow teachers to feel comfortable as they use the outdoors as an extension of their classroom.

The connection between environmental education and gardening extends beyond the practical application of a school curriculum. Environmental education promotes an understanding of the environment and positive affective changes in behavior that result in positive earth stewardship. Gardening is an excellent place for these affective changes to occur. In the garden children can see the importance of nature’s cycles and the effect mankind has on these natural events. Stetson (1991) found that “by working to keep a plant alive and healthy, the students

develop a respect for living things”(p. 35). Growing food crops gives a child a connection with the foods he or she eats and an understanding of our connection with the living world. (Pivnick, 1994).

Laubenthal (1995) used an earth-based curriculum with her preschool students which centered on gardening and nature. “We prepared a garden plot and sectioned it in 1-foot squares, one for each child. The program encouraged children to nurture a small piece of the earth, and in return the earth nurtured them with a harvest. A feeling of respect emerged. Hands-on gardening created hope and renewal in the hearts of all who participated. . .Positive self-esteem, peer cooperation, and a feeling of being responsible for life were among the most obvious social benefits” (p. 5).

Participating in gardening and tending plants allows children the opportunity to observe the intricate, colorful, extraordinary beauty of nature. Skelsy and Huckaby (1973) state that “where environmental problems do touch us and our children personally, the emphasis is often on the ugly. Whole classrooms of children have been galvanized to fight pollution - and admirable cause - but not nearly enough time has been allotted to finding and appreciating the beautiful.”

In essence, the gardening experience allows children to see how important it is to care for nature for the preservation of mankind and the continuation of living systems. Handscom and Leipzig (1994) maintain that “the garden at our school. . .is a place where all of the children of the school and community may learn not just science, but also responsibility for our environment “ (p. 10).

Nabhan and Trimble in *The Geography of Childhood* (1994) state that they fear that childhood is becoming an endangered species because children are quickly losing contact with live nature in their daily lives. Francis (1995) supports this belief that children are losing their contact with nature. He sees the garden as an “excellent place to restore some of the qualities of childhood. The garden can be one of the most accessible and resourceful places where children can have unstructured interaction with nature and come to participate in the wonders of natural process” (p. 188). Moore (1995) believes that:

If sustainable development values are to be created in society, we must recreate, as a matter of great urgency, viable educational habitats for children where they are able to learn on a daily basis the lessons of nature. Gardening is clearly an effective first step. . .as a vehicle for interdisciplinary environmental education, gardens are unsurpassed. This is because they are a constantly changing, highly attractive, interactive, motivational setting - a fertile source of language and scientific investigation. . .Gardening is one of the most direct means through which people of all ages can acquire an awareness of themselves as part of the Earth’s life support system (p. 223-224, 230).

The interrelationship between gardening and environmental education allows these subject areas to support each other within the curriculum, and it also entitles them to have many of the same implementation problems. Mirka (1970) and McCaw (1979/80) inquired into the reasons teachers do not address environmental education to any great extent within the curriculum. Sewing (1986) identified the educational, logistical, attitudinal, and conceptual barriers that deter the teaching of environmental education in elementary schools. She found that the barriers against teaching environmental education (EE) are: (a) not enough classtime or preparation time; (b) lack of EE instructional materials; (c) EE is too expensive; (d) EE should be taught in the

science curriculum; (e) emphasis is placed on the cognitive rather than the affective elements of EE; (f) teachers feel that EE means taking field trips; (g) teachers are not comfortable with their training or preparation to teach EE; and (h) teachers have positive attitudes toward teaching EE, but lack the commitment to do so.

A case study at an elementary school that focused on the implementation of environmental education into curriculum identified four areas that necessitated action for successful implementation: (a) Coordination of the project between departments, teachers, and administration; (b) articulation of a school philosophy toward environmental education and the goals that were to be achieved; (c) differing perceptions of the implementation process; and (d) conceptual problems about environmental education. The incorporation of environmental education into the curriculum requires an awareness of how to manage change. A forum for communication between students, teachers, departments and administrators would help to neutralize conflict. Organizing a development team, planning, teacher training, additional curricular materials, and acquiring assistance and expertise would ease the implementation process (Samuel, 1993).

Ham, Rellergert-Taylor and Krumpal (1987-1988) designed an environmental education workshop for teachers that specifically focused on eliminating or reducing know barriers to EE. Although the program was evaluated strictly as a field test, the results indicated that the workshop was able to reduce some of the conceptual, logistical, and educational barriers to EE. Teacher training in the use of a garden-based curriculum, and the implementation of a school gardening program can also reduce these barriers to the use of garden-based education.

Bradley (1995) found that several factors were important to the success of an urban wildlife habitat installed at an elementary school. The most important factor was the dedication and commitment of the students, parents, teachers, and administration. The second factor was the ownership that the children had in the project. . it was not done for them, they did it. The third factor was the time frame for implementation. They spent an entire year laying the ground work, developing an appreciation for the environment, and ensuring that everyone had input into the design which provided ownership and academic understanding.

Environmental education research has pin-pointed factors that influence the teaching of environmental education in the elementary classroom. There have not been any studies done to determine the factors that influence the use of school gardening in the elementary classroom.

Chapter Summary

In an elementary classroom, where learners are seen as active participants in their own learning, the use of school gardening is an effective tool for administering an interdisciplinary curriculum. There are many aspects of gardening that make it attractive to the elementary school teacher. Gardening is a hands-on experience that requires the participation of the learner. It is also a forum for students to improve upon the affective qualities of responsibility, decision-making, nurturing and caring for another living being, and cooperation. The garden is a place to discover the diversity, beauty and wonder of nature. Gardening is intricately connected with environmental education due to the many natural aspects that they share. Gardening also allows teachers to meet many of the state and school district-mandated standards of learning.

CHAPTER III

PROCEDURES AND METHODOLOGY

Introduction

In this chapter the research design, population, research instruments, and data collection procedures are described. This research study used two research instruments which were designed to answer the research questions. Included in the description of this study are a descriptive profile of the populations and data analysis for each question. The study research questions were:

1a. What are the factors that are essential to the successful implementation of school gardening into an elementary school curriculum as determined by educators who are currently using school gardening in their curriculum?

1b. What logistical features of school gardening need to be addressed for the successful implementation of school gardening into the elementary school curriculum?

2a. How do teachers perceive the use of a garden-based curriculum in their classroom?

2b. Is school gardening being used as the focus of interdisciplinary educational or thematic units in the elementary school classroom, or is it being used primarily to teach science?

3. What are the educational needs of teachers who are using school gardening in the curriculum? How do teachers feel about their qualifications for implementing the use of gardens and growing plants in their classrooms?

4. What are the attitudes of teachers who are using school gardening in their curriculum as to the effectiveness of school gardening as a teaching strategy?

Research Methodology

Daphne R. Sewing (1986) in her master's thesis *Barriers to Environmental Education: Perceptions of Elementary Teachers in the Palouse Region of Washington and Idaho* identified the barriers to environmental education (EE) and the relative importance of these barriers to the implementation of EE into the elementary curriculum. The personal interview was used as the method of inquiry. Closed ended questions lent to the ease of analysis. The interviews focused on four areas that were identified through the literature as barriers to EE. The four areas of inquiry were:

Logistical Factors. The objective of this area of inquiry was to determine the relative importance of selected logistical barriers to conducting environmental education activities.

Conceptual Factors. The objective of this area of inquiry was to determine teachers' perceptions of the definition of environmental education, and its place in the public school curriculum.

Educational Factors. The objective of this area of inquiry was to determine how teachers perceive their preparation and training to implement environmental education in the curriculum.

Attitudinal Factors. The objective of this area of inquiry was to determine teachers' perceptions of the importance of environmental education.

Environmental education and the use of school gardening interact at many levels. Environmental education can be exclusive of school gardening, but school gardening is rarely exclusive of environmental education. Environmental education may focus on such subjects as pollution, bird migration, and hibernation which can remain exclusive of growing plants. However, growing plants under any circumstance require an interaction among the plant, the environment, and the caretaker. Using Sewing's work as a template, this research will revise the inquiry to focus on the use of school gardening.

This study will address the same areas of inquiry to identify the factors as they pertain to the implementation of school gardening into an elementary school curriculum.

Logistical Factors. Incorporating school gardening into an elementary school curriculum can be very simple or it can involve extensive planning, tools, labor and time. The extent of the gardening project delineates the time, money, labor, and educational requirements. However, from the smallest project to the largest garden, the logistics of bringing it all together into a positive, growing, learning experience for elementary school children means that some crucial areas must be addressed.

Sewing (1986) was able to define the logistical factors that limited the teaching of environmental education. School gardening faces many of the same logistical barriers as environmental education because of the interaction between the two subject areas. The scope of this research included identifying any additional logistical factors that affect the successful implementation of school gardening into the curriculum.

Conceptual factors. A problem that faces school gardening is the misconception that it belongs exclusively within the science curriculum. The natural fit among gardening, science, and mathematics leads to the ease with which gardening fits into science learning. In a constructivist classroom, however, gardening and horticulture have been shown to relate to all manner of history, social studies, language arts, nutrition, physical education, and the arts.

Another misconception is that gardening can only occur outdoors in a plowed bed where the plants need to be grown in rows. Plants can be grown in any place or container that holds soil (or nutritive water such as hydroponics) and has sufficient hours of available light. Gardening can take place indoors or outdoors, under lights or in natural light, in a bed or in containers. There is no exclusive way that gardening must occur; therefore, school gardening and learning by growing plants is not solely an experience that must occur in an outdoor garden plot.

A third misconception is that school gardening must be taught as a separate subject in the existing curriculum. As a separate subject it would compete with the limited amount of instructional time allotted for other subject areas. The idea exists that school gardening should be taught after the basics are taught; but instead, it should be used as a tool to assist in teaching the basics.

Educational Factors. Teachers vary in their backgrounds and interests in gardening. A teacher may believe that school gardening would be an excellent tool for a thematic curriculum, but feel that he or she lacks the knowledge necessary to implement such a program. The

teacher's interest is crucial to the use of school gardening. In this study, the respondents were teachers who have already shown an interest in using gardening in their curriculum. It is important, however, to discern how adequately these teachers felt they were using this teaching strategy, and to identify their additional educational needs.

In addition, the ultimate goal in using school gardening is for students to learn. Teacher assessment of learning using school gardening will enable educators to evaluate this tool as a teaching strategy.

Attitudinal Factors. When a teacher has an interest in a new educational idea it is more likely to be incorporated into the curriculum than if the teacher is not interested. The respondents in this study were teachers who had already implemented school gardening into their curriculum. It was presumed that their initial attitude toward school gardening was positive, and that they had an interest in using school gardening as a teaching strategy. It is of interest to ascertain whether or not, after a minimum of one year using school gardening, these teachers still felt positive about their school gardening experiences.

The viewpoints of elementary school teachers toward using school gardening in the curriculum were based on their experiences with this teaching method as it related to student learning. This investigation determined if experienced teachers observed that using school gardening in the curriculum enhanced student learning.

Population

The subjects used in this study were elementary school teachers who currently, or in the recent past, used school gardening in their curriculum. These teachers were selected from elementary schools that had received a Youth Gardening Grant from the National Gardening Association in either of the two academic years 1994/1995 or 1995/1996. Each year approximately 300 schools or organizations are awarded Youth Gardening Grants that consist of \$600 worth of gardening equipment such as hoes, hand trowels, a wheelbarrow, sprinkler and hose, plant materials, and seeds donated by cooperating horticulture businesses. The intent of the grant is to help "jump start" youth gardening and provide the necessary materials to make the gardening experience available to more children around the country.

To be considered for a Youth Gardening Grant, applicants must fill out an extensive application that asks for a gardening plan that describes both the academic and maintenance plan for the garden. Schools that apply for the grant must be very complete in their descriptions of their school gardening plan and intent. The grant application also requires the payment of a \$10.00 grant processing fee. An elementary school that is a recipient of a Youth Gardening Grant has indicated a strong interest in the use of school gardening within the curriculum. It is assumed that any school that has received a Youth Gardening Grant has interest in school gardening and has participated in school gardening for at least one academic year.

In the 1994/95 school year, 298 Youth Gardening Grants were presented to various organizations and schools. Of these 298 grant recipients, 168 specifically referred to themselves as elementary schools or as simply "schools." The remainder of the recipients referred to themselves specifically as high schools, middle schools, 4-H clubs, community groups and the like. In the 1995/96 school year, 299 Youth Gardening Grants were presented, and 154 of these

grant recipients referred to themselves specifically as elementary schools or as “schools.” It is these identified elementary schools and “schools” that were selected to be the study population.

Teachers were chosen as the respondents in this study because they are the key players in school gardening. Teachers are ultimately responsible for the activities and learning that occurs when students engage in school gardening. These people are intimately involved in the use of this teaching strategy, and they are the people who have gone through the process, from start to finish, in implementing school gardening. This study, therefore, places its focus on the perceptions and activities of these teachers.

The survey was completed by individual teachers who were selected by the principal of each participating elementary school. Each principal was asked to select a teacher, who is actively involved in school gardening, for participation in the survey portion of this study. One teacher was asked to respond from each elementary school.

The selection of elementary schools to participate in the personal interview portion of this study was defined by those elementary schools that received a Youth Gardening Grant in the Commonwealth of Virginia in the 1994/95 or 1995/96 school years. The limitation to elementary schools in this state was determined by the logistical limitations of the researcher. Seventeen of these schools responded to the School Gardening Survey. Nine of these seventeen schools were selected to be the sites for the personal interviews. The principal at each participating school selected the individual teachers who participated in the interviews. A maximum of four teachers were interviewed at each of the selected elementary schools.

Demographics

Applications for Youth Gardening Grants from the National Gardening Association are sent all over the United States to elementary schools and organizations that are interested in youth gardening. There are no limitations made concerning the number of schools or groups per state that can apply. There are no regional limitations made on the selection of Youth Gardening Grant recipients. The grants are awarded based on the merit of the application and the completeness of the gardening plan.

Instrumentation

This study involved the use of two methods of research instrumentation which addressed the research questions.

School Gardening Survey. A self-administering survey was mailed to elementary schools that had received a Youth Gardening Grant from the National Gardening Association in the 1994/1995 or the 1995/1996 academic school years. This survey was designed to ask for information regarding the four categories of inquiry as described by Sewing (1986) and addressed the research questions of this study. The survey was written to address the basic issues that face school gardening using primarily closed-ended questions for ease of analysis and interpretation. In addition, the majority of these questions allowed a space for additional comments by survey respondents. One open-ended question, and one question based on a Likert-type scale, were included to obtain specific information that could not be obtained by closed-ended questions.

The survey was pre-tested in three schools in the Roanoke County/Montgomery County school districts in southwestern Virginia. This area was chosen because of its proximity to the researcher. Each of the three schools involved in the pre-test used school gardening in their curriculum. Four teachers from each of the three schools responded to the survey which gave 12 surveys for review. The teachers were asked to comment on any problems they might have in answering or understanding the questions. As a result of the pre-test, the format of question 11 was changed, one question was eliminated as redundant, and four questions were removed as irrelevant.

The results of this survey defined the specific concerns of teachers as well as their personal needs and attitudes. The survey also furnished the information that provided the focus for the interview portion of this study (see Appendix A for the School Gardening Survey). The data obtained from the School Gardening Survey was statistically analyzed using the computer-based, statistical analysis tool, *Statistical Analysis System* (SAS).

Personal Interviews. The people who know about the process of implementing a school gardening program are the people who have gone through the process. A sample of elementary schools in the Commonwealth of Virginia was selected from the list of schools that had received a Youth Gardening Grant from the National Gardening Association. Teachers at these schools were personally interviewed concerning the issues that they felt were most important to the success or failure of their school gardening programs.

Each structured interview contained questions that corresponded to the study objectives and were based on the information obtained from the initial, mailed survey. The personal-interview format contained predominantly closed-ended questions to simplify analysis, but open-ended questions were allowed to provide an opportunity for the teachers to expand beyond the interview itself. In addition, teachers were asked to separate a stack of 30 cards on each of which was written a factor that had been determined to affect the use of school gardening in an elementary school curriculum. The cards were separated according to their importance to the successful use of school gardening as a teaching strategy. The categories were “most important,” “important,” and “not important.” After the cards were separated into these categories, the teachers were asked to take the cards they had deemed to be “most important,” and from these select the five factors they felt were crucial to the use of school gardening as a teaching strategy. The interview instrument design was comparable to that designed and tested by Sewing (1986) as an approach to define the barriers faced by teachers in the implementation of environmental education (see Appendix B for the Personal Interview format).

The interview format was pre-tested by two teachers who have used gardening in their curriculum. The pre-test resulted in a streamlining of the interview format so that the interview could be completed in the designated 15-minute time allotment. Three questions were eliminated because they did not specifically address the research questions. Two questions were expanded to improve clarification and understanding of the questions. The data obtained from the personal interviews was statistically analyzed using the computer-based, statistical analysis tool, *Statistical Analysis System* (SAS).

Research Instrument Approval for Research Involving Human Subjects

The survey and the interview formats were submitted to Research and Graduate Studies at the Virginia Polytechnic Institute and State University (VPI & SU) for approval to conduct research involving human subjects. The applications included a copy of the survey and the interview format, as well as the specific departmental requirements for research justification, acquiring informed consent from the research participants, permission to take photographs, and compensation to research participants. Permission was granted from this department to conduct both the survey and the interview with human subjects.

Data Collection Procedures

School Gardening Survey. The survey was sent to 322 schools specified as either elementary schools or simply as “schools” from the initial list of 597 Youth Gardening Grant recipients for either the 1994/1995 or 1995/1996 school years. Each survey was sent in a packet that included a letter of introduction to the school principal and requested permission for the participation of his or her school in the survey. The principal was asked to select a teacher who was actively involved in school gardening at the school to participate in the survey.

The packet also included a letter of introduction to the participating teacher, a copy of the survey, and a pre-addressed, stamped, return envelope. Respondents were asked to return the surveys within a 10-day time period. Surveys were printed on yellow paper to distinguish the survey. The survey was four pages in length and required approximately 10 to 15 minutes to complete.

To maximize returned responses, the teacher’s letter of introduction contained a request form for the pamphlet, *Gardening with Children* from the office of Consumer Horticulture at VPI & SU, and for a one-page summary of the conclusion and results from the survey. The request form for this additional information was separate from the survey to maintain confidentiality. In addition, Dillman’s (1978) Total Design Method (TDM) for survey research was utilized. Survey letters were written according to TDM specifications. The survey packet was mailed according to TDM procedures concerning survey folding and return envelopes. A follow-up postcard serving as a survey reminder was sent one week after the initial packets were sent out. A three-week follow-up reminder and an additional copy of the survey were sent to schools that had not responded within the specified time period.

Personal Interviews. The elementary school teachers who participated in the personal interviews were employed at elementary schools in the Commonwealth of Virginia that had received a Youth Gardening Grant from the National Gardening Association in either the 1994/1995 or 1995/1996 school years. Principals of the schools were contacted by telephone. The principals were asked to permit the participation of their schools and teachers in this study. The principals were also asked to select a maximum of four teachers from their schools who were actively involved in school gardening to participate in the interview portion of this study. With permission from the principals, appointments were made at the convenience of each selected teacher on a day when all of the selected teachers at a school could be interviewed. A letter of

confirmation was sent to each school approximately two weeks prior to the scheduled appointment.

On the day that the interviews were conducted, each principal was asked to give permission for photographs to be taken of his or her school and the current student gardening projects. Photography consent forms were signed by those principals who agreed to the photography. A copy of this form was given to the principal for his or her records.

Prior to the interviews, the participating teachers were asked to read an informed consent form that explained the purpose of the interview. They were asked if they had any questions about the interview process or the research and to sign the informed consent form. The teachers were given a copy of the informed consent form for their records. They were also given a list of the research investigators names and telephone numbers and invited to call if they had any questions about the interview at a later date.

During an introduction by the interviewer, the respondents were assured that their responses would be treated confidentially, that their responses were valuable to the study, and that there were no right or wrong answers. Interview participants were also informed that they could withdraw from the interview at any time. The setting for the interviews was on school grounds, during or after school hours, in rooms that had a minimum of distractions. The personal interviews lasted between 15 and 20 minutes each.

In an attempt to eliminate bias, all the teachers selected from a particular school were interviewed in the same day. This was done to decrease the chances of respondents discussing the interview content with others yet to be interviewed. Respondents were asked not to mention the interview's purpose and content to other teachers.

Chapter Summary

This chapter described the methodology and procedures used to determine the factors that are crucial to the implementation of school gardening into an elementary school curriculum. The research design, population, research instruments, and data collection procedures were explained. The two research instruments used in the study to identify and assess the factors that affect school gardening implementation were described in detail.

CHAPTER IV

SCHOOL GARDENING SURVEY AND PERSONAL INTERVIEW QUESTIONS

Introduction

This chapter discusses the intent and development of the questions used in the school gardening survey and in the personal interviews that were conducted with elementary school teachers who have utilized school gardening in their curriculum. In the first section, the School Gardening Survey questions are described as they relate to the research questions of this study. In the second section, the questions used in the personal interviews are described as they relate to the survey results and the research questions of this study.

School Gardening Survey Questions

The questions used in the School Gardening Survey were designed to serve two purposes. First, specific survey questions were aimed at answering the research questions asked by this study. Second, several survey questions were designed to give a qualitative description of the respondent schools. It is important to point out that the survey did not address the research questions in numerical order. Therefore, although this discussion follows the research questions in numerical order, the survey questions relating to each research question were randomly located within the survey itself.

School Gardening Survey Questions that Describe the Respondent Schools

Several survey questions were used to provide a qualitative description of the respondent schools. This was necessary to demonstrate that the Youth Gardening Grants were granted without bias, to verify that this was a national survey, and to provide information on the types of elementary schools that are utilizing school gardening.

Survey Question 5 inquired into the number of years that school gardening has been a part of the school's curriculum. Survey Question 7 inquired into the school's administrative situation as a public, private, alternative, or magnet school. Survey Question 8 inquired into the approximate number of children currently enrolled in the respondent's school. Survey Question 9 inquired into the demographic environments in which each school was located. These demographic environments were divided into rural, suburban, and urban settings. Survey Question 10 inquired into the state in which the responding school was located.

School Gardening Survey Questions Related to Research Questions

The research questions and the relevant survey questions that relate directly to them are as follows:

Research Question 1a. What are the factors that are essential to the successful implementation of school gardening into an elementary school curriculum as determined by educators who are currently using school gardening in their curriculum?

Survey Question 11 used 11 logistical and educational factors determined by Sewing (1986) to influence the success of environmental education programs. These factors were reworded to retain their primary meaning but changed to describe school gardening rather than environmental education. In addition, seven logistical factors were included that were postulated to affect the use of school gardening (Table 1). These seven factors were the availability of gardening equipment; the availability of volunteer help; the management of student behavior; the availability of outside, expert help; the availability of storage for supplies; the availability of a summer garden maintenance program; and the availability of a person with the responsibility for school gardening activities.

To obtain information related to Research Question 1a, respondents were asked to respond in three different ways to each specific factor. The first request was for the respondent to answer the question, “Could school gardening be successful without this factor?” A positive response to a factor in this question indicated that the teacher can overcome the factor and still succeed with school gardening. A negative response to this question indicated that the factor is necessary for school gardening success. The second request was for the respondent to answer the question, “Is this factor adequate at your school?” This question elicited teachers’ feelings as to whether or not they were provided with the materials and education necessary to succeed using school gardening in their curriculum. The third request was for the respondent to select from the list of 18 factors, the five factors that are absolutely essential for school gardening success. A positive response to a factor in this question indicated the respondent’s feeling that the factor is essential to the success of school gardening at his or her school.

Teachers were also furnished a space in Survey Question 23 where they could provide additional comments concerning the success or failure of school gardening at their school. This question provided an opportunity for teachers to include factors that were not mentioned in Survey Question 11 but were relevant to their specific school situation.

Research Question 1b. What logistical features of school gardening need to be addressed for the successful implementation of school gardening into the elementary school curriculum?

Of the 18 factors provided in Survey Question 11, 16 were purely logistical in nature. Information related to each factor such as its importance to the school’s gardening success and the ability of the school gardening program to succeed without that particular factor, was obtained for these logistical factors.

Additional questions, Survey Questions 12 through 15 and 17 through 20, were asked in order to obtain qualitative information on the logistical features of school gardening programs at the respondent schools. These questions obtained information that expanded upon some of the logistical factors described in Survey Question 11. Each of these questions was followed by a list of selections from which the respondents chose those that were most applicable to their circumstances. Each respondent was asked to mark any or all selections that pertained to his or her school’s situation. After each list of designated selections, there was a space to place additional responses, or addenda, relevant to the individual school.

Table 1. The factors determined to affect the successful use of school gardening in an elementary school curriculum (L = Logistical; E = Educational)

Factor	
Appropriate class size	L
Availability of funding for supplies	L
Teachers' gardening knowledge	E
Availability of a site to grow plants	L
Addressing safety concerns	L
Support of the principal	L
Teachers' science knowledge	E
Adequate amount of instructional time	L
Adequate amount of preparation time	L
Availability of garden-based curriculum	L
Availability of gardening equipment	L
Availability of volunteer help	L
Management of student behavior	L
Availability of outside, expert help	L
Availability of storage for supplies	L
Availability of a summer garden maintenance program	L
Availability of support materials	L
Person with responsibility for school gardening activities	L

Survey Question 12 requested input on the outside, expert sources that had been used to assist in school garden education at the school. Survey Question 13 inquired into the forms of volunteer help that had been used when gardening with students at the school. Survey Question 14 inquired into the person, or persons, primarily responsible for coordinating school gardening activities. Survey Question 15 inquired into what the respondent felt was an adequate adult-to-student ratio when participating in school gardening activities. Survey Question 17 inquired into the types of educational materials the teachers used in the classroom to support the use of school gardening in the curriculum. Survey Question 18 inquired into the various methods used to maintain school gardens when the school was closed during the summer months. Survey Question 19 inquired into the primary sources of financial support that were accessed at the respondent's school. Survey Question 20 inquired into the types of garden set-ups used at the school.

Research Question 2a. How do teachers perceive the use of a garden-based curriculum in their classroom?

Survey Question 1 inquired into the school gardening activities that were used at the respondent schools. The activities that were defined by the question included indoor and outdoor gardening activities. This question asked whether or not the teachers perceived that school gardening is an activity that occurs solely outdoors, or if gardening is an activity that can be done indoors as well.

Survey Question 3 obtained the information needed to characterize the educators' goals when they used school gardening in their curriculum. Respondents were asked to indicate if their goals were purely academic, or if their goals included accessing the additional benefits of gardening such as social development, recreational use, and therapeutic use. A space was provided for the respondents to indicate other school gardening goals that were relevant to their teaching situation. The responses to this question showed whether or not the teachers perceived school gardening solely as a means to reach academic goals, or whether they perceived that it can also be used to reach alternative goals.

Survey Question 4 inquired into the grade levels that were engaged in school gardening activities at the respondent's school. This question indicated if teachers were using school gardening in conjunction with a certain age group or if all grades were experiencing gardening in the curriculum. This information indicated whether or not the teachers perceived that gardening should be limited to certain ages groups.

Research Question 2b. Is school gardening being used as the focus of interdisciplinary education in the elementary school classroom, or is it being used primarily to teach science?

Survey Question 2 requested that respondents indicate the subject areas into which they have incorporated school gardening. The responses to this question indicated whether or not school gardening was seen as a separate topic of study, or was used as an interdisciplinary teaching strategy. The responses also indicated when school gardening was used primarily to teach science. A space was provided for the respondents to indicate additional subject areas into which they incorporated school gardening.

Research Question 3. What are the educational needs of teachers who are using school gardening in the curriculum? How do teachers feel about their qualifications for implementing the use of a garden and growing plants in the classroom?

Survey Question 16 inquired into the primary sources of information that teachers were using to assist in the incorporation of school gardening into their school's curriculum. This question determined where teachers were getting their school gardening guidance. Survey Question 21 asked teachers what additional types of school gardening training they would be interested in obtaining. This question specifically listed structured educational services such as Master Gardener training, teacher in-service training, and graduate credit courses in school gardening. Respondents were also given the option to indicate that they did not need any additional school gardening education or to indicate other forms of school gardening education that were not listed.

In addition, Survey Question 11 included two factors that related to teachers' feelings about their qualifications for implementing school gardening into the curriculum. These two factors were a teacher's science knowledge and a teacher's gardening knowledge. These two factors were included in the questions that related to factor importance to school gardening success and the ability of a school gardening program to succeed without a particular factor.

Research Question 4. What is the attitude of teachers who are using school gardening in their curriculum as to the effectiveness of school gardening as a teaching strategy?

Survey Question 22 requested that respondents indicate how they would rank the success of school gardening as a teaching strategy to enhance student learning. Teachers were asked to respond to a Likert-type scale that ranged from "very successful" to "very unsuccessful." Survey Question 6 asked if school gardening was to be incorporated into the school's curriculum in the following year. This question indicated whether or not a teacher's response to school gardening was favorable enough to continue using school gardening as a teaching strategy in the future.

Personal Interview Questions

The second phase of this study was to conduct personal interviews with teachers who have used school gardening in the curriculum with their students. The questions used in the personal interviews were based on the information obtained from the School Gardening Survey. The purpose of the personal interviews was to verify, and to expand upon, the results obtained from the School Gardening Survey. In addition, the interview format provided an opportunity for teachers to elaborate upon, and provide new information about, their school gardening experiences.

The restrictions on the personal interviews were threefold: (a) the interview itself could be no longer than 15 minutes; (b) the questions in the interview needed to refer directly to the information in the survey as it related to the research questions; and (c) the teachers who participated in the interviews needed to teach at elementary schools selected from the survey population which were located in the Commonwealth of Virginia. Twenty-eight teachers were interviewed for this portion of the study. The information gleaned from this sample can verify, and expand upon, the School Gardening Survey results. It is important to point out that the personal interviews did not address the research questions in numerical order. Therefore, although this discussion follows the research questions in numerical order, the interview questions relating to each research question were randomly located within the interview itself.

To make it possible later to compare interview responses, the teachers were given the definition of school gardening that was to be used for the interview. This definition was shown to the teachers after they had responded to Interview Question 1, whereby the teachers were asked to provide their personal definition of school gardening. Teachers were also told that the presented definition was not any better than the one that they had written. By using a standard definition, all interviews were then based on a shared understanding of school gardening.

The standard definition used for these interviews was: "School gardening is. . .an educational strategy in which any or all school related subjects are taught through the use of growing plants or learning in a garden. The gardening activities can involve growing plants indoors or outdoors in a variety of ways that differ with every school's situation. For example, gardening can occur in such places as windowsills, under grow-lights, in containers, in a terrarium, or in a plowed garden plot."

The last part of the personal interviews, Interview Question 10, was a response sheet of 10 specific questions that inquired into a variety of factors that were addressed in the School Gardening Survey. Teachers were asked to circle the word which indicated how true they believed each statement on the response sheet to be. The response selections were based on a Likert-type scale that included the responses: "always true," "often true," "sometimes true," and "never true." Teachers were also allowed to indicate if they did not perceive an appropriate response from the selections provided. References to Interview Question 10 will be made throughout the following discussion on the relationship between interview and research questions.

Teacher Interview Questions Related to Research Questions

The research questions and the relevant interview questions that relate directly to them are as follows:

Research Question 1a. What are the factors that are essential to the successful implementation of school gardening into an elementary school curriculum as determined by educators who are currently using school gardening in their curriculum?

The main focus of this research was to identify those factors that are most important to the successful implementation of school gardening into the elementary school curriculum. Interview Question 4 was an open-ended question that asked the respondent to give an opinion as to the most difficult part of using school gardening as a teaching strategy. This question was asked early in the interview to acquire the respondent's first thoughts as to what makes school gardening difficult. This response related to Interview Question 9 which pursued more detailed information on factors that affected school gardening success.

The mailed School Gardening Survey asked teachers specific questions about 18 logistical and educational factors that had been determined to affect the use of school gardening in elementary schools (Table 1). Surveyed teachers were also asked to supply additional factors that they felt were relevant to school gardening success.

The responses to the survey resulted in the identification of 12 additional factors that affect the successful use of school gardening in the elementary school curriculum (Table 2). In the personal interviews, the respondents were asked in Interview Question 9 to rank all 30 of these factors as to their importance to the success of school gardening. They were first asked to divide the factors into three categories based on importance: "most important," "important," and "not

Table 2. Twelve additional factors provided by the School Gardening Survey found to influence the success of school gardening (L = Logistical, E = Educational)

Factor	
Focus as to the purpose of the gardening program	E
Pressure to meet other academic requirements	L
Availability of a water source	L
Help from support staff for mowing, plowing, etc.	L
Accessibility of the gardens to the students	L
Support from the school district	L
Vandalism	L
Teacher's viewing the garden as a resource	E
Faculty interest in school gardening	E
Long-range plan for the gardening program	L
Integrating gardening with other subject matter	E
Student ownership of the gardening project	E

important.” The teachers were then asked to take those factors that they had selected as “most important,” and from those factors to select the five factors that they felt were absolutely essential to the success of school gardening in the curriculum. The responses to this question expanded upon the information obtained from the School Gardening Survey.

The mailed School Gardening Survey indicated that finding adequate time to engage in school gardening activities during the school day is a major factor in the successful use of school gardening. Interview Question 5 was an open-ended question that inquired into what were the most time-consuming aspects of school gardening. This question expanded upon the concept of time limitations in the school day.

Research Question 1b. What logistical features of school gardening need to be addressed for the successful implementation of school gardening into the elementary school curriculum?

The teachers’ responses to Interview Question 4 described some of the logistical features of school gardening that need to be addressed for the successful implementation of school gardening into the elementary school curriculum. Also, 23 of the 30 factors used in Interview Question 9 were logistical factors. In addition to the 16 logistical factors used in the School Gardening Survey, the personal interviews included the availability of a water source; help from support staff for mowing, plowing, etc.; accessibility of the gardens to the students; support from the school district; vandalism; integrating gardening with other subject matter; and pressure to meet other academic requirements. The teachers’ responses identified which of these logistical factors need to be addressed to implement school gardening into the curriculum successfully.

Research Question 2a. How do teachers perceive the use of a garden-based curriculum in their classroom?

The intent of Interview Question 1 was to obtain an understanding of what teachers know about school gardening and how they understand its use. This question required that the participating teacher provide a definition of school gardening by finishing the statement “School Gardening is. . . .” This statement was printed on cards on which each teacher wrote his or her definition. By asking this question at the beginning of the interview, the respondent was not predisposed to any outside opinions by further discussion on school gardening. Prior to providing their personal definitions of school gardening, the teachers were told that there was no right or wrong answer to this question. This was necessary to allay any fear of giving the wrong response.

Research Question 2b. Is school gardening being used as the focus of interdisciplinary educational or thematic units in the elementary school classroom, or is it being used primarily to teach science?

Interview Question 2 asked respondents to indicate the school subjects in which they incorporated gardening. This question was similar to a question asked on the School Gardening Survey. Interview Question 3 was an open-ended question that asked respondents to identify the particular school subject in which gardening was most useful. These two questions provided an additional indication as to where teachers were using school gardening in the curriculum. Also, one part of Interview Question 10 (10-5) related specifically to the use of school gardening in the curriculum. Teachers were asked to respond to the statement, “gardening is best used in the

science curriculum.” Teacher responses to this statement gave an indication of teacher attitudes toward the use of school gardening and its place in the curriculum.

Research Question 3. What are the educational needs of teachers who are using school gardening in the curriculum? How do teachers feel about their qualifications for implementing the use of a garden and growing plants in the classroom?

The School Gardening Survey indicated that teachers are primarily relying on their own personal knowledge to support their school gardening efforts. Teachers also indicated that they are interested in obtaining additional training in the use of school gardening. The School Gardening Survey did not ask specifically what training or education the teachers had participated in to support their use of school gardening.

Interview Question 6 inquired into the courses or workshops in which teachers had previously participated to obtain additional training or education on the use of gardening as a teaching strategy. Teachers also were asked to indicate the name of the program, course, or workshop in which they had participated. This question defined the structured education in which the teachers had participated to obtain school gardening information. It also indicated whether or not the teachers were receiving any additional educational support for their use of this teaching strategy.

Interview Question 7 asked if teachers felt adequately prepared to use gardening as a teaching strategy in their classroom. This question indicated whether or not teachers felt confident in their use of school gardening. The survey results indicated that teachers felt the need for additional education in this area. This question provided direct information on how confident these teachers were about their present state of preparedness for using school gardening.

Interview Question 8 expanded beyond the survey results that indicated that teachers felt positively towards pursuing additional education in the use of school gardening. To extend beyond the inclination to pursue further education in school gardening, Interview Question 8 asked the teachers to specify the areas of school gardening that they felt a specific need to learn to improve their use of school gardening as a teaching strategy. The areas listed in this question were related specifically to gardening in general and to gardening in the curriculum. Teachers were also given the option to express any additional areas they felt would improve their use of school gardening.

Three parts of Interview Question 10 related specifically to teacher preparedness and confidence when using school gardening in the curriculum. Responses to these statements identified teachers’ feelings about their qualifications for implementing the use of a garden and growing plants in the classroom. Teachers were asked to respond to the following statements:

10-1 I am comfortable using school gardening as a teaching strategy in areas that I teach.

10-2 I have a good background for using school gardening in the curriculum.

10-7 I feel ineffective when using gardening in the curriculum.

Research Question 4. What is the attitude of teachers who are using school gardening in their curriculum as to the effectiveness of school gardening as a teaching strategy?

Three parts of Interview Question 10 related specifically to how teachers viewed student learning when gardening was used as a teaching strategy. Teachers were asked to respond to the following statements:

10-4 Using gardening as a teaching strategy assists students in learning and understanding new ideas and concepts;

10-6 Student attitudes toward the environment become more positive when gardening is used in the curriculum;

10-9 Student learning improves when gardening is used in the curriculum.

Two parts of Interview Question 10 related specifically to how teachers viewed school gardening as a teaching strategy. Teachers were asked to respond to the following statements:

10-3 Using gardening in the curriculum is worthwhile;.

10-10 School gardening is an effective teaching strategy.

One part of Interview Question 10 related specifically to the relationship between school gardening and student behavior. Management of student behavior was indicated by the survey to be an important factor in determining school gardening success. Teachers were asked to respond to the following statement:

10-7 Student behavior improves when gardening is used in the curriculum.

Chapter Summary

The questions developed for the School Gardening Survey were designed to address two areas of inquiry. First, specific questions were designed to answer the research questions of this study. Second, specific questions were designed to elicit descriptive information regarding the respondent schools and provide information to verify that this was a national survey.

Each of the questions used in the personal interviews related specifically to a research question defined by this study. The questions used in the personal interviews were also designed to support and expand upon information obtained from the School Gardening Survey. The data obtained from the personal interviews had value as a means to verify, and expand upon, survey results. It is the intent of this study to combine the results from both the School Gardening Survey and the personal interviews to address the research questions.

CHAPTER V

SCHOOL GARDENING SURVEY AND PERSONAL INTERVIEW RESULTS

Introduction

The School Gardening Survey and personal interview results are reported in this chapter. First, the School Gardening Survey results are presented. This presentation is comprised of the survey results that describe the respondent schools and the survey results as they pertain to the research questions. In addition, teacher addenda to several of the questions and teacher comments are presented. Second, the personal interview results are furnished. This presentation includes a description of the teacher responses to the interview questions as they relate to the research questions. The responses from the School Gardening Survey and the personal interviews were coded for computer processing using the Statistical Analysis System (SAS) statistical package.

School Gardening Survey Results

A total of 596 schools and organizations received a Youth Gardening Grant from the National Gardening Association in either the 1994/95 or the 1995/96 academic year. Of the 596 total number of Youth Gardening Grants granted in these two years, 322 grants (54%) were given to elementary schools or to educational facilities that were identified solely as “schools.” The inclusion of the latter into the survey population was important because it was impossible to determine if they were elementary schools. The eligible population of 322 elementary schools or “schools” identified from this total population were sent a School Gardening Survey for completion. A total of 236 usable survey responses were received resulting in a 74.9% rate of return. Of the surveys returned from facilities identified simply as “schools,” six were unusable because they were schools for older students. A total of 73 schools failed to respond (Table 3).

The majority of questions on the survey (65%) allowed for more than one answer. Respondents were asked to mark all answers that pertained to their school gardening activities. As a result, many of the frequencies are not cumulative. The teachers were also asked to provide any additional activities or remarks that pertain to their teaching situation but were not listed in the survey. The responses to this request provided insight into the creative and expansive properties of these school gardening programs. The following discussion includes tables of these additional responses. The number in parenthesis after an added response indicates the number of respondents that furnished the information. In addition, at the end of the survey teachers were asked to give any additional comments that they felt might be relevant to the survey (see Appendix C for Additional Teacher Comments).

When reviewing the following survey results, it must be pointed out that several of the survey respondents did not answer every question in the survey. As a result, the responding

Table 3. Distribution of responses to the School Gardening Survey

Respondents	N	%
Total population	596	
Non-eligible	274	
Eligible population	322	
Returned / Wrong address	7	
Usable population	315	
Number of responses	242	76.8
Non-usable responses	6	
Usable responses	236	
Non-responses	73	23.2

Note. Percentages given in data analysis are based on usable population

population varies in size for some of the survey questions. The usable population for this study was 236, but the population size varies in the value of N from 229 to 236.

The results provided by the School Gardening Survey and the personal interviews are presented as qualitative information based on percentages obtained from the survey and interview data. Correlations made using these data did not produce any significant results. However, descriptions of these correlations are presented throughout the analysis of the survey and interview results.

Description of Respondent Schools

School Gardening Surveys were sent to the District of Columbia and every state in the Union except Alaska, North Dakota, South Dakota, and Idaho. Of the states that received surveys New Mexico, Nebraska, Arkansas, Utah, and the District of Columbia did not return a response. Survey responses were received from 42 (84%) of the states (Table 4).

The National Gardening Association does not grant funding based on a school's or an organization's administrative status. Grant applications are sent to any organization or person who makes a request for an application. The elementary schools that received Youth Gardening Grants and responded to the survey were both publicly and privately funded (Table 5).

Each respondent was asked to provide the approximate enrollment of students at his or her school. The enrollment of students at the participating schools ranged widely, from eight students to 1,400 students. The mean enrollment was 499 students, and the mode for the respondent population was 700 students (Table 6).

Respondents were also asked to identify the demographic environment in which their schools were located (Table 7). Two respondents indicated that their schools were located in an area that encompassed both urban and rural school environments. These schools were marked for both school environments.

Each respondent was asked to indicate the number of years that his or her school has included school gardening in the curriculum (Table 8). The mean number of years that the responding schools had included gardening is four years. The range of years that schools had been gardening, however, was from one year to over 20 years. The mode of the number of years that these schools had been gardening was three years.

Research Questions and School Gardening Survey Results

The results of the School Gardening Survey were used to address the research questions. **Research Question 1a.** What are the factors that are essential to the successful implementation of school gardening into an elementary school curriculum as determined by educators who are currently using school gardening in their curriculum?

There are many logistical and educational factors that have been found to determine the success of environmental education in a school curriculum. Considering these factors, this inquiry delves into those factors that may affect the success of school gardening in an elementary school curriculum. Respondents were asked to respond to the identified factors in three specific ways.

The School Gardening Survey first asked if school gardening could be successful without the presence of a certain factor (Table 9). The responses to this question

Table 4. Distribution of School Gardening Survey responses by state (N = 236)

State	Surveys sent	Surveys responding	Percent returned	Percent of total surveys returned
New England				
Vermont	4	3	75	1.3
New Hampshire	1	1	100	0.4
Maine	3	1	33	0.4
Massachusetts	11	6	55	2.6
Connecticut	4	4	100	1.7
Rhode Island	2	2	100	<u>0.9</u>
Sub Total				7.3
Middle Atlantic States				
New York	29	18	62	7.7
Pennsylvania	8	8	100	3.4
New Jersey	18	13	72	<u>5.5</u>
Sub Total				16.6
Midwestern States				
North Dakota	0	0	0	0.0
South Dakota	0	0	0	0.0
Nebraska	2	0	0	0.0
Kansas	3	2	66	0.9
Missouri	4	3	75	1.3
Iowa	3	2	66	0.9
Minnesota	4	3	75	1.3
Wisconsin	2	1	50	0.4
Illinois	12	8	66	3.4
Indiana	8	8	100	3.4
Ohio	7	7	100	3.0
Michigan	10	4	40	<u>1.7</u>
Sub Total				16.3

Table 4 Continued.

Southern States					
Florida	12	10	83	4.3	
Georgia	10	7	70	3.0	
Alabama	1	1	100	0.4	
Mississippi	1	1	100	0.4	
Louisiana	8	5	63	2.1	
Arkansas	1	0	0	0.0	
Tennessee	4	3	75	1.3	
North Carolina	7	6	86	2.6	
South Carolina	7	6	86	2.6	
Virginia	19	17	89	7.2	
Kentucky	8	7	88	3.0	
West Virginia	2	2	100	0.9	
Maryland	4	3	75	1.3	
Delaware	1	1	100	<u>0.4</u>	
Sub Total				29.5	
Southwestern					
Arizona	3	1	33	0.4	
New Mexico	1	0	0	.0	
Texas	14	10	71	4.3	
Oklahoma	7	6	86	<u>2.6</u>	
Sub Total				7.3	
Rocky Mountain States					
Montana	1	1	100	0.4	
Idaho	0	0	0	0.0	
Wyoming	1	1	100	0.4	
Nevada	1	1	100	0.4	
Utah	2	0	0	0.0	
Colorado	1	1	100	<u>0.4</u>	
Sub Total				1.2	
Pacific Coast States					
California	59	44	75	18.7	
Oregon	3	2	66	0.9	
Washington	4	3	75	1.3	
Alaska	0	0	0	0.0	
Hawaii	2	2	100	<u>0.9</u>	
Sub total				21.8	
Total				100	

Regional divisions based on boundaries described in The World Book Encyclopedia 1990

Table 5. The percentage of positive responses to the survey question that describes the administrative status of the respondent schools (N = 236)

School Administrative Status	%
Public school	83.4
Private school	10.2
Magnet school	4.7
Alternative school	1.7

Table 6. Distribution of student populations of schools that responded to the School Gardening Survey (N=229)

Student population*	Number of schools	%
1 to 100 students	11	4.9
101 to 200 students	21	9.5
201 to 300 students	21	9.5
301 to 400 students	35	15.7
401 to 500 students	37	16.6
501 to 600 students	40	18.0
601 to 700 students	28	12.6
701 to 800 students	10	4.5
801 to 900 students	10	4.5
901 to 1000 students	6	2.7
1001 to 1100 students	5	2.6
1101 to 1200 students	3	1.3
1201 to 1300 students	1	.5
1301 to 1400 students	1	.5

*Mean = 400

Mode = 700

Table 7. The percentage of positive responses to the survey question that describes the demographic environment in which the respondent school is located (N =236)

Community	%
Suburban community	42.7
Rural community	27.8
Urban community	31.6

Note: Percentages are not cumulative

Table 8. The distribution of years that respondent schools have incorporated school gardening into the curriculum (N = 230)

Number of years*	%
1	8.3
2	22.6
3	33.5
4	8.3
5	9.1
6	4.8
7	3.0
8	2.2
9	.9
10	3.0
11	.4
12	.4
13	.4
15	1.7
18	.4
> 20	.9

* Mean = 4 years

Mode = 3 years

Table 9. The percentage of positive responses to the survey question: “Could school gardening be successful without this factor?” (N = 236)

Factor	%	SE
Small class size	79.7	2.9
Availability of outside, expert help	73.4	2.9
Availability of garden-based curriculum	64.1	3.2
Teachers’ science knowledge	58.3	3.3
Availability of volunteer help	54.7	3.3
Availability of support materials	54.3	3.3
Availability of storage for supplies	52.2	3.3
Teachers’ gardening knowledge	46.5	3.3
Availability of a summer garden maintenance program	45.7	3.3
Availability of funding for supplies	30.2	3.0
Availability of a site to grow plants	28.2	2.9
Support of the principal	27.0	2.9
Adequate amount of instructional time	18.9	2.6
Availability of gardening equipment	18.6	2.6
Person with responsibility for school gardening activities	18.0	2.6
Addressing safety concerns	17.4	2.5
Adequate amount of preparation time	17.3	2.5
Management of student behavior	6.9	1.7

L = Logistical E = Educational SE = Standard Error

indicated whether or not teachers felt that they could overcome certain barriers and still succeed using school gardening. The second question asked respondents if each of the identified factors was adequately provided at their individual school (Table 10). The responses to the question indicated whether or not teachers felt that they were provided with the materials and education necessary to succeed using school gardening in their curriculum. The third question asked respondents to select and identify those five factors that they felt were absolutely essential to the success of school gardening (Table 11). This question allowed the respondents to select only five of the 18 identified factors.

The standard error (SE) was calculated for each of the factors as they related to each of these three questions. The SE is related to the standard deviation within the sample, the size of the sample, and the proportion of the population covered by the sample. By determining the SE it is possible to group the factors and to determine if the factors are the same or different from each other (Rowntree, 1981). The numerical sequence given to the essential factors in Table 11 is based on the standard error and groups the factors based on this determination of equal value. Those factors with the same numerical rating are considered to be equivalent to one another. Those factors with the same numerical rating are considered to be equivalent to one another. This numerical sequence will be used in the analysis of survey and personal interview results.

It must be pointed out that due to the overlap of the range created by the standard error, some of the factors can be grouped in two different directions. The factor groupings in these situations are made according to the strength of the association between the factors which fall within the range of the standard error. This creates a format for a discussion of factor importance, but it also can create debate over factor relationships.

Research Question 1b. What logistical features of school gardening need to be addressed for the successful implementation of school gardening into the elementary school curriculum?

Of the 18 factors determined to affect the success of school gardening in a school curriculum, 16 are logistical factors. The importance of these logistical factors to the success of school gardening is presented in Tables 9, 10, and 11. In addition, several questions in the School Gardening Survey delved further into the logistical features of school gardening. The results obtained from these questions are presented in the following discussion.

Educators often search out information from outside sources to assist them when conducting educational programs. Responding teachers have used several sources of outside, expert help to assist in school garden education at their schools (Table 12). Additional expert sources that respondents indicated that they use to assist in school gardening education include a variety of organizations and skilled personnel (Table 13).

Teachers often need additional help when engaging in gardening experiences with students. Responding teachers indicated that they accessed a variety of sources for volunteer help (Table 14). Additional sources of volunteer help were listed by the survey respondents (Table 15). This list of volunteers included a variety of sources that were available, depending on each school's local situation.

School gardening can be done on a large or small scale. In any situation, however, there is often a person or group of persons responsible for organizing and coordinating school gardening activities. Table 16 presents a variety of ways that schools administer school gardening, and the

Table 10. The percentage of positive responses to the survey question: “Is this factor adequate at your school?” (N = 236)

Factor	%	SE
Addressing safety concerns _L	96.5	1.2
Availability of a site to grow plants _L	94.8	1.5
Support of the principal _L	93.0	1.7
Management of student behavior _L	93.0	1.7
Teachers’ science knowledge _E	90.8	1.9
Teachers’ gardening knowledge _E	82.8	2.5
Person with responsibility for school gardening activities _L	82.0	2.6
Availability of gardening equipment	80.6	2.6
Adequate amount of instructional time _E	72.3	3.0
Small class size _L	71.9	3.0
Availability of storage for supplies	71.1	3.0
Availability of outside, expert help	70.2	3.1
Availability of garden-based curriculum _M	69.4	3.1
Availability of support materials	68.9	3.1
Availability of funding for supplies	65.6	3.2
Availability of volunteer help _P	62.9	3.2
Adequate amount of preparation time _E	56.9	3.3
Availability of a summer garden maintenance program _L	50.7	3.3
L = Logistical E = Educational SE = Standard Error		

Table 11. Percentage of positive responses to the survey question: “What are the five factors that are absolutely essential for school gardening success?” (N = 236)

Factor		%	SE
1a.	Person with responsibility for school gardening activities _L	63.0	3.2
1b.	Availability of a site to grow plants _L	61.4	3.2
1c.	Availability of funding for supplies	60.6	3.2
2a.	Support of the principal _L	48.0	3.3
2b.	Availability of gardening equipment	47.7	3.3
3a.	Adequate amount of instructional time _L	32.8	3.1
3b.	Teachers’ gardening knowledge _E	29.8	3.0
3c.	Availability of volunteer help _L	27.2	2.9
4a.	Management of student behavior _L	26.7	2.9
4b.	Availability of a summer garden maintenance program _L	24.2	2.8
5.	Adequate amount of preparation time _L	20.0	2.6
6a.	Availability of outside, expert help _L	10.2	2.0
6b.	Availability of support materials _L	9.3	1.9
6c.	Small class size _L	8.9	1.9
6d.	Availability of storage for supplies	8.9	1.9
6e.	Addressing safety concerns _L	8.5	1.8
6f.	Availability of garden-based curriculum _L	6.8	1.7
7.	Teachers’ science knowledge _E	5.9	1.5

L = Logistical E = Educational SE = Standard Error

Table 12. The percentage of positive responses to the survey question that describes the sources of outside, expert assistance in school gardening accessed by elementary school teachers (N = 235)

Expert Sources	%
Interest parents	68.5
Master Gardeners	41.3
County Extension horticultural agent	35.7
Commercial horticulturists	27.7
Professional consultant	27.7
Garden club member	25.5
Botanical garden/arboretum staff	13.2

Note: Percentages are not cumulative

Table 13. Additional sources of outside, expert assistance in school gardening accessed by elementary school teachers

Environmental Experts	School Staff
Naturalists (2)	Teacher's own knowledge
Local Parks Department	Other teachers who are
State Department Adopt a Watershed Program	gardeners on staff (7)
Nature Center staff	Former science
"Arlington for a Clean Environment" group	teacher (2)
Santa Barbara Environmental Council	School psychologist
Environmental artist	High school horticulture
US Fish and Wildlife Service	students/teachers
Nature Society	Principal
State Forestry Department	Retired teachers
National Park Service personnel	Staff member with
Audobon Society	horticulture degree
Department of Environmental Quality	Teacher's spouse
for worm composting project	
Green Corps - Department of Environment,	University/Extension Personnel
City of Chicago	Master Composters
	University professor
Community Members	Community College
Parent grant writer	Class on school and
Volunteer from school's neighborhood	community gardens
Local farmers	
PTA	Organizations
Community members	Farm Bureau
City horticulturist	AHS 1995 Symposium
County official	on children's gardens
Educational Curriculum	Clubs
Lifelab	Optimist Club
U. of Santa Cruz - Language Acquisition	Ladies club
Science Education for Rural Schools (LASER)	

Table 14. The percentage of positive responses to the survey question that describes the sources of volunteer gardening help accessed to assist in school gardening activities at elementary schools (N = 235)

Volunteer Help	%
Interested parents	80.4
Older students from school	52.3
Master Gardeners	34.0
Garden club members	17.9
Senior citizens	17.0
High school students	16.2
4-H Club members	10.6
University students	8.1

Note: Percentages are not cumulative

Table 15. Additional sources of volunteer help accessed to assist in school gardening activities at elementary schools

Community Members
Greenhouse technician
FFA students (2)
Boy Scouts and Girl Scouts (9)
Jaycees
Farm stores
Grandparents (2)
Community helpers (7)
Church groups
Family Resource Board members
Community garden director
Teachers and School Personnel
Other teachers (11)
Custodians (3)
Paid staff
After school care program
Bus drivers
Science resource teacher
Educational assistant (2)
University interns
Teacher's friends
Junior High students
Organizations
Trust for Public Lands
Operation Green Thumb
Green Guerrillas
Beautification Committee
Horticultural interns from the Brooklyn Botanical Gardens
Housing (tenement) residents from government subsidized apartments
Garden Gophers - student garden club
PTA (2)
Master Composter
Park District

Table 16. The percentage of positive responses to the survey question that describes the person or persons responsible for the administration and coordination of school gardening at elementary schools (N = 235)

School Gardening Coordinator	%
Interested teacher	54.9
Lead teacher	21.7
Parent volunteer	18.3
Principal	15.7
Teacher committee	15.3
Interested community volunteer	8.5
Committee of parents & teachers	6.4
Parent committee	5.5

Note: Percentages are not cumulative

person or persons primarily responsible for coordinating school gardening activities at the school. Additional sources of school gardening leadership were found in the community and within the school (Table 17).

Maintaining the school gardens when school is closed through the summer months can present a roadblock to school gardening. Respondents indicated, however, that they used great creativity when addressing this problem. The variety of school situations presented a variety of solutions to this issue (Table 18). Additional sources that were accessed to assist in school garden maintenance depended on each school's individual circumstances (Table 19). Sources were found in the community and in the school itself.

Funding of gardening activities is an issue that all educators must face if they are going to pursue this teaching strategy. A variety of materials are needed to support school gardening such as gardening tools, plant materials, soil amendments, and curriculum materials. Schools appealed to various sources of financial support for school gardening (Table 20). Other sources of funding accessed demonstrated the creativity that is needed to raise dollars for new programs (Table 21).

The design and set-up of a school garden varies with the location and climate of each school. Also, the resources available for gardening affect the form of garden usage. Schools used a variety of garden set-ups to achieve their educational goals (Table 22). Additional gardening venues were described by teachers who found alternative ways to provide gardening experiences (Table 23).

Teachers used a variety of educational materials in the classroom to support the use of school gardening in the curriculum (Table 24). These materials ranged from textbooks provided by the school system to the hands-on use of experiments and computer programs. In a whole language classroom, teachers often make use of "trade books." Trade books are a common piece of literature read by the students in a class and then used for the focus of a study or a thematic unit. Teachers also looked outside the traditional classroom to find information and materials that were helpful in the classroom (Table 25).

Respondents were asked to identify the ratio of adults to students that they found was adequate when participating in school garden activities (Table 26). The mean number of students that respondents felt that one adult could supervise during a gardening activity was 10 students. The mode of the responses was also 10 students. The range, however, varied from one student in a special education situation to 25 students in a typical school.

Research Question 2aHow do teachers perceive the use of a garden-based curriculum in their classroom?

The types of school gardening activities that teachers were using with students involved both indoor and outdoor gardening experiences (Table 27). A consideration when reviewing these percentages is that schools which garden in raised beds also consider them outdoor gardens. Three of the survey respondents made a distinction between an outdoor garden and raised beds. The majority of the respondents did not make this distinction; therefore, it is probable that schools which garden using raised beds perceive those same gardens as outdoor gardens. In most cases, both of these activities were marked, and the two types of gardens were considered to be one and the same. In addition to the survey listing of school gardening activities, teachers provided a wealth of diverse activity ideas that used gardening and growing plants as their central focus (Table 28).

Table 17. Additional persons responsible for the administration and coordination of school gardening at elementary schools

Community Leaders

- Master Gardeners
- County Clean Environment Schoolyard Habitat Committee
- Garden Club
- Urban Service members
- University professor
- Butterfly Hope (a nonprofit educational enrichment program)
- Green Thumb gardener (federal program)
- Retired teachers (2)
- Family Resource Center coordinator

School Personnel

- Paid staff
- Para-professional
- Teacher assistant
- Counselors (2)
- Assistant principal
- Outdoor learning teacher
- Advisory committee
- Staff coordinator
- Science resource teacher (2)
- Grant funded position specifically for the garden
- Volunteer Coordinator
- PE coach
- Special education teachers

Table 18. The percentage of positive responses to the survey question that describes the methods used by elementary schools to maintain school gardens during the summer months (N = 236)

Garden Maintenance Source	%
Interested teachers	49.6
Interested parents	35.2
Interested students	22.9
Do not maintain the garden	22.0
Year-round school	8.5
Master Gardeners	7.2
Student garden club	4.2
Local garden club	2.5
4-H Club	1.3

Note: Percentages are not cumulative

Table 19. Additional methods used by elementary schools to maintain school gardens during the summer months

Community Sources

- Local prison crew
- Senior citizens
- Boy Scouts/Girl Scouts (2)
- Family Resource Center Program
- Butterfly Hope Program (a nonprofit educational enrichment program)
- Green Thumb volunteer
- Family Resource Center coordinator
- School neighbors (3)

Educational Sources

- Custodians (19)
- Teacher's parents
- Summer camp (2)
- Summer school students
- School groundskeepers (2)
- Teacher's husband
- Counselor
- Parent employee hired by the school
- School aide
- Recreation center summer program
- Student employee
- Community raised beds for families
- Principal
- Garden program director (2)

Alternative Ideas

- Cover the beds with plastic.
- In a subtropical climate, plant in the fall and the crops are in by the spring.
- Hire private grounds maintenance

Table 20. The percentage of positive responses to the survey question that describes the funding sources accessed by elementary school teachers to finance school gardening (N = 236)

Funding Sources	%
Grants	79.7
Donations	63.6
PTA budget	34.3
School administration	18.6
Science budget	12.7

Note: Percentages are not cumulative

Table 21. Additional funding sources accessed by elementary school teachers to finance school gardening

Garden Fund-Raisers
Plant sales (4)
Sales of garden-harvested materials
Sales of herbal vinegar
Community Sources
Fund-raisers (18)
Auctions
Recycling aluminum (3)
Stone Soup luncheon for students to buy (all profit goes to the garden)
Bake sales
Student run a school store with profits used for the garden
Students give money
Garden club member donations
Foundation money
Memorial fund
Educational Funding Sources
School moneys for landscaping and maintenance
State funds
Teachers pockets (12)

Table 22. The number of positive responses to the survey question that describes the garden arrangements used by elementary school teachers (N = 236)

Garden Arrangements	%
Class garden	69.9
Topic garden for all classes	40.7
Large group gardens	25.4
Small group gardens	16.1
Individual student gardens	5.1

Note: Percentages are not cumulative

Table 23. Additional garden arrangements used by elementary school teachers

Indoor Gardening

Grow Lab (3)

Plants in the hall

Outdoor Gardening

School garden (12)

Courtyard habitat (3)

School garden for senior citizens

School beautification gardens

Flowers in front of building/ landscaping

Landscaped botanical walk

Community garden (2)

Outdoor learning center

Pots

Individual student rows

We consider our entire campus as our garden

Table 24. The percentage of positive responses to the survey question that describes the educational materials accessed by teachers to support the use of school gardening in the elementary school curriculum (N = 235)

Educational Materials	%
Library books	84.7
Gardening catalogs/magazines	77.4
Personal books	66.0
Experiments	65.1
Videos	49.4
Trade books	44.7
Text books	38.3
Computer software	26.4
Internet	15.3
Filmstrips	11.5

Note: Percentages are not cumulative

Table 25. Additional sources of educational materials accessed by teachers to support the use of school gardening in the elementary school curriculum

Community Sources
Field trips to farms, nurseries, etc.(2)
County Extension bulletins
National Wildlife Federation information
Field guides
Project WILD (2)
Garden club materials (2)
Kentucky Agriculture and Environment workshops
Curriculum books from the National Gardening Association
American Horticulture Society information
State environmental education books
Educational Sources
Custom field guides made by science club
‘Growing Ideas’/Growlab materials from the National Gardening Association (5)
Posters, graphs and charts (5)
Teacher-made materials (8)
Scholastic science kit (2)
Guest speakers (2)
Teacher lesson books
Lifelab teachers curriculum (3)
Journals
AIMS activities (Activities to Integrate Mathematics and Science - Fresno University in California)
Materials developed by the principal

Table 26. Distribution of the student to adult ratios described by teacher responses to the School Gardening Survey as adequate for school gardening activities (N=224)

Student to Adult Ratio*	Frequency	%
1	1	0.4
2	3	1.3
3	5	2.2
4	15	6.7
5	29	12.9
6	31	13.8
7	4	1.8
8	26	11.6
10	57	25.4
11	2	0.9
12	9	4.0
15	13	5.8
18	1	0.4
20	15	6.7
22	3	1.3
24	2	0.9
25	4	1.8
29	1	0.4
30	3	1.3

*Mean = 10

Mode = 10

Table 27. The percentage of positive responses to the survey question that describes the types of school gardening activities utilized by elementary school teachers (N = 236)

School Gardening Activities	%
Outdoor garden	94.5
Raised beds	53.4
Windowsill	46.2
Indoor grow-lights	42.4
Container gardening	39.4
Greenhouse	17.8

Note: Percentages are not cumulative

Table 28. Additional gardening activities utilized by elementary school teachers

Outdoor Activities:

Plants and Water

wetland restoration
aquatic and semi-aquatic tanks and pools
pond and bog (5)

Plants and the Community

outplanting in city parks
26 station nature trail/nature walk (2)

Plant Variety

weed garden
native plantings (4)
arbor with picnic tables for outdoor classroom
habitat areas
grape and gourd arbors
apple orchard
Christmas trees
fall bulb gardening

Plants and the Environment

composting
weather station

Indoor Activities:

cuttings/propagation (3)
simulated rain forest
vermi-composting (3)
bulb forcing (3)
mini-greenhouse on wheels
Wisconsin Fast Plants
desert terrariums

The survey results indicated that gardening is used at every grade level found in the elementary school system (Table 29). In addition, 13 of the schools provide gardening opportunities for pre-Kindergarten classes (this data is not presented in a Table).

The goals of school gardening at respondent schools ranged from purely academic to the use of gardening as therapy (Table 30). Respondents also provided many additional goals for school gardening (Table 31).

Research Question 2b. Is school gardening being used as the focus of interdisciplinary educational or thematic units in the elementary school classroom, or is it being used primarily to teach science?

The educational subject areas into which school gardening is incorporated at respondent schools demonstrated the ability of gardening to be used across the curriculum (Table 32). The responding teachers also offered a variety of additional topics that they taught using the garden and gardening as the central focus of the learning experience (Table 33).

Research Question 3. What are the educational needs of teachers who are using school gardening in the curriculum? How do teachers feel about their qualifications for implementing the use of gardens and growing plants in their classrooms?

Teachers often used a variety of resources to assist them in understanding a new subject area. The use of varied materials assisted in providing context and understanding to any new information. These resources also could provide teachers with creative ideas for use in the classroom. Respondents were asked to identify the primary sources of school gardening information they have used to assist in understanding and incorporating school gardening into their school's curriculum (Table 34). Teachers also provided additional sources of information that they accessed from a variety of arenas (Table 35).

Respondents were asked to indicate their interest in additional forms of education for themselves which would focus on improving their use of school gardening (Table 36). The educational options given were formal training approaches accessible to most teachers. Teachers also indicated that they would be interested in alternative methods of training (Table 37).

The list of factors that affect the success of school gardening included two educational factors, teachers' science knowledge and teachers' gardening knowledge (Tables 9, 10, and 11). Teacher ratings of these factors indicated how important they felt their own education was to the success of school gardening.

Research Question 4. What are the attitudes of teachers who are using school gardening in their curriculum as to the effectiveness of school gardening as a teaching strategy?

Teachers were asked to indicate how they perceived the success of school gardening as a teaching strategy to enhance student learning (Table 38). Respondents responded to a Likert-like scale, that ranged from "very successful" to "very unsuccessful," to note how they had experienced the success of school gardening as a teaching strategy in reaching student learning goals.

Each school must decide at some point whether or not to incorporate school gardening into the curriculum in the following school year. The question concerning a school's plans for the future incorporation of school gardening into the curriculum in the following year received 230 responses. Six of the respondents (2.6%) indicated that they would not continue with school

Table 29. The percentage of positive responses to the survey question that describes the elementary school grade levels that are engaged in school gardening (N = 235)

Grade Level	%
Kindergarten	66.0
First grade	70.2
Second grade	72.3
Third grade	69.4
Fourth grade	67.7
Fifth grade	66.0
Sixth grade	30.6
Special education	47.7

Note: Percentages are not cumulative

Table 30. The percentage of positive responses to the survey question that describes the goals of school gardening in the elementary school curriculum (N = 236)

Goals of School Gardening	%
Academic	91.5
Social development	83.1
Recreational	61.9
Therapeutic	51.7

Note: Percentages are not cumulative

Table 31. Additional goals of school gardening in the elementary school curriculum

Environmental Ethics	Diversity in Human Culture
Appreciation of nature (3)	Diversity
Learning about nature	
Respect for earth	Life Skills
Environmental awareness (5)	Business
Cosmic curriculum	Physical therapy
develop a sense of connectedness	Life skills development
to all living things	Self-sufficiency
Increase wildlife habitat	
Environmental stewardship (3)	Quality of Life
Environmental protection/preservation	Gardening club
Concern for the environment (2)	Language enrichment
Environmental values (2)	Motivational
Environmental education	Emotional
	Enrichment
The Arts	To have fun
Aesthetics	Therapeutic for teachers
Art	and volunteers
Beautification of school (3)	
Community Relationship	Miscellaneous
Principles of peace and love	Appreciation of agriculture
Promotion of good behavior	Hands-on learning
Community service (7)	
Community affiliation	
Pride in the school	
Community relationships	
Community development	
Community gardens	
Service learning	
Home and school involvement	
Parents involved	

Table 32. The percentage of positive responses to the survey question that describes educational subjects taught in conjunction with school gardening (N = 236)

Subject Areas	%
Science	92.4
Environmental Education	83.1
Mathematics	68.6
Language Arts / English	67.8
Art	65.7
Health / Nutrition	58.9
Ethics	58.1
Social Studies / History	51.3
Music	24.2
Physical Education	19.9
None	0

Note: Percentages are not cumulative

Table 33. Additional subject areas taught in conjunction with school gardening

The Arts	Life Skills
Dance	Socialization for pre-schoolers
Performing arts	Vocational studies
Drama	Technology education
French	Family & consumer sciences
Making healing potions and lotions, teas, potpourri, etc.	Sex education
Medicinal use of herbs and flowers	Child development
	Nurturing
Diversity in Human Culture	Quality of Life
African American culture	Recreational reading outside
George Washington Carver	Summer camp
Tuskegee Institute	Gardening and agriculture as a whole year theme
Appreciation of biodiversity	Library
Cultural diversity	Holidays
Multi-cultural education	
Community Relationships	
Service learning	
Community partnerships	
Community relationships	
Community problem solving	
Human interactions	
Beautification	
School Scout troops	
Arbor Day tree planting	

Table 34. The percentage of positive responses to the survey question that describes the sources of school gardening information accessed by elementary school teachers (N = 235)

Sources of Gardening Information	%
Personal knowledge	85.1
Friends/volunteers	53.6
Growlab/“Growing Ideas” newsletter	40.4
Education journals/publications	36.2
Teacher in-service training	32.3
Cooperative Extension Service	23.4
Master Gardener training	14.5
Lifelab	13.6
4-H Club educational material	10.2
Local college	4.3

Note: Percentages are not cumulative

Table 35. Additional sources of school gardening information accessed by elementary school teachers

Educational Sources	Community Sources
Workshops	Arboretum
Staff teacher (2)	Botanical garden (2)
District support through LITES program	Teacher experience
Science curriculum guide (3)	at Audobon Center
Curriculum guide developed at our school	Garden club (3)
Horticulture coursework	Garden club magazine
High school biology teacher	State Garden Club Council
Visiting other schools with programs	Project Learning Tree (2)
Teacher and administrative input	Project WILD
Training school	Project Aquatic
Former science teacher	AHS Symposium (2)
Horticulture teacher at Local High School	Master Composter training
Monthly newsletter by local biologists	Museum of Science
Green Corps classes	School neighbor
Department of Environment	Butterfly Hope Involvement
City of Chicago	(a non profit educational enrichment program)
Personal Sources	Foundations
Read, read, read! (2)	Wonders of Wetlands
Gardening books and magazines (2)	
Library	
Personal research	

Table 36. The percentage of positive responses to the survey question that describes elementary school teacher interest in additional school gardening education (N = 236)

Educational Forums	%
In-service by school gardening expert	69.1
Cooperative Extension training such as 100 hr Master Gardener Program	49.6
Continuing education credit at community college	34.3
Graduate credit at local university or college	28.0
Continuing education credit at university or college	25.4
No further training	7.6

Note: Percentages are not cumulative

Table 37. Additional forms of school gardening education that are of interest to elementary school teachers

Lifelab training
Satellite classes
AHS School Gardening Symposia
School-wide training
Off site training
Instruction from commercial horticulturists
Landscape design

Table 38. Distribution of responses to the survey question that describes the success of school gardening as a teaching strategy

Rating	N	%
Very successful	143	61.4
Somewhat successful	83	35.6
Neither successful nor unsuccessful	3	1.3
Somewhat unsuccessful	2	.9
Very unsuccessful	2	.9
No response	2	.9

gardening in the future. Of these six respondents, four described school gardening as a “very successful” teaching strategy and two described it as “somewhat successful.” These schools are not discontinuing the use of school gardening due to the perception that it is a poor teaching strategy. The majority of the teachers (97.4%) indicated that they would be using school gardening in the following school year (this data is not presented in a table). The use of a teaching strategy in the following year indicates a teacher’s continued interest in using that strategy to achieve student learning goals.

Teacher Comments

Respondents were asked to make additional comments as to the factors that had affected the use of school gardening in the curriculum at their school. Of the 236 returned surveys, 148 (63%) of the respondents made additional comments. These comments were “keyword” searched to identify additional factors that affected the teacher’s implementation of school gardening into the curriculum. This source of information was “keyword” quantified (Table 39) as well as presented as viewpoints of those people who had experienced the use of school gardening within the elementary school curriculum (see Appendix C for School Gardening Survey Teacher Comments).

Personal Interviews

The results from the personal interviews are presented in this section. These results describe the personal interview population and the interview results as they relate to the research questions. The majority of questions in the interview were closed-ended but allowed for more than one answer. Respondents were asked to provide all answers that pertained to their school gardening activities. As a result, many of the frequencies are not cumulative. A card-sort procedure was used to determine the factors that were important to the successful use of school gardening as a teaching strategy. In addition, several open-ended questions were allowed to provide an opportunity for the teachers to expand beyond the interview itself. The following discussion includes tables of information obtained from the open-ended questions. The number in parenthesis after a response indicates the number of respondents that furnished the information. A detailed accounting of the personal interview responses is found in Appendix D.

In addition, a Likert-like scale was used in Interview Question 10 to provide information concerning teacher’s opinions on several topic areas. The scale parameters used were “always true,” “often true,” “sometimes true,” “never true,” and “I don’t know.” The teachers were asked to respond to 10 statements that individually addressed the research questions. The information obtained from the 10 statements will be presented as they relate to the individual research questions.

Each statement in Interview Question 10 is given a Likert-Score based on an average of teacher responses to the statement. The response “always true” was given the value 4, “often true” was given the value 3, “sometimes true” was given the value 2, “never true” was given the value 1. A higher Likert-Score represents a statement that tends toward being true, and a lower Likert-Score represents a statement that tends toward being not true. The Likert-Score is given as each statement is related to the research questions.

Table 39. Additional factors that are important to the successful implementation of school gardening into the elementary school curriculum that were identified by a keyword search of teacher’s comments from the School Gardening Survey (N = 148)

Keyword	Number	%
“Interest” in gardening		
teacher	16	10.8
student	4	2.7
parent	5	3.4
“Support” of school gardening		
teacher	4	2.7
administration	6	4.1
volunteer/community	10	6.8
Garden “vandalism”	5	3.4
“Time”		
for planning garden activities	17	11.5
classtime in the garden	13	8.8
“Plan”		
time to plan garden activities	4	2.7
having a garden plan	7	4.7
Summer “maintenance”	5	3.4
Garden “accessibility”	1	.7
“Scheduling” garden activities	4	2.7
Availability of “water”	1	.7
“Help”		
expert help	2	1.4
volunteer help	9	6.1
school staff help	2	1.4
Teacher’s viewing the garden as a “resource”	2	1.4
“Integration” into the curriculum	3	2.0
Teacher “enthusiasm”	3	2.0
“Involvement”		
teacher	8	5.4
parent/volunteer	6	4.1
student	4	2.7
student “ownership” of the garden	3	2.0

Note: Percentages are not cumulative. Quotation marks (“”) indicate keyword used in search.

Personal Interview Population

The teachers selected for the personal interviews teach at elementary schools that had received a Youth Gardening Grant from the National Gardening Association in either the 1994/95 or the 1995/96 academic years in the Commonwealth of Virginia. The teachers who participated in the personal interviews were selected by the principals of the schools as teachers who had used school gardening in some form in their curriculum. The participating teachers represented every grade level found in the elementary school system (Table 40).

Research Questions and Personal Interview Results

Research Question 1a. What are the factors that are essential to the successful implementation of school gardening into an elementary school curriculum as determined by educators who are currently using school gardening in their curriculum?

Research Question 1b. What logistical features of school gardening need to be addressed for the successful implementation of school gardening into the elementary school curriculum?

The personal interviews expanded upon the information obtained in the School Gardening Survey concerning the logistical and educational factors that affect the successful use of school gardening. Time utilization was identified in the School Gardening Survey to be an important factor to the success of school gardening. In an open-ended question, interviewed teachers provided details on the most time-consuming parts of school gardening (Table 41). In another open-ended question, the interviewed teachers also provided information on what they perceived to be the most difficult parts of using school gardening as a teaching strategy (Table 42).

Teacher comments on the School Gardening Survey provided 12 additional logistical and educational factors that affect the use of school gardening at an elementary school. Interviewed teachers were asked to give their input on the 30 factors provided by the survey. Using the card-sorting method, the teachers were asked to separate the factors into three categories based on their importance to the successful use of school gardening as a teaching strategy (Table 43, Table 44, and Table 45). They were then asked to take those factors that they had selected as “most important” and from these factors choose the five that they felt were crucial to the successful use of school gardening as a teaching strategy (Table 46).

The standard error (SE) was calculated for each of these factors as they related to each of the four categories. The numerical sequence given to the factors in Table 46 was based on the standard error and groups the crucial factors based on this determination of equal value. This numerical sequence will be used in the discussion of survey and personal interview results. Again, it must be pointed out that due to the overlap of the range created by the standard error, some of the factors can be grouped in two different directions. The factor groupings in these situations are made according to the strength of the association between the factors which fall within the range of the standard error. The factor groupings for the personal interview data were made more difficult due to the large SE calculations that result from a small population size. This creates a format for a discussion of factor importance, but it also can create debate over factor relationships.

Table 40. Distribution of grade levels taught by teachers participating in the personal interviews (N = 28)

Grade	Number
PreKindergarten	2
Kindergarten	2
First grade	5
Second grade	4
Third grade	4
Fourth grade	4
Fifth grade	1
Sixth grade	2
Special Education	1
K through 5	3

Table 41. Personal interview responses to the question: “What contributes the most to the amount of time school gardening takes?” (N = 28)

Preparation for the school gardening activity (14)
Preparation of the garden for planting (8)
Integrating with the academic curriculum (3)
Allowing every child to participate in the gardening activity (2)
Gardening in short time periods (2)
Actual hands-on nature of gardening (2)
Mulching and weeding

Table 42. Personal interview responses to the question: “What do you find is the most difficult part of using school gardening as a teaching strategy?” (N = 28)

Time to fit gardening into the class schedule (12)

Management of student behavior
(all of the children want to plant at the same time) (6)

Getting volunteer help (4)

Financing the materials (3)

Preparation (getting the materials together) (2)

Inconsistency in the weather (2)

Not difficult at all (2)

Time for all of the children to have hands-on experiences

Finding time to integrate gardening into the curriculum

Educating the custodial staff to view
the garden as a teaching resource

Storage

Vandalism

Finding the space for a class to garden

Table 43. The percentage of responses to the personal interview question that describes the factors that are most important for the successful use of school gardening as a teaching strategy (N = 28)

Most Important Factors	%	SE
* Student ownership of the gardening project	64	9.2
* Integrating gardening with other subject matter	61	9.4
Availability of a site to grow plants	54	9.6
Adequate amount of instructional time	54	9.6
* Focus as to purpose of the gardening program	54	9.6
* Availability of a water source	54	9.6
* Accessibility of the gardens to the students	54	9.6
Availability of gardening equipment	50	9.6
Adequate amount of preparation time	46	9.6
* Faculty interest in school gardening	46	9.6
* Teachers viewing the garden as a resource	39	9.5
Teachers' gardening knowledge	32	9.0
Management of student behavior	32	9.0
Person with responsibility for school gardening activities	32	9.0
Support of the principal	32	9.0
Availability of support materials	29	8.7
Availability of volunteer help	29	8.7
Addressing safety concerns	29	9.7
Teachers' science knowledge	25	8.3
Availability of outside, expert help	25	8.3
* Long-range plan for the gardening program	25	8.3
Availability of funding for supplies	25	8.3
* Pressure to meet other academic requirements	21	7.9
Availability of summer garden maintenance program	18	7.4
Availability of garden-based curriculum	14	6.7
* Help from support staff for mowing, etc.	14	6.7
* Support from the school district	14	6.7
Availability of storage for supplies	11	6.0
Small class size	11	6.0
* Vandalism	11	6.0

L = Logistical

E = Educational

SE = Standard Error

* Factors added from survey results

Table 44. The percentage of responses to the personal interview question that describes the factors that are important for the successful use of school gardening as a teaching strategy (N = 28)

Important Factors	%	SE
Availability of storage for supplies	57	9.5
Addressing safety concerns	57	9.5
Availability of summer garden maintenance program	54	9.6
Availability of support materials	54	9.6
Person with responsibility for school gardening activities	54	9.6
* Teachers viewing the garden as a resource	54	9.6
Teachers' gardening knowledge	50	9.6
Management of student behavior	50	9.6
Availability of volunteer help	50	9.6
Teachers' science knowledge	50	9.6
* Help from support staff for mowing, etc.	50	9.6
Adequate amount of preparation time	46	9.6
Support of the principal	46	9.6
Availability of outside, expert help	46	9.6
Adequate amount of instructional time	43	9.5
* Vandalism	43	9.5
Availability of garden-based curriculum	39	9.4
Small class size	39	9.4
Availability of gardening equipment	36	9.2
* Focus as to purpose of the gardening program	36	9.2
* Support from the school district	36	9.2
* Long-range plan for the gardening program	36	9.2
Availability of funding for supplies	36	9.2
* Accessibility of the gardens to the students	32	9.2
* Faculty interest in school gardening	32	9.0
* Integrating gardening with other subject matter	32	9.0
* Student ownership of the gardening project	32	9.0
Availability of a site to grow plants	29	8.7
* Pressure to meet other academic requirements	29	8.7
* Availability of a water source	25	8.3

L = Logistical

E = Educational

SE = Standard Error

* Factors added from survey results

Table 45. The percentage of responses to the personal interview question that describes the factors that are not important for the successful use of school gardening as a teaching strategy (N = 28)

Not Important Factors	%	SE
Small class size _L	50	9.6
* Pressure to meet other academic requirements _E	50	9.6
* Vandalism _L	50	9.6
Availability of garden-based curriculum _E	46	9.6
* Support from the school district _L	46	9.6
* Long-range plan for the gardening program _E	39	9.4
* Help from support staff for mowing, etc _L	36	9.2
Availability of funding for supplies _E	36	9.2
Availability of storage for supplies _L	32	9.0
Availability of summer garden maintenance program _E	29	8.7
Availability of outside, expert help _L	29	8.7
Teachers' science knowledge _E	25	8.3
* Faculty interest in school gardening _L	25	8.3
Availability of volunteer help _E	21	7.9
Support of the principal _L	21	7.9
* Availability of a water source _E	21	7.9
Availability of a site to grow plants _L	18	7.4
Teachers' gardening knowledge _E	18	7.4
Management of student behavior _L	18	7.4
Availability of support materials _E	18	7.4
Person with responsibility for school gardening activities _L	14	6.7
Availability of gardening equipment _E	14	6.7
Addressing safety concerns _L	14	6.7
* Focus as to purpose of the gardening program _E	11	6.0
* Accessibility of the gardens to the students _L	11	6.0
Adequate amount of preparation time _E	7	5.0
* Integrating gardening with other subject matter _L	7	5.0
Adequate amount of instructional time _E	4	3.6
* Teachers viewing the garden as a resource _L	4	3.6
* Student ownership of the gardening project _E	4	3.6

L = Logistical

E = Educational

SE = Standard Error

* Factors added from survey results

Table 46. The percentage of positive responses to the personal interview question that describes the factors that are crucial to the success of school gardening (N = 28)

Crucial Factors	%	SE
* 1a. Student ownership of the gardening project	57	9.5
* 1b. Integrating gardening with other subject matter	43	9.5
2a. Availability of a site to grow plants	36	9.2
* 2b. Availability of a water source	29	8.7
2c. Person with responsibility for school gardening activities	25	8.3
2d. Availability of gardening equipment	25	8.3
2e. Support of the principal	25	8.3
* 2f. Focus as to purpose of the gardening program	25	8.3
* 2g. Faculty interest in school gardening	25	8.3
2h. Adequate amount of instructional time	21	7.9
* 2i. Teachers viewing the garden as a resource	21	7.9
3a. Availability of volunteer help	18	7.4
* 3b. Accessibility of the gardens to the students	18	7.4
3c. Adequate amount of preparation time	14	6.7
3d. Availability of support materials	14	6.7
3e. Availability of outside, expert help	14	6.7
* 3f. Long-range plan for the gardening program	14	6.7
3g. Teachers' gardening knowledge	11	6.0
3h. Addressing safety concerns	11	6.0
3i. Availability of funding for supplies	11	6.0
3j. Availability of summer garden maintenance program	7	5.0
3k. Management of student behavior	7	5.0
3l. Teachers' science knowledge	7	5.0
* 3m. Pressure to meet other academic requirements	7	5.0
4a. Availability of garden-based curriculum	4	3.6
* 4b. Help from support staff for mowing, etc.	4	3.6
* 4c. Support from the school district	4	3.6
5a. Availability of storage for supplies	0	0.0
5b. Small class size	0	0.0
* 5c. Vandalism	0	0.0

L = Logistical

E = Educational

SE = Standard Error

* Factors added from survey results

Research Question 2a. How do teachers perceive the use of a garden-based curriculum in their classroom?

The personal interview respondents were first asked to give their personal definition of school gardening. The responses to this question described how teachers perceived the use of school gardening. A keyword search of these school gardening definitions indicated the emphasis that teachers placed on the use of gardening within the curriculum (Table 47).

Several factors were determined in the School Gardening Survey to be important to school gardening success. Student behavior was described by 93% of the survey respondents to be of primary importance. In the interview, teachers were asked to respond to the statement, “Student behavior improves when gardening is used in the curriculum,” to indicate whether or not school gardening can be used as a method to improve student behavior (Table 48).

Research Question 2b. Is school gardening being used as the focus of interdisciplinary educational or thematic units in the elementary school classroom, or is it being used primarily to teach science?

The use of school gardening in the curriculum can be strictly science-based or it can expand across the curriculum. Table 49 presents the subject areas in which interviewed teachers included the use of gardening or growing plants as the focus of a discussion or an activity. These teachers also provided additional subject areas in which they incorporated school gardening (Table 50). In an open-ended question, teachers also were given the opportunity to describe where in the school curriculum they found school gardening to be the most useful (Table 51). Finally, the teachers were asked to respond to the statement, “Gardening is best used in the science curriculum,” to indicate whether or not they perceived gardening to be strictly a science-based teaching strategy (Table 52).

Research Question 3. What are the educational needs of teachers who are using school gardening in the curriculum? How do teachers feel about their qualifications for implementing the use of gardens and growing plants in their classrooms?

Interview questions delved into the educational needs of the teachers who were using school gardening in their curriculum. The interviewed teachers were asked if they had received any previous training or education in the use of school gardening. Of the 27 responding teachers, nine (33%) had participated in one or more forms of formal school gardening education (this data is not presented in a table). Table 53 presents the various types of school gardening education in which these teachers have participated. To improve their use of school gardening, teachers were also asked what additional training they would be interested in obtaining (Table 54). Teachers also provided additional educational areas which they felt would improve their use of school gardening (Table 55).

The teachers were asked if they felt adequately prepared to use gardening as a teaching strategy in their classroom. Of the 28 teachers interviewed, 21 (75%) felt that they were qualified (this data is not presented in a Table). In addition, teachers were asked to respond to several statements that described how qualified they felt when using school gardening as a teaching strategy (Table 56). The responses to these questions indicated whether or not teachers felt that they were prepared to use school gardening in the curriculum.

Table 47. Keyword search of school gardening definitions obtained from the personal interviews (N = 28)

	Number	%
“Integrate” gardening into the curriculum	12	43
“Hands-on” learning	10	36
“Gardening” as a separate subject	10	36
“Learn”		
About plants	4	14
About the environment	4	14
Academic learning	3	10
“Appreciation”		
Nature	3	10
Environment	4	14
“Fun” / “Enjoyment”	6	20
“Exploration”	1	3

Note: Percentages are not cumulative. Quotation marks (“”) indicate keyword used in search.

Table 48. The percentage of personal interview responses to the statement “Student behavior improves when gardening is used in the curriculum.” (N = 28)

Response	%
Always true	32
Often true	43
Sometimes true	25
Never true	0
Don’t know	0

Likert-Score = 3.07

Note: Likert-Scores based on scale:

4 = always true; 3 = often true; 2 = sometimes true; and 1 = never true

Table 49. The percentage of positive responses to the personal interview that describes the subjects taught in conjunction with school gardening (N = 28)

Subject	%
Science	100
Reading	93
Language Arts/English	89
Mathematics	89
Art	79
History/Social Studies	68
Physical Education	43
Music	39

Note: Percentages are not cumulative

Table 50. Additional subject areas taught in conjunction with school gardening

Poetry (2)
Life skills (2)
Health
Fine motor skills
Behavior management
Community outreach
Follow directions
Stay on task

Table 51. The percentage of personal interview responses to the question: “Where in the school curriculum is school gardening the most useful?” (N = 28)

Subject	%
Science (17)	60.7
Mathematics (6)	21.4
Curriculum is integrated (5)	17.9
Language Arts (5)	17.9
Reading (4)	14.3
Social Studies (3)	10.7

Note: Percentages are not cumulative

Table 52. The percentage of personal interview responses to the statement: “Gardening is best used in the science curriculum.” (N = 28)

Response	%
Always true	7
Often true	39
Sometimes true	50
Never true	4

Likert-Score = 2.46

Note: Likert-Scores based on scale:

4 = always true; 3 = often true; 2 = sometimes true; and 1 = never true

Table 53. The forms of school gardening education previously acquired by interviewed teachers

Formal Training or Education

Growlab inservice

Lifelab inservice

VA Wildlife Center (2)

4-H Conference (2)

Project Learning Tree (2)

Project WILD(2)

Dept. of Game and Fisheries “Gardening with Kids”

College classes

Class on natural gardens

Workshop by science coordinator

Informal Training or Education

Gardening as a child (10)

Teaching with an experienced teacher

Table 54. The percentage of positive responses in the personal interview question that describes the areas of additional education in which teachers are interested in obtaining to improve their use of school gardening (N = 28)

Subject	%
Environmental education	68
Integrating gardening into the curriculum	68
Soils	50
Garden pest control	46
Weed control strategies	46
Basic plant science	39
Gardening skills	36
Basic science	11

Note: Percentages are not cumulative

Table 55. Additional education in which interviewed teachers expressed an interest in obtaining to improve their use of school gardening (N = 28)

Master Gardener training (2)
Graduate credit classes
Use of arboretums and botanical gardens as a part of the curriculum
Plants for certain areas (For example, shade plants, plants for sunny locations)
Connect plants with the past in social studie
Information on what other schools have done
Strategies on how to use the garden

Table 56. The percentage of responses to interview statements that address teachers' perceptions about their qualifications for implementing school gardening into the curriculum (N = 28)

	Always True	Often True	Sometimes True	Never True	Don't Know
I am comfortable using school gardening as a teaching strategy in the areas that I teach. (Likert-Score = 3.46)	61	29	11	0	0
I have a good background for using school gardening in the curriculum. (Likert-Score = 2.96)	32	36	29	4	0
I feel ineffective when using gardening in the curriculum. (Likert-Score = 1.46)	0	11	25	64	0

Note: Likert-Scores based on scale:

4 = always true; 3 = often true; 2 = sometimes true; and 1 = never true

Several of the factors that affect the successful use of school gardening are educational factors both for the teachers and for their students. The educational factors and their importance to school gardening success are presented in Tables 43 and 46.

Research Question 4. What are the attitudes of teachers who are using school gardening in their curriculum as to the effectiveness of school gardening as a teaching strategy?

The use of school gardening as a teaching strategy was addressed through several interview questions in which the teachers expressed their perceptions as to the usefulness of school gardening to student learning (Table 57).

Chapter Summary

This chapter presented the results obtained from the School Gardening Survey and the personal interviews. This data provided a description of the respondent schools and information pertaining to the research questions. The use of these research instruments also provided additional information on school gardening through the comments of teachers who have used school gardening in their curriculum.

Table 57. The percentage of responses to interview questions that address the use of school gardening as a teaching strategy (N = 28)

	Always True	Often True	Sometimes True	Never True	Don't Know
Using gardening in the curriculum is worthwhile. (Likert-Score = 3.82)	82	18	0	0	0
Student attitudes toward the environment be become more positive when gardening is used in the curriculum. (Likert-Score = 3.75)	75	25	0	0	0
Using gardening as a teaching strategy assists students in learning and understanding new ideas and concepts. (Likert-Score = 3.68)	71	25	4	0	0
School gardening is an effective teaching strategy. (Likert-Score = 3.50)	57	36	7	0	0
Student learning improves when gardening is used in the curriculum. (Likert-Score = 3.32)	39	54	7	0	0

Note: Likert-Scores based on scale:

4 = always true; 3 = often true; 2 = sometimes true; and 1 = never true

CHAPTER VI

ANALYSIS OF SCHOOL GARDENING SURVEY AND PERSONAL INTERVIEW RESULTS

Introduction

A statistical and descriptive analysis and interpretation of the data received from the School Gardening Survey and personal interviews are presented in this chapter. The results are discussed as they relate to each research question.

Data Analysis

The results from the School Gardening Survey and from the personal interviews were used to determine those factors that teachers felt were the most important to insuring the success of a school gardening program. Survey and interview questions also provided information that furnished a description of on-going school gardening programs. Input and answers provided by the survey and interviews are discussed as they relate to the research questions.

Analysis of School Gardening Survey and Personal Interview Results

The analysis and interpretation of the School Gardening Survey and personal interview results are presented in three sections. First, there is a description of the respondent schools as characterized by the survey and interview results. The second section presents the research questions with a discussion of the corresponding information received from the survey and interview responses. The third section discusses the qualitative information supplied by the open-ended survey and the interview comments.

Description of Respondent Schools from the School Gardening Survey and Personal Interview Results

Descriptive percentages of the School Gardening Survey data were calculated to define the general characteristics of the respondent population. The percentages and the mode and mean scores obtained from the survey describe the general characteristics of the elementary schools that are using school gardening in their curriculum and were recipients of a Youth Gardening Grant from the National Gardening Association in the 1994/95 or in the 1995/96 academic years.

The majority of teachers (84%) that responded to this survey indicated that they teach at public schools (Table 5). In addition, publically funded magnet schools (5%) and alternative schools (2%) responded to the survey. Of the total number of responding elementary schools, 212 (90%) were publicly funded and 24 (10%) were privately funded.

The range of school enrollments at the respondent schools varied from eight students to 1,400 students (Table 6). This large variation in student population supports the fact that the

Youth Gardening Grants are not awarded based on the size of the student population, but rather by the completeness of the applicant's grant application. The mean school population was 499 students, and the mode was 700 students. The mode and the mean student populations indicated that most school gardening occurs at schools that service a large number of students. These numbers also suggest that a potentially large number of children are exposed to plants and gardening at school.

Of the 24 private schools that responded to the survey, 15 (63%) had a student population of 200 students or less. Of these 15 schools, five (33%) were special education schools for physically or mentally disabled children. The tendency of private or special education schools to have small student populations does not prevent them from becoming recipients of a Youth Gardening Grant. Of the 213 publicly funded schools that responded, 17 (8%) of the schools had a student population of 200 students or less. Of these 17 schools, five (29%) were special education schools for disabled children. The application for a Youth Gardening Grant by small, special education schools is an indication that special education teachers view school gardening as a method to reach the special needs of their students. It also indicates that the horticulture industry, through the auspices of the National Gardening Association, is helping these teachers meet those student needs.

The schools that participated in this survey are found to be fairly evenly distributed in urban, suburban, and rural areas (Table 7). Although the majority of the schools using school gardening are located in a suburban environment, they are closely followed by equal numbers of rural and urban schools. There was no indication that schools in a certain demographic environment were more likely to use school gardening than those in another.

The criteria that determined the granting of a Youth Gardening Grant did not include the location of the school in the United States. Survey responses were received from every geographic area in the United States (Table 4). The elementary schools located in the states that received the higher number of grants for the two-year period used in this study were found in California (10%), New York (5%), Virginia (3%), New Jersey (3%), Texas (2%), Florida (2%) and Illinois (2%). The majority of the survey responses were returned from California (18.7%), New York (7.7%), Virginia (7.2%), New Jersey (5.5%), Texas (4.3%), and Florida (4.3%). The level of response from the individual states directly corresponded with the number of surveys sent to each state. Survey responses closely represented the survey distribution by geographic location.

Schools located in the warmer climates of the southern, southwestern and Pacific coast states (58.6%) were actively gardening. However, the survey information also indicated that there is an almost equal amount of interest in gardening in schools located in the more northern climates of the New England states, mid-Atlantic, midwestern, and Rocky Mountain states (41.4%). Cold temperatures and a short growing season do not prevent teachers from more northern states from using school gardening as a teaching strategy.

The number of years that the respondent schools have been gardening ranged widely from one year to over 20 years (Table 8). The mode number of years for school gardening programs was three years, and the mean was four years. Although a few of the schools have been gardening for 10 to over 20 years, the predominant length of time that schools have been gardening is relatively short. However, with two to three years of experience gardening with

students, the respondent teachers have substantial insight into the implementation of school gardening into their curriculum. These numbers also indicated that teachers are interested enough in school gardening to use it year after year. The fact that they did not discontinue gardening after one year of implementation, despite any problems they may have encountered, indicated that the positive results of the experience outweighed the difficulty of the effort.

The teachers selected for the personal interviews represented every grade level found in the elementary school system including teachers of prekindergarten and Special Education classes (Table 40). In addition, three of the teachers interviewed were instructors in a special education class entitled “English as a Second Language.” The interviewed teachers were chosen by the principals of the selected schools as teachers who have used school gardening in some form in their curriculum. The qualitative descriptions of the selected schools in which the interviewed teachers were employed and the descriptions of their gardening programs were included in the School Gardening Survey demographics.

Analysis of the School Gardening Survey and Personal Interview Responses Related to the Research Questions

School Gardening Survey and personal interview questions provided information that addressed the research questions of this study.

Research Question 1a. What are the factors that are essential to the successful implementation of school gardening into an elementary school curriculum as determined by educators who are currently using school gardening in their curriculum?

Research Question 1b. What logistical features of school gardening need to be addressed for the successful implementation of school gardening into the elementary school curriculum?

The two research instruments used in this study were structured to identify the factors that teachers view as essential to the successful implementation of school gardening into an elementary school’s curriculum. Eleven of the factors used in the School Gardening Survey were those selected from research studies that inquired into the successful implementation of environmental education programs. Due to the many similarities between the two topics, the selection and use of these factors are valid. Several factors, however, were edited to retain their meaning but to change the wording from “environmental education” to “school gardening.” In addition, seven logistical factors were included that were postulated to affect the use of school gardening (Table 1). The factors used in the personal interviews included the factors used in the survey, but in addition, the personal interviews included 12 supplementary factors described by survey respondents as being important to the success of school gardening (Table 2).

In three School Gardening Survey questions teachers were asked to identify the factors that are essential for the success of school gardening. The first question asked if school gardening could be successful without a certain factor (Table 9). The responses indicated whether or not teachers felt that certain factors did or did not hinder the success of school gardening. A high average score indicated that although the factor may be important to school gardening success, it was a factor that did not deter teachers from gardening with their students. The lower the average score, the more important that factor was to the success of school gardening.

The respondents were also asked to indicate if each factor was adequate at their particular school (Table 10). The relationship between importance and actual availability of certain factors

revealed where programs were strongly supported and where programs were struggling. Finally, this survey question asked teachers to select from the list of 18 factors the five factors that they felt were absolutely essential for school gardening success (Table 11). The higher the average score of a factor chosen as essential to school gardening, the more important it was to the successful implementation of school gardening into the elementary school curriculum. The lower the score, the less important it was to school gardening success. The calculation of the standard error (SE) for the factors, within the context of these three questions, allowed for the grouping of factors based on their rating of importance to the success of school gardening.

It should be pointed out that the value of asking these three questions was that it allowed teachers to express a variety of opinions on many of the factors. For example, they could feel that a factor was so important that school gardening could not be successful without it, but that it was very adequate at their school in general, and therefore, it was not rated as essential to school gardening. This often occurred with factors such as student behavior and student safety that were not specific to school gardening and were dealt with in all other areas of the school day. The three questions provided a method of viewing the importance of a factor within the context of the availability of that factor to the teachers who were using school gardening.

The personal interviews asked teachers to rate the 18 survey factors and the 12 additional factors provided by the survey results. The interviewed teachers were asked to rate these factors in order of importance to the use of school gardening as a teaching strategy (Table 43, Table 44, and Table 45). They were then asked to take the factors that they deemed “most important” and to choose from these the five factors they felt were crucial to school gardening success. The higher the rating of a factor, the more important it was to the successful use of school gardening as a teaching strategy (Table 46).

Using the information obtained from the School Gardening Survey and the personal interviews, each of the survey factors is first discussed individually in the order of its importance to the success of school gardening as determined by the School Gardening Survey (Table 11). The factors are grouped into sets according to their relationship based on the standard error calculation. All factors that are grouped into a set are equivalent, for example, factors 1a, 1b, and 1c are equivalent as are factors 2a and 2b. This is followed by a discussion of the 12 additional factors used in the personal interviews in the order of their importance to the successful use of school gardening as a teaching strategy. These factors are also grouped into equivalent sets according to their relationship based on the standard error calculation.

Factor 1a. A person with responsibility for school gardening activities.

For school gardening to be successful at an elementary school, there needs to be a person who will take on the responsibility of school gardening. This factor is identified as one of the most essential components of successful school gardening (Table 11). This factor was also identified among the top four factors without which school gardening could not be successful (Table 9). The personal interviews also rated this factor as one of the second most crucial factors for school gardening success (Table 46). In every school visited there was one teacher or volunteer who had instituted the use of school gardening at that school. This person had taken on the responsibility of the school gardening activities. The interviewed teachers relied heavily on the responsible party for equipment, garden maintenance, curriculum materials, and inspiration. The considerable efforts of these responsible people were recognized by the interview responses.

In over half of the schools that responded to the School Gardening Survey, the primary person responsible for school gardening activities was an interested teacher or a lead teacher (Table 16). Of the 236 responding schools, 119 (50%) were administered by a single person. These individuals sometimes expressed how difficult it was to carry the burden of the gardening program alone (Appendix A). In addition, 19 school gardening programs were administered by two people (8%). However, 42% of the schools had a group of teachers, parents, or combinations of both who shared the responsibility for the school gardening program.

For those schools where one person was solely responsible for school gardening, six were run by a community volunteer, eight by a parent volunteer, 24 by a lead teacher, eight by the principal, and 73 by an interested teacher. Of the schools that had two people responsible for their school gardening programs, three were run strictly by two volunteers, and 16 were managed by a teacher and a volunteer.

These findings indicate that of the 236 responding schools, only 17 or 7% were administered by volunteers other than teachers. In the remaining 93% of the schools, teachers or a combination of teachers and volunteers were the administrators of school gardening. These numbers indicated that the motivation and structure for school gardening is coming from the teachers themselves and not from an outside source.

Factor 1b. Availability of a site to grow plants.

An available site to grow plants was identified by both the survey and the interview to be essential/crucial to school gardening success (Table 11 and Table 46). This logistical factor implies an outdoor garden plot, but teachers indicated that they have found a variety of ways to provide gardening sites for their students that do not include turning over an outdoor garden. These growing sites include containers, windowsills, and terrariums. In fact, 95% of the survey respondents indicated that this factor was adequate at their schools (Table 10).

School gardens can be designed in a variety of ways to meet an assortment of needs. Most of the responding schools used a class garden in which an entire class worked on a garden together (Table 22). Many schools also had topic gardens such as butterfly gardens, native plantings, or wildflower gardens where specific topics were studied. Some of the schools divided gardens into plots that were managed by large groups of six to ten students, or small groups of two to five students. Twelve of the surveyed schools (5%) even had gardens for individual students. In each of the group or individual garden arrangements, the students were given greater personal responsibility for a garden than is possible in a garden maintained by an entire class.

Garden sites do not occur only in the out-of-doors. Several respondents indicated that their gardens were found indoors under lights or on the windowsill (Table 27). The variety of ways that children were gardening shows the potential of this program to be used to meet the goals of individual teachers, students, schools, and communities (Table 28). Teachers were not limiting their concept of “gardening” to an outdoor, plowed garden plot, but they had expanded their concept of gardening to include any activity that involves caring for and tending plant life.

Factor 1c. Availability of funding for supplies.

Implementing any new program requires financial support. School gardening requires an initial investment in gardening tools and educational resources. It also requires a yearly allotment for plant materials, seeds, and possibly, soil amendments. Most of the surveyed on-going school gardening programs received their financial support from the grants they received from the

National Gardening Association and other grant sources and from donations (Table 20). Some teachers (5%) volunteered that frequently those donations came from their own pocketbooks. Although funding is critical, it was described by 34% of the survey respondents as inadequate at their schools (Table 10). Teachers are not receiving the financial backing that they need to support school gardening. However, the interviewed teachers did not see lack of funding as a factor that would keep them from gardening with their students (Table 45 and Table 46).

Teachers were using a variety of creative ways to raise funds to support school gardening (Table 21). Plant and produce sales and Stone Soup luncheons were means for students to use the products from their gardens to support school gardening. These fund-raising methods also allowed the garden to become semi-self-supporting. The students were learning about economics, finances, and marketing as they marketed, advertised, and sold the products produced by their garden. In this interdisciplinary use of the garden, students were learning the basic functions of a small business. Recycling aluminum was not only a way to fund the gardening program, but it was also is a way to instill in the students a positive environmental ethic. Fundraising for the school garden can become part of the interdisciplinary curriculum that centers on the gardening experience.

The survey results indicated that the school administration and the science budget were not primary sources of funding. Teachers were forced to find alternative approaches to financing gardening because it was not considered a part of the curriculum that is supported by the school system. Gardening was seen as an “extra” that is financed by the individual school, students, or teachers. This suggested a need for the education of those in the school administration as to the value of school gardening to the students they serve. Fund-raising is also an area where volunteers and horticultural businesses can support school gardening.

Factor 2a. Support of the principal.

The support of the principal of the school assists the successful use of school gardening. The principal provides permission for using school grounds, financial and curriculum support, and is a go-between with grounds maintenance and school administration personnel. School gardening can progress if the principal supports the use of this teaching strategy, and the surveyed teachers (48%) emphasized this support by selecting it as one of the second most essential factors for successful school gardening (Table 11). Most of the surveyed teachers (93%) indicated that the support of their principal was adequate (Table 10). In 16% of the surveyed schools, the principal was even the person responsible for coordinating the school gardening activities (Table 16).

In the personal interviews, 79% of the teachers indicated that the support of the principal was important to the successful use of school gardening (Table 43 and Table 44). Personal conversations with the principals at the interview-site schools indicated their interest in school gardening and their support for the use of this teaching strategy at their schools.

Factor 2b. Availability of gardening equipment.

Having the proper kind and amount of gardening equipment in appropriate child sizes to use when gardening, often with a large number of small students, was rated as an important factor to successful school gardening. Both survey and interview percentages showed the availability of proper gardening equipment to be essential/crucial to school gardening success (Table 11, and Table 46). Survey results indicated, however, that gardening equipment is adequate in 80% of the surveyed schools (Table 10).

A Youth Gardening Grant provides some gardening equipment but not enough to garden with a large class of students. Funds raised for school gardening are spent on such necessary gardening equipment as shovels, wheelbarrow, hoses, water sprinklers, and hoes. However, many of the interviewed teachers indicated that they used their personal gardening equipment or had students bring tools from home. Despite the importance of this factor, the lack of gardening tools did not keep teachers from gardening with their students. This is an area where alternative sources for gardening tools, such as donations from the community, would be valuable.

Factor 3a. Adequate amount of instructional time.

The School Gardening Survey ranked this factor as important to the successful use of school gardening (Table 11), and 81% of surveyed respondents indicated that school gardening could not be successful without this factor (Table 9). However, 72% of the surveyed teachers indicated that adequate instructional time was adequate at their school (Table 10). Interviewed teachers ranked this factor as one of the second most important factors for the successful use of school gardening as a teaching strategy (Table 43).

Interviewed teachers were asked in an open-ended question to indicate the most difficult part of using school gardening as a teaching strategy (Table 42). These teachers (43%) explained that finding time to fit gardening into the class schedule was the hardest part of school gardening. They also stated that they had difficulty in obtaining sufficient instructional time for all of the children to have hands-on experiences in the garden and in finding the instructional time to integrate gardening into the curriculum.

The lack of instructional time is suggested by interviewed teachers as the part of school gardening that is the most frustrating. The abundance of itinerant classes such as library, physical education, and music take much of the instructional time, and this limits the non-scheduled time teachers can garden with their students. Due to the interdisciplinary nature of gardening, it is suggested that the itinerant teachers also make use of the garden as a resource. The garden can easily be the focus of learning in many of these auxiliary classes.

Factor 3b. Teachers gardening knowledge.

While 53% of the survey teachers indicated that their gardening knowledge was necessary for school gardening success (Table 9), and 30% indicated it was absolutely essential (Table 11), the majority of the survey (82%) respondents indicated that their gardening knowledge was adequate for the gardening activities they were using to enhance their curriculum (Table 10). Seventy-five percent of the interviewed teachers also responded positively when asked if they were adequately prepared to use gardening as a teaching strategy in their classroom (this data is not presented in a Table). Both surveyed and interviewed teachers also indicated that gardening knowledge was more important to school gardening success than science knowledge. This factor will be discussed in detail under Research Question 2a.

Factor 3c. Availability of volunteer help.

Teachers often need assistance when using a hands-on activity with a large group of students. While 45% of the surveyed teachers ranked this factor as necessary for successful school gardening (Table 9) and 27% as essential (Table 11), only 63% of the surveyed teachers indicated that they had adequate volunteer help when gardening with their students (Table 10). Teacher comments expressed a need for assistance when gardening (see Appendix C). However, volunteer help was seen as important, but not essential or crucial, to school gardening success in

both the survey and the personal interviews (Table 11, Table 43, and Table 46). Interviewed teachers indicated that they would garden with or without volunteer help.

Parents are the primary source of volunteer help used by teachers to work with students in the garden (Table 14). Of the 235 responses to the survey question concerning sources of volunteer help, 189 teachers (80%) indicated that they used parents to help them incorporate gardening in their curriculum. The overwhelming use of parents as volunteers may result from the ease with which they can be contacted and their personal interest in the classroom proceedings.

The next group of volunteers most frequently used to assist in school gardening activities were the older students (52%) at the school. Mentoring has become a common teaching strategy in which older students are used to facilitate the learning of younger students. Not only does mentoring benefit the younger students by the example and interaction with the older students, but it also provides opportunities for older students to be responsible and nurturing. Gardening activities provide an opportunity for mentoring to take place. The use of parents and older students as volunteers indicated that teachers are utilizing the most accessible sources of volunteers.

Master Gardeners are frequently used as a source of volunteer help (34%) at schools. Due to the component of the Master Gardener program that requires volunteer hours as payment for horticultural training, Master Gardeners are an extremely useful and available source of volunteer assistance. Master Gardeners who are interested in school gardening may need to advertise their availability to teachers and educators.

Teachers responding to the School Gardening Survey indicated an interest in using Master Gardeners to assist them in school gardening. Master Gardeners were used as either a source of expert assistance (Table 12) or volunteer school gardening help (Table 14) resulting in a cumulative total of 44% of the respondents using Master Gardeners for school gardening assistance (Table 58). This percentage indicates the wide-spread use of Master Gardeners in facilitating school gardening.

Teachers not only used Master Gardeners frequently to assist them with school gardening, but they also indicated a high interest (50%) in obtaining Master Gardener training for themselves (Table 36). To determine if exposure to Master Gardeners increases other's interest in obtaining Master Gardener training, a Chi-square test was used to correlate exposure to Master Gardeners, as either a source of expertise or as a school gardening volunteer, to a teacher's interest in obtaining Master Gardener training. There was no correlation between these two factors.

The volunteers used by individual schools for gardening with students varied with each school's situation and the sources of volunteers available to them (Table 15). The frequent use of Scouts, Jaycees and other organized community groups involved the people of the community with their local schools in a format that benefited all participants.

The types of volunteers used by a school for gardening may depend on the specific educational focus of the gardening program itself. For example, a common use of school gardening is the education of students concerning environmental issues. There are many public and private environmental groups that can provide volunteer and expert information services. These groups range from the local nature center and parks department to The National Audubon Association and the National Park Service or Forest Service. Teachers that have a particular

Table 58. Use of Master Gardeners (MG) as expert or volunteer help by respondents to the School Gardening Survey (N = 236)

MG Help	Frequency	%
No Response	1	0.4
MG as Expert or Volunteer	74	31.4
MG as Expert Only	23	9.7
MG as Volunteer Only	6	2.5
No MG Assistance	132	55.9

focus for their students when gardening have found that they can access a wide variety of volunteer help, both for the actual gardening process and as a source for expert information.

Factor 4a. Management of student behavior.

While 93% of the teachers indicated that school gardening could not be successful without this factor (Table 9), making it appear to be the highest ranked requirement for school gardening success, only 27% of the teachers considering it among the five factors absolutely essential for school gardening success (Table 11). This ranking may have been influenced by the fact that 93% of the respondents indicated that this factor was adequate at their schools (Table 10). Responsible student behavior is necessary for any school activity and is emphasized throughout the school day during every activity in which students participate. Despite its rated importance to school gardening success, student behavior is not a detriment to school gardening because it is a factor that is controlled within the entire school curriculum.

In the personal interviews, teachers (22%) indicated that managing a large class of children while gardening was one of the most difficult parts of school gardening (Table 42). However, small class size was not rated as crucial by a single interviewed teacher (Table 46) and only 9% of the surveyed teachers rated it as essential to successful school gardening (Table 11). Teachers have had to develop strategies to keep all of the students involved while just a few students at a time are actually gardening. These methods included such activities as looking at garden features through a hand lens, turning compost, or completing school work at nearby picnic tables. In fact, most of the schools visited for the personal interviews had some kind of picnic table arrangement near the outdoor gardens solely for this purpose.

Teachers of younger students indicated that they use gardening as a reward for good student behavior. The interviews also asked teachers if student behavior actually improved when gardening (Table 48). Seventy-five percent of the interviewed teachers indicated that behavior always or often improved when gardening. Student interest and enthusiasm for learning through gardening has social and behavioral advantages outside of the academic curriculum.

Factor 4b. Availability of a summer garden maintenance program.

Maintaining the school gardens during the summer when children are not attending school is a concern for many educators who are considering the use of school gardening. Of all of the factors discussed in the School Gardening Survey, summer garden maintenance was the least adequate (Table 10), yet it was seen as essential/crucial to the success of school gardening by only 24% of the survey respondents (Table 11) and 7% of the interviewed teachers (Table 46).

The surveyed teachers indicated that they used a variety of methods to maintain their gardens, one of which (22%) was not doing anything at all (Table 18). The primary work force that was used for summer maintenance was interested teachers (50%), followed by or assisted by interested parents (35%) and students (23%). Some schools sought out alternative ways to maintain their gardens by involving a variety of community groups which ranged from Master Gardeners and Scout groups to garden clubs and prisoners (Table 19). The custodians of many of the schools maintained the gardens, but this is not considered a custodial duty in many school districts and can not be relied upon as a maintenance source.

Some of the schools (8%) indicated that they were year-round schools and that garden maintenance was part of the curriculum during the summer. Year-round schools provide an excellent foundation for school gardening because the students can tend their plants throughout

the growing season. As an increasing number of school districts incorporate year-round schools, there may be an increase in the use of school gardening as a direct result of this change in the school calendar.

Factor 5. Adequate amount of preparation time.

When interviewed teachers were asked in an open-ended question to indicate the most time-consuming part of using school gardening as a teaching strategy, the inevitable answer was preparation, both preparation for the school gardening activity (50%) and preparation of the garden for planting (29%, Table 41). Fifty-seven percent of the surveyed teachers indicated that their preparation time was adequate at their schools (Table 10), despite the fact that having the time to prepare was the fifth most essential (Table 11) and the second most important factor without which school gardening would not be successful (Table 9). Interviewed teachers (92%) rated preparation time as “important” or “most important” (Table 43 and Table 44) but did not rate it as crucial to school gardening success as an adequate amount of instructional time (Table 46).

This information indicated that time for preparation is an area of frustration to educators that used school gardening. The provision of adequate tools and supplies, and having appropriate curriculum materials for integrating gardening into the curriculum, would cut down on the amount of preparation time teachers would need to set up gardening activities. These are areas that could be addressed by the school administration and the horticultural community.

Factor 6a. Availability of outside, expert help.

Parents are indicated in the School Gardening Survey as the primary source of expert help (69%) that teachers used to assist in school garden education (Table 12). There is no evidence, however, that these parents are truly gardening or horticultural experts. In any case, parent assistance is accessed far in excess of any other type of outside, expert help.

Master Gardeners (41%) are another outside source that is used frequently for expert assistance. Although Master Gardeners may also be used solely for volunteer gardening help (34%, Table 14), the presence of their training and horticultural expertise indicates that they are often used as a source of gardening information. In addition, the substantial use of Master Gardeners indicated that teachers are aware of the availability of this particular form of volunteer help. It may be in the interest of Master Gardening programs to advertise the availability of their expertise to schools in general, which would expand their volunteer impact. It could also be in the interest of the Cooperative Extension Service to train Master Gardeners in the skills needed to work with children and to augment a school curriculum with their horticultural knowledge.

Cooperative Extension agents are used as expert sources of information by 36% of the schools. This indicated that teachers are searching for additional help from qualified sources. However, Cooperative Extension is more than an agriculture educational resource supported by each state through the state university. It is also the provider of Master Gardener training and the source of 4-H clubs. When all of these Cooperative Extension programs are consolidated, the survey responses indicated that 66% of the teachers are using Cooperative Extension services as sources of expert or volunteer assistance in their school gardening endeavors (Table 59).

The infrequent use of botanical gardens and arboretums may be an indication that most schools are not located in the vicinity of these types of resources. However, teachers are accessing a plethora of resources to aid in the implementation of school gardening depending on

Table 59. The use of Cooperative Extension Services for school gardening assistance by respondents to the School Gardening Survey

Use of Extension Services	Frequency	%
No Use of Extension Services	80	33.9
Use of Extension Services	156	66.1

the focus of the gardening project (Table 13). Environmentalists, artists, and psychologists, to name a few, are meeting the needs for expertise in school gardening programs.

Factor 6b. Availability of support materials for the garden curriculum.

The availability of materials to support the use of school gardening in the educational curriculum was seen as important to school garden success by 46% of the survey respondents (Table 9) but as essential by only 9.3% (Table 11). This comparison may be due to the fact that 69% of the survey respondents indicated that this factor is adequate at their school. Interviewed teachers (83%) also recognized support materials as being important to the use of school gardening (Table 43 and Table 44), but only 14% saw it as a crucial factor (Table 46). Improving the accessibility of support materials related to the interdisciplinary use of school gardening could decrease the amount of preparation time needed for learning using this teaching strategy.

The School Gardening Survey indicated that the types of educational materials used in the classroom to support the use of school gardening in the curriculum are accessed where all good research starts; i.e., in the library (Table 24). Eighty-five percent of the teachers used library resources to augment the use of gardening in the curriculum. Teachers also used gardening catalogs and magazines, experiments, and their own personal books in the classroom to support learning in the garden.

It is evident that teachers are not relying on the textbooks provided by the school system to support their use of school gardening. If school gardening is to become more readily available it is possible that the textbooks provided by the school system could be revised to add pertinent and useful information on this subject. Unfortunately, proposed changes for the contents of textbooks bring up major issues, such as textbook turnover and expense, that cannot be resolved in short time-periods. A solution to this problem is the production of independent garden-based curricula that are written in conjunction with, and augment, textbooks and meets state-mandated academic requirements..

The interdisciplinary nature of learning that occurs in many classrooms encourages the use of a variety of teaching methods including the use of trade books and computers (Table 24). The Internet was being used by a small fraction of the surveyed schools, but this may be reflective of other factors such as teacher training and Internet availability. A few of the surveyed teachers (3%) were also resorting to developing their own gardening materials to meet the educational needs of their students (Table 25). The teachers were making this extra effort when faced with the limited availability of useful, gardening curriculum materials.

The development of support materials may be an area where the horticultural community can assist teachers in their use of school gardening. The large amount of preparation time necessary for school gardening activities would be minimized if applicable support materials were readily available for student learning.

Factor 6c. Small class size.

It would be expected that a small class size would be important to the use of gardening in the curriculum because of the hands-on nature of this teaching strategy. The survey response to this factor was surprising in that 80% of the teachers indicated that school gardening could be successful without this factor (Table 9), and only 9% felt it was essential to school gardening success (Table 11). Not a single interviewed teacher saw this factor as crucial to school

gardening success (Table 46), and only 11% saw it as “most important” (Table 43). Fifty percent of the interviewed teachers saw class size as not important to school gardening success (Table 45). This lack of concern for class size indicated that teachers are able to overcome the logistical features of a large class size and still use school gardening effectively. The strategies that teachers used to deal with large class sizes included such methods as the use of volunteers or student mentors to assist in gardening activities, and providing a variety of learning assignments that must be accomplished by every student when gardening. Large class sizes did not prevent teachers from using school gardening as a teaching strategy.

With respect to class size and student management when gardening, teachers were asked to indicate the adult-to-student ratio that they felt was adequate to ensure successful learning experiences in the garden (Table 26). The ratio of adults to students specified by respondents depended on the age of the students and the type of education planned for the gardening experience. Teachers working with young or learning disabled children recommended a very small adult-to-student ratio, ranging from one to six students to one adult. In special education situations, these adult-to-student ratios may already exist in the classroom. For the general school population, however, both the average and the modal adult-to-student ratio was one adult to 10 students. Many teachers reported that 23 to 30 students could be handled by one adult which indicated that some teachers are gardening with their entire classes by themselves and are doing so successfully. Other teachers are using volunteers to maintain higher adult-to-student ratios.

Factor 6d. Availability of storage for supplies.

Storage for gardening supplies was a factor that 71% of surveyed teachers indicated was adequate at their schools (Table 10). Less than half of the surveyed respondents felt it was important to school gardening success (Table 9) and only 9% saw it as essential (Table 11). Not a single interviewed teacher saw storage as a crucial factor (Table 46), and 32% saw it as “not important” to school gardening success (Table 45). This information indicated that storage is a concern but it is not an overbearing problem. Teachers are gardening with or without a good storage space, and are finding places to keep their gardening materials and tools. It is not apparent if the methods teachers have used for storage of gardening tools and materials are satisfactory.

Factor 6e. Addressing safety concerns.

In any school activity the safety of the students is always of utmost importance. Eighty-three percent of survey respondents indicated that safety is a very important factor when engaging in school gardening activities (Table 9). However, 97% of the surveyed respondents indicated that safety was adequate at their schools (Table 10), and only a few respondents (9%) saw safety as an essential factor in school gardening success (Table 11). The survey responses to this factor indicated that teachers are very aware of the importance of student safety in every activity in which they engage with students. However, safety is also an issue that teachers deal with during the entire school day, and it is not an issue solely related to school gardening. The interview results supported these findings, in that although 86% of the teachers indicated safety was important (Table 43 and Table 44), only 11 % described safety as a crucial factor (Table 46),

Factor 6f. Availability of garden-based curriculum.

Teachers in both the interview and survey did not see the provision of a garden-based curriculum as crucial or essential to school gardening success. Survey results indicated that only

36% of the teachers viewed a garden-based curriculum as necessary for school gardening success (Table 9) and only 7% saw it as essential (Table 11). Of the surveyed teachers, 69% indicated that the availability of a garden-based curriculum was adequate at their schools (Table 10). In fact, 46% of the interviewed teachers indicated that a garden-based curriculum was “not important” to the successful use of school gardening (Table 45). These results indicated that teachers felt that they did not need an organized, pre-established, garden-based curriculum to succeed with school gardening. Their ability to find information from alternative sources decreased the importance of a curriculum that is in place.

When respondents were asked in the School Gardening Survey where they obtained their information for the use of school gardening, most indicated that they relied on their own personal knowledge (Table 34), although they also accessed a myriad of other resources (Table 35).

By using their own initiative, teachers are finding the information they need to utilize school gardening in their curriculum.

When asked what additional forms of information they would like to obtain to improve their use of school gardening, one of the interviewed teachers’ first choices was obtaining information on “integrating school gardening into the curriculum” (Table 54). A garden-based curriculum that addresses the specific needs of teachers at varying grade levels could provide this subject integration. A garden-based curriculum could assist in the implementation of school gardening into the curriculum by providing practical and educational information that could be used when integrating a curriculum around gardening.

Factor 7. Teacher’s science knowledge.

Survey results revealed that 42% of the teachers indicated that a teacher’s science knowledge was important to the success of school gardening (Table 9), and only 6% felt it was essential (Table 11). The lack of importance respondents placed on their science knowledge may be due to the fact that 91% indicated that this factor was adequate (Table 10). Surveyed teachers also did not see this factor as a source of concern (Table 46). The interdisciplinary use of school gardening may decrease the importance of a teacher’s science knowledge to the success of school gardening. Both surveyed and interviewed teachers used school gardening to address subject areas across the curriculum and did not solely emphasize science learning while gardening (Table 32 and Table 49).

Teachers indicated in both the survey and the interviews that a teacher’s gardening knowledge was more important to school gardening success than a teacher’s science knowledge. These responses indicated that teachers are relying more on their gardening knowledge than on their science knowledge when using school gardening. Despite the fact that growing plants can be heavily oriented toward the sciences, fewer of the surveyed teachers (83%) indicated that their knowledge of gardening was adequate as compared to those (91%) who indicated that their knowledge of science was adequate (Table 10). Due to the fact that a large part of growing plants is science-based, the teachers’ satisfaction with their prior science education is encouraging. However, in relation to these percentages, 30% of the surveyed teachers felt that their gardening knowledge was essential to school gardening success, whereas only 6% placed this importance on their science knowledge.

Of the interviewed teachers, 11% indicated that they would be interested in additional science education, and 39% in additional plant science education (Table 54). Nevertheless, these

same teachers expressed a greater interest in obtaining additional education on gardening or gardening-related topics. This represents an expressed need for gardening and school gardening education for teachers who are interested in using school gardening in the curriculum.

Additional Factors Obtained from School Gardening Survey Results

The School Gardening Survey provided 12 additional factors that affect the success of school gardening (Table 2). The following section discusses each of these factors in the order of its rating as a factor that is crucial to the successful use of school gardening as a teaching strategy. These factors are numbered according to their relationship based on the standard error calculation. The presentation and order of these factors does not include the previously discussed factors which results in “gaps” in the numbering (Table 45).

Factor 1a. Student ownership of the gardening project.

The factor described by interviewed teachers as being one of the most crucial to school gardening success was student ownership of the gardening project (Table 46). Student ownership of any educational activity increases student learning. As a result, interviewed teachers indicated that school gardening could only be of value if there is student ownership of the learning activity. Ownership comes through student involvement in as many facets of his or her learning as can be provided and by interconnecting that learning with a variety of subject areas. As a student participates in the learning process, he or she begins to value that learning as it becomes something that he or she has personally created. In addition, integration of the curriculum attends to the differences in how students learn, and it allows for the building of meaning in new subject areas. Creating a gardening curriculum that allows for student ownership of the gardening project allows for real learning to occur.

When teachers were asked to give their own definition of school gardening, 43% indicated that the value of school gardening lay in integrating the curriculum with the gardening experience and 36% emphasized the hands-on features of gardening (Table 47). The integration of the curriculum around the garden, and the hands-on nature of gardening, provides a forum for student ownership.

Factor 1b. Integrating gardening with other subject matter.

The personal interview responses ranked the integration of gardening with other subject matter as one of the most crucial factors that affect the successful use of school gardening as a teaching strategy (Table 46). Also, the integration of gardening into the curriculum was one of the most requested areas of additional education that interviewed teachers indicated would assist them in improving their use of school gardening (Table 54). In addition, in the open-ended interview question that asked teachers to indicate where in the school curriculum school gardening is the most useful, five of the teachers insisted promptly that the curriculum is integrated and that subjects do not stand alone (Table 51). All of these responses described the educational trend toward curriculum integration and the necessity of school gardening to accommodate this educational philosophy. Again, the horticulture community could assist elementary school teachers by developing grade appropriate, educational materials that meet students’ and teachers’ school gardening needs for an integrated curriculum.

Factor 2b. Availability of a water source.

The availability of a water source is a logistical feature of gardening that is based on a plant's biological need for water. In the personal interviews teachers rated the availability of water source as one of the second most crucial factors to the successful use of school gardening (Table 46). However, many teachers indicated through their comments that the lack of a convenient water source did not deter them from gardening. They described students carrying water to the gardens from inside the school building or even passing buckets of water out of school windows. Due to the fact that all schools have water available, it is the convenience of that water to the garden site that may cause problems when gardening with students.

A plant's survival requires water, which is the reason that this factor is rated as being of major importance, but it is not seen as a factor that impedes the use of school gardening. Teachers' responses in the personal interviews rated the logistical factors, "a site to grow plants" and the "availability of gardening equipment," as of equal importance to the success of school gardening as the availability of a water source. These two factors are in the same category as a water source, in that they are necessary or "crucial" to school gardening as logistical features. As discussed earlier, they are factors that teachers are able to overcome with creativity and perseverance, but unfortunately these solutions often consume valuable preparation and instructional time.

Factor 2f. Focus as to the purpose of the gardening program.

Over half of the interviewed teachers (54%) rated this factor as "most important" to the success of school gardening (Table 43). As indicated by teachers' personal definitions of school gardening, teachers can either view the garden as a place to look at the beauty of nature, and not touch, or they can view it as an extension of their classroom where active, hands-on learning can occur (Table 47). Gardening can be seen as a tool that incorporates a wealth of interdisciplinary topics, or it can be viewed as a place to teach science. The focus of the teacher will determine the type of learning and activities that will occur when using school gardening. The interviewed teachers expressed the need of teachers to define how they view the use of school gardening before it can be used to its full extent in relationship to that viewpoint.

Factor 2g. Faculty interest in school gardening.

It has been determined in the environmental literature that a teacher's interest in the use of a teaching strategy is the most important determinant in the use of that strategy. It was assumed for this research that the teachers who participated in the School Gardening Survey and in the personal interviews had an interest in school gardening because of their application for a Youth Gardening Grant. This particular factor, however, is not limited to the gardening teacher's interest, but rather it includes the interest of the faculty of the school where school gardening occurs. It is presupposed that if the faculty of a school supports a project, then the chances of the success of that project will improve. Interviewed teachers (78%) indicated that the support of the faculty was important to the success of school gardening (Table 43 and Table 44), and 25% felt it was crucial (Table 46). It is concluded that it is in an atmosphere of professional support that teachers who are using school gardening are inclined to continue the use of this teaching strategy.

Factor 2i. Teachers viewing the garden as a resource.

Many interviewed teachers pondered the difference between this factor and the factor, "Focus as to the purpose of the gardening program." The difference is small, but important. The

focus as to the use of school gardening is “how” gardening will be incorporated into the curriculum i.e. the goals of school gardening itself. The factor “teachers viewing the garden as a resource” addresses teachers’ perceptions of gardening as a teaching tool for them to use to augment the curriculum. Ninety-three percent of the interviewed teachers indicated that viewing the school garden as a resource was important (Table 43 and Table 44), and 21% indicated that it was crucial (Table 46). This would indicate that it is the teacher’s perceptions of school gardening that provide the impetus for the use of school gardening in the curriculum. Again, teachers are indicated as the driving force behind successful school gardening. It is suggested once more that the horticultural community focus its support and efforts toward the needs and education of teachers if it anticipates advancing the use of school gardening at elementary schools.

Factor 3b. Accessibility of the gardens to the students.

Teacher comments from the School Gardening Survey indicated that garden accessibility to the students is important to successful school gardening. If the outdoor garden is located away from the school, or is difficult to access, the teachers do not use it as often, or are less inclined to use school gardening. The schools visited for the teacher interviews had located their outdoor gardens within close range of the school building, and in most cases, right outside the classroom doors. At schools that had a courtyard, this was often the location of the school outdoor gardens. Despite the fact that 86% of the interviewed teachers rated this factor as important (Table 43 and Table 44), only 18% rated it as crucial (Table 46). Garden accessibility is a factor that has been adequately dealt with at many schools that use school gardening. Teacher comments also indicated that the proximity of the gardens to the school building was moreover an attempt to decrease vandalism.

Factor 3f. Long-range plan for the gardening program.

Over half of the interviewed teachers (63%) indicated that a long-range plan for the garden program was important to the successful use of school gardening (Table 43 and Table 44), but only 14% rated it as crucial (Table 46). Those teachers who felt it was not an important factor (39%) sometimes expressed that they just “winged it” every year, and despite this off-hand approach, they were quite happy with the results in student learning when using school gardening (Table 45). It is apparent that teachers’ use of long-range planning varied with individuals and that its importance to school gardening varied in the same regard.

Factor 3m. Pressure to meet other academic requirements.

The interviewed teachers indicated that finding the time to fit gardening into the class schedule was the most difficult part of using school gardening as a teaching strategy (Table 42). Finding the time within the school day to work and learn in the garden was a source of frustration to teachers who were using school gardening in their curriculum. School schedules are filled with additional classes such as music, art, library, and computer that take up a large part of the school day. This gives teachers very little free time to use on time-consuming activities such as school gardening. The teachers of younger students (prekindergarten and kindergarten) even expressed relief that they did not have as many additional classes, and that they were relieved of this interference to their gardening activities.

The connection between this factor and the factor “adequate amount of instructional time” lies in the “time” element. The factor “pressure to meet other academic requirements” also includes the demands placed on teachers by the school system and the state to meet an assortment

of educational requirements in a myriad of topic areas. Teachers must meet these educational requirements, and unless they can visualize how school gardening can help them meet these requirements, it is hard for them to rationalize the time taken up by school gardening activities.

When asked to rate this factor, 50% of the interviewed teachers indicated that this factor was important to school garden success (Table 43 and Table 44), and 50% stated that it was not important (Table 45). Although teachers were divided on this issue, their comments indicated that teachers realized they must work around the additional, itinerant classes, and work within the required academic parameters, if they are to use school gardening in the curriculum.

Factor 4b. Help from support staff for mowing, plowing, etc.

Help and assistance from the school support staff comes in many forms. In the School Gardening Survey, the custodians of the schools were sometimes the work force for summer garden maintenance or garden preparation (Table 19). Only 14% of interviewed teachers rated this factor as “most important,” (Table 43) although 50% did view it as “important”(Table 44). It is evident that teachers acknowledged the importance of this factor, but it was not viewed as a factor that would prevent school gardening.

The problems with support staff, as indicated by interview comments, were that unless the support staff are informed of the importance of the school gardening, it could interfere with or ruin the gardening projects. One teacher lamented that the custodian threw away a vermicomposting bin that she had purchased at her own expense. Another teacher described how the custodians mowed over her school garden. It may be useful to include the support staff in school gardening activities so that it, too, will have ownership of school gardening. This could be as simple as presenting the staff with produce or a bouquet of flowers from the garden as a “thank you” for their help, or inviting it to enjoy a school-grown salad with the student gardeners.

Factor 4c. Support from the school district.

The school administration can provide a variety of support for a school gardening program. It can provide financial assistance, teacher training, curriculum materials, and the permission to use the school grounds for gardening activities. The school administration can also provide garden maintenance assistance through the grounds maintenance and landscape departments of the school district. Although it can provide all of these things, the school administration is shown from the survey and interviews to provide little or none of these services (Table 20, Table 24, and Table 34). Only 14% of interviewed teachers rated this factor as crucial to school gardening (Table 46), and 46% rated it as “not important” (Table 45). Teacher comments expressed the opinion that school gardening could be used successfully without the support of the school district. Teachers did not feel the need for support from the school administration.

However, school gardening would be easier if the school district would provide the support and materials that are within its means to provide. Teachers spend much of their time searching out avenues for supplies and assistance that could be easily provided by the school district. It would be of value to educate the school administrators as to the value and usefulness of school gardening. It is probable that an educated administration might provide the educational and logistical support needed to increase the use and ease of school gardening which would allow for more “educational” time in the garden. This support would not only improve current school gardening programs, but it could also interest and educate teachers who are not as willing to

spend the time and effort searching for supplies and assistance, or who are not aware of the educational benefits of school gardening.

Factor 5c. Vandalism.

Although the teachers' comments from the School Gardening Survey indicated that vandalism was a problem with some school gardening programs, the interviewed teachers revealed that it was not an important factor to school gardening success. Not a single teacher stated it was crucial to school gardening success (Table 46), and 50% rated it as "not important" (Table 45). The teachers did not view vandalism as a deterrent to the successful use of school gardening as a teaching strategy.

In teacher comments, some teachers indicated that they have had vandalism problems. They pointed out, however, that the vandalism was used as part of student learning about personal responsibility and respect for others. One teacher even indicated that the rate of vandalism decreased over the years as students became increasingly invested in school gardening. As students developed ownership of the gardens they not only stopped their own attempts at vandalism, but they also placed social pressure on others to decrease vandalism.

Research Question 2a. How do teachers perceive the use of a garden-based curriculum in their classroom?

Teachers' perceptions of the use of school gardening in their classroom determines how school gardening will be used in the curriculum. When interviewed teachers were asked to give their personal definition of school gardening, three distinct perceptions were made clear (Table 47). The most common perceptions were that teachers saw school gardening as a method to integrate (43%) the curriculum around a hands-on (36%), environment-based activity. Teachers viewed school gardening as a method to teach students about plants (14%), the environment (14%), and to address academic subjects (10%). In addition, some of the teachers (36%) saw school gardening as a separate subject area where students were taught the actual subject of "gardening." Teachers (44%) also saw gardening as an arena for enjoying and appreciating nature.

Teachers' perceptions of school gardening were addressed in the School Gardening Survey in a question that inquired into the goals of teaching when using gardening (Table 30). Schools are normally seen as institutions of academic learning. Although the majority of the surveyed teachers (91%) indicated that they used the garden for this type of learning, a large number (83%) indicated that they used the gardening experience as a forum for social development. More than half of the teachers included the goal of using gardening as a recreational activity (62%) and as a therapeutic activity (52%). Two teachers expressed the fact that the garden was therapeutic for themselves and not just for the students. Some teachers that used gardening with special needs children suggested that their goals were wholly therapeutic. Teachers who are using school gardening are viewing the gardening experience as reaching beyond the academic curriculum. The benefits of gardening that have been described in horticulture therapy have shown themselves in the school garden.

Many additional school gardening goals were provided by the surveyed respondents (Table 31). Developing an environmental ethic and an appreciation of nature, exploring community relationships, learning life-skills, investigating the diversity found in nature and society, enjoyment, and integrating the arts are goals that teachers have included in school gardening

education. Teachers are not viewing the use of school gardening as a completely academic process, but rather they are seeing it as an arena for enriching students lives in a wide variety of ways.

Teachers of younger students mentioned that the gardening activity itself was used as a reward for good behavior. In addition, the majority of interviewed teachers indicated that student behavior improved when using school gardening in the curriculum (Table 48). In these cases, gardening was used as a strategy to improve student behavior.

As with any learning activity, it is important to identify the age group with which the activity would be appropriate. Some activities are appropriate for younger, older, or all students, depending on the developmental and educational needs of the activity. It was meaningful to identify teachers' perceptions of the age groups of students who could successfully participate in and learn from school gardening. Survey responses indicated that the use of gardening in the curriculum does not seem to be grade or age specific (Table 29 and Table 40). There was no grade level that used gardening more frequently than another. School gardening is a teaching strategy that can be used at every grade level in the elementary school.

The indication that the sixth grade rarely used school gardening may be the result of two factors. The first factor is that sixth grade is often not part of an elementary school. In many school districts sixth grade is included at the junior high level, so it is probable that sixth grades were not present at many of the respondent schools. The second factor is that because sixth grade students do not come back to the elementary school in the following year to see the results of their gardening projects, it is probable that teachers are deterred from gardening with these students.

Thirteen of the surveyed schools also had prekindergarten (Pre-K) classes that participated in school gardening. At many schools, Pre-K is instituted to connect with children who have been identified as "at-risk" at an early age. Attention should be given to these special needs children, as they may require specialized, small gardening tools and age-appropriate curriculum ideas to effectively learn using school gardening.

Several schools indicated that their extended day and summer school students were gardening. These "after-hours" students may be a large audience for school gardening in the future. Teachers are looking for learning activities that are out of the classroom, and that provide physical and hands-on activity for children after school hours. Gardening and its associated activities, such as composting, can be an activity that meets these criteria.

Teachers' perceptions as to what constitutes gardening will also determine how school gardening is used in the curriculum. "Gardening" is often thought of as an activity that must occur outside in a plowed garden plot. This misconception can prevent many educational institutions from utilizing school gardening because of the unavailability of outdoor areas for gardening. To determine the existence of this misconception, teachers were asked in the survey to indicate how they "garden."

The majority of the respondents indicated that they conducted gardening activities out-of-doors in some form of outdoor gardening plot (Table 27). More than half of these outdoor gardens were constructed as raised beds. The prominent use of raised beds indicated a dedicated interest in using school gardening, as building raised beds can be a time-consuming and difficult task. It also indicated that using small, contained areas for gardening could make gardening

accessible to schools that may face certain barriers to gardening such as inadequate soils or the lack of an open area for gardening.

The survey responses indicated that indoor gardening is combined with outdoor gardening activities by using either grow lights or a windowsill as a light source for growing activities. More than a third of the schools used containers for gardening, although it was not evident if this growing was done indoors or outdoors. Of interest is that greenhouses are available to 18% of the schools for gardening activities. However, several teacher comments expressed the opinion that the use of the greenhouses is limited due to a lack of knowledge on how to use a greenhouse facility.

In addition to the specified types of school gardening activities described in the survey question, teachers indicated that they engaged students in such activities as creating native plantings, constructing aquatic environments, vermi-composting, bulb gardening, plant propagation, and developing nature trails (Table 28). Teachers are visualizing ‘gardening’ as extending beyond the standard garden plot design and are recognizing that gardening can occur both indoors and outdoors.

Research Question 2b. Is school gardening being used as the focus of interdisciplinary educational or thematic units in the elementary school classroom, or is it being used primarily to teach science?

Horticulture, plant production, and horticultural practices are considered to be science-based subjects. The interconnection between gardening and science can predetermine in some teachers’ minds that school gardening is used solely to teach science topics. Survey and personal interview responses, however, indicated that school gardening at elementary schools was used as a tool to teach across the curriculum. School gardening was seen as a useful strategy in addressing all of the basic subjects that were included in the elementary curriculum (Table 32 and Table 49). Surveyed and interviewed teachers also provided a wide range of additional topics that they addressed when using school gardening (Table 33 and Table 50). This information disclosed the wide range of subject matter, both academic and social, that can be learned when gardening. Teachers are not limiting the learning that takes place through the activity of growing plants to the standard science curriculum.

When interviewed teachers were asked in an open-ended question to indicate where in the school curriculum school gardening was the most useful (Table 51), the majority of them indicated that it was best used to teach science (61%) and mathematics (21%). However, when asked if school gardening is best used in the science curriculum, only 7% of the teachers indicated that this was always true (Table 52). In fact, interviewed teachers emphasized in both their school gardening definitions (Table 47) and in their determination that integration is crucial to the success of school gardening (Table 46), that gardening is most often used as the focus of an interdisciplinary curriculum.

Despite the fact that science (92%) was seen as the primary academic topic in the curriculum that could be taught using gardening, 83% of the surveyed teachers used their school garden to teach about the environment (Table 32). More than half of the surveyed respondents also used the garden to teach one or more of the following areas: mathematics (67%), language arts (68%), art (66%), health and nutrition (59%), ethics (58%), and social studies (51%).

Responses from the interviewed teachers portrayed similar information concerning the integration of the curriculum around the school gardening experience (Table 49). Of interest, however, was that few of the surveyed teachers (20%) viewed gardening as a place where physical education occurs. Gardening is consistently listed as an exercise activity when sources of exercise are being reviewed. These teachers have indicated that there is an apparent lack of understanding of gardening as an exercise medium.

Research Question 3. What are the educational needs of teachers who are using school gardening in the curriculum? How do teachers feel about their qualifications for implementing the use of gardens and growing plants in their classrooms?

The School Gardening Survey inquired into two factors that affect the success of school gardening based on a teacher's education and knowledge. Surveyed teachers rated their knowledge of gardening as more important to the success of school gardening than their knowledge of science (Table 9). Thirty percent of these teachers placed gardening knowledge as essential to the success of school gardening, whereas only 6% indicated that science knowledge was essential (Table 11). In the personal interviews, only a quarter of the teachers indicated that either form of education was important to school gardening success (Table 43). This information indicates that teachers depend more on their knowledge of gardening than on their knowledge of science when using school gardening in the curriculum.

Survey responses also indicated that teachers were relying primarily on their own personal knowledge of gardening to support school gardening at their schools (Table 34). Although most school gardening programs access outside, expert help, 73% of the surveyed teachers did not consider it essential to the success of school gardening (Table 9). In essence, teachers are relying on their own personal knowledge of science and gardening to support school gardening. Ninety-one percent of the surveyed teachers indicated that their science knowledge was adequate, and 83% indicated that their gardening knowledge was adequate (Table 10).

In the personal interviews teachers gave positive responses to statements that inquired into their feelings of adequacy when engaging in school gardening. When asked if they had received prior training in using gardening as a teaching strategy, only 33% indicated that they had, but despite this, 75% indicated that they were adequately prepared to use school gardening with their students (this data is not presented in Tables). Interviewed teachers were also asked to respond to several statements that focused on how prepared they felt when using school gardening (Table 56). Ninety percent of the interviewed teachers indicated that they felt comfortable using school gardening as a teaching strategy, and 68% felt that they had a good background for using school gardening in the curriculum. Also, 36% of the teachers stated that they often or sometimes felt ineffective when using gardening in the curriculum. These responses indicated that teachers felt comfortable using school gardening; that is, there is nothing holding them back from using this strategy, but they do not feel as prepared as they should be in using school gardening.

With respect to teachers' expressed need for better school gardening education, an interview question asked teachers to indicate what school gardening topics they would be interested in obtaining to improve their use of school gardening (Table 54). Teachers requested information on integrating gardening into the curriculum, environmental topics, soils, and environmentally sound, non-chemical forms of garden pest control and weed control strategies.

Teachers also requested information on specific horticultural and educational topics that they indicated would assist them in improving their use of school gardening (Table 55).

From the survey, 18 (8%) of the responding 236 teachers indicated that their training was sufficient to successfully handle school gardening with their students and no further training was necessary (Table 36). The majority of the teachers (92%) felt that additional training was needed. These teachers indicated that they were most interested in the easily accessible, in-service training that is provided throughout the school system. Also, half of the teachers (49%) stated that they were interested in the Master Gardener training provided by the Cooperative Extension Service. Collectively, there was also a great interest in continuing education credit or graduate credit offered by the local community college, botanical garden, university, or college depending on each individual's situation. Interviewed teachers also expressed interest in receiving Master Gardener training and or attending graduate credit courses on school gardening (Table 55). Teachers view school gardening as an area where they would benefit from additional training.

Teachers indicated that they were using a variety of educational materials and sources to assist them as they incorporate school gardening into the curriculum (Table 34). The majority of teachers (85%), however, were relying heavily on their own personal knowledge of gardening to support their school gardening activities. When asked if they had ever had training or education in the use of school gardening, only 36% of the interviewed teachers responded positively. The forms of school gardening education these teachers stated they had received were often formal educational formats, such as Lifelab training. Interestingly, however, the majority of the interviewed teachers stated that it was their informal training, such as gardening as a child that allowed them to feel comfortable using school gardening in the curriculum. (Table 53). This may indicate that teachers who are not "gardeners" will be less likely to use school gardening unless they are given sufficient training to familiarize themselves with basic gardening concepts and skills.

Only a third of the surveyed teachers had received in-service training on school gardening (Table 34). This indicated that many school systems are not actively seeking school gardening training for their teachers. The provision of school gardening training through the convenient device of teacher in-service training may be an efficient way to introduce more teachers to the benefits of gardening in an interdisciplinary curriculum. In-service training was requested by 69% of the surveyed teachers (Table 36). Surveyed teachers also suggested alternative methods of receiving school gardening education which they indicated would assist them in improving their use of school gardening (Table 37). The responses to these questions indicated that teachers are inclined toward acquiring further education in the use of school gardening.

Teachers also rely heavily on friends and volunteers for gardening information. The Growlab information provided by the National Gardening Association through its grant program was used, as was information provided by the Cooperative Extension Service and its affiliates, Master Gardening and 4-H. Additional sources for information were accessed through the community and the educational system (Table 35).

Research Question 4. What is the attitude of teachers who are using school gardening in their curriculum as to the effectiveness of school gardening as a teaching strategy?

The School Gardening Survey asked teachers to respond to a Likert-like scale that indicated how successful they felt school gardening was as a teaching strategy to enhance student learning. Ninety-seven percent of the respondents viewed school gardening as a successful teaching strategy (Table 38). This overwhelming response indicated that the majority of teachers, who have had experience using school gardening as a teaching strategy, have seen student learning enhanced when that learning occurs through the interdisciplinary use of school gardening.

The interviewed teachers supported these survey results by responding positively to the statements “Using school gardening in the curriculum is worthwhile” (100%), “Using school gardening as a teaching strategy assists students in learning and understanding new ideas and concepts” (96%), “Student learning improves when gardening is used in the curriculum (93%), and “School gardening is an effective teaching strategy” (93%).

In addition, a survey question inquired into each teacher’s plan to use school gardening in the school’s curriculum in the following year. Of the 236 survey responses, six teachers indicated that they were not going to continue using school gardening. Almost all of the respondents (97%) indicated that they would be using school gardening in the curriculum in the subsequent year. It is important to point out that there may exist a bias in the response to this question. Survey respondents may want to please the National Gardening Association with a positive response due to their position as grant recipients. They may have indicated their interest in the future use of school gardening, when in fact that use is in question. Despite this possible bias, the fact that 97% of the respondents indicated that they would be using school gardening in the following school year allows for the conclusion that teachers have a favorable view of school gardening as a teaching strategy.

Qualitative Information

The request for additional comments at the end of the teacher survey and throughout the personal interviews resulted in qualitative information that provided teachers’ insights into what makes school gardening successful. The information obtained from these sources were “keyword” quantified as well as presented as viewpoints of those people who have experienced the use of school gardening within the elementary school curriculum (see Appendixes C and D for teacher comments).

As surveyed and interviewed teachers discussed school gardening, it became evident that they saw the garden as a place where the curriculum could be integrated, where respect and responsibility toward the environment and toward others was learned, where the nature could be enjoyed, and where students could just have fun while learning. These comments revealed the teachers’ interest in school gardening and their belief that the use of school gardening is a useful and effective teaching strategy.

Chapter Summary

The School Gardening Survey and personal interview results were discussed as they addressed the research questions of this study. Information provided by the survey and interviews was used to describe the factors that affect the successful use of school gardening as a teaching

strategy, teachers' perceptions as to the use of school gardening, teachers' use of school gardening within the curriculum, teachers' personal educational needs to successfully use school gardening, and teachers' perceptions as to the effectiveness of school gardening as a teaching strategy. It is evident from this discussion that teachers who use school gardening in the elementary school curriculum have found it to be an effective and useful teaching strategy for student learning of school subject material.

CHAPTER VII

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter closes with a study summary, conclusions, general recommendations, and recommendations for further research on the use of school gardening in the elementary school curriculum.

Summary

This study examined the factors that affect the successful use of school gardening as a teaching strategy in the elementary school curriculum. A national survey pertaining to school gardening was sent to the elementary schools that had received a Youth Gardening Grant from the National Gardening Association in the 1994/95 or in the 1995/96 academic years. The School Gardening Survey asked teachers, who were currently using school gardening in their curriculum, to identify the logistical or educational factors that were important to the successful use of school gardening at their school. In addition, 28 elementary school teachers, located in the Commonwealth of Virginia and selected from the survey test population, were personally interviewed concerning their use of school gardening. The test population used for both research instruments was composed of elementary school teachers experienced in the use of school gardening. An analysis of the survey and interview data determined whether or not: (a) there were factors that experienced teachers felt were important to the successful use of school gardening; (b) experienced teachers had specific, and possibly different, perceptions of school gardening and how it should be used in the elementary school curriculum; (c) experienced teachers had educational needs related to their use of school gardening; and (d) experienced teachers perceived school gardening to be an effective teaching strategy to enhance student learning.

Conclusions

The School Gardening Survey and the personal interviews provided a wealth of information that can be used by elementary school teachers who are interested in incorporating school gardening into their curriculum. The experienced teachers who participated in the survey and interviews furnished information that identified and described in detail a comprehensive picture of the essential parameters of school gardening as it is used and administered at the elementary school level.

The results of this study indicate that there are indeed factors that significantly increase the chances of successfully implementing school gardening into the curriculum of an elementary school. The teachers who were surveyed and interviewed indicated that several educational and logistical factors were crucial or essential for school gardening to be useful as a teaching strategy and for the successful integration of school gardening into the curriculum.

The factor that was described in the School Gardening Survey as one of the most essential to the successful use of school gardening at an elementary school was the existence of a person, or persons, who takes on the responsibility for school gardening. This person coordinates school gardening activities and administrates the funding and educational needs of garden education. It is this responsible party that lends the support and motivation necessary for pursuing and incorporating school gardening. The survey also indicated that this person, or persons, was in most cases a teacher or a group of teachers.

The survey and interviews also indicated that the support of the principal was high on the list of essential/crucial factors that affect the successful use of school gardening. In addition, one of the factors identified by the survey, and characterized as one of the most crucial factor by the personal interviews, was students' ownership of their learning using the school garden. The understanding of new subject matter is enhanced by school gardening if students become active participants in their own learning and are personally responsible for the plants they are tending. It is evident that the successful use of school gardening occurs when teachers and administrators concurrently support school gardening and understand the effectiveness of its use as a teaching strategy. This results in teachers, administrators and students having ownership of the school garden.

The interviewed teachers also rated the integration of school gardening into the curriculum as equally as important to school gardening success as student ownership of the garden. Context and relevance are given to new information when it is presented as part of an interdisciplinary curriculum. The interdisciplinary use of school gardening provides a format that lays the foundation for student ownership.

It is interesting that when given an expanded list of factors to choose from which included many more educational factors, interviewed teachers found the educational features of school gardening to be more important to school gardening success than the practical features. Interviewed teachers also rated additional educational factors among the second most important factors. These factors were the focus of the school gardening program, the teacher's viewing the garden as a resource, and faculty interest in school gardening. All three of these factors are related to teachers' perceptions and understanding of school gardening, and impact their willingness to use school gardening in their curriculum.

Several logistical and practical gardening factors were determined by the School Gardening Survey to be key to the successful use of school gardening and as equally important as a person who is responsible for school gardening activities. These factors are the availability of a site to grow plants and the availability of funding for gardening supplies. Related to these two factors, and one of the second most essential factors as determined by the survey, was the availability of gardening equipment. The personal interview results grouped the availability of gardening site and of gardening equipment as two of the second most important factors that affect successful school gardening. In addition, the interviewed teachers included the availability of a water source. These interviewed teachers did not, however, rate the availability of adequate funding as highly as these other logistical factors.

If the practical, logistical factors necessary for the process of gardening are available, teachers can employ school gardening to its fullest extent within the curriculum. These practical features are adequate funding for supplies, a site to grow plants, the availability of gardening

tools, and a water source. Unfortunately, funding is a problem at most schools, and a site to grow plants, gardening tools, and water are not always available or easily accessible; therefore, teachers often deal with their practical gardening needs in very creative ways. This study acknowledges the importance of the practical features of gardening, but it also provides an abundance of ideas for addressing each of these logistical needs.

In the School Gardening Survey, the availability of an adequate amount of instructional time was grouped as one of the third most important factors that affect the successful use of school gardening. Interviewed teachers stated in an open-ended question that finding the time to accomplish gardening activities with their students during the school day was the most difficult part of school gardening. They also indicated that additional academic requirements limit the amount of time teachers have available to garden with their students. Although the availability of an adequate amount of preparation time was determined in the survey to be the fifth most important factor, it was verbalized in an open-ended, interview question to be the most time-consuming part of using school gardening. Addressing the time limitations placed on the use of school gardening is important to the successful use of this teaching strategy.

In the School Gardening Survey, teachers rated their gardening knowledge as one of the third most important factors that affect the successful use of school gardening. These teachers indicated that they rely more on their gardening knowledge than they do on their science knowledge when using gardening in the curriculum. They also indicated that their gardening knowledge was less adequate than their knowledge of science. Interviewed teachers, however, rated their gardening knowledge and their science knowledge to be equally important. Providing teachers with the gardening knowledge that they need to support the use of school gardening is an avenue of assistance that can be provided by the horticulture community.

The School Gardening Survey indicated that the practical factor of accessing adequate volunteer help is also grouped among the third most important factors. Teachers are accessing a variety of sources to meet their volunteer needs. Parents and older students are the most accessible and engaged sources of volunteer help, but Master Gardeners are also used by many teachers to assist in school gardening activities. Volunteers are needed to provide an adequate adult-to-student ratio when students are engaged in school gardening activities. This volunteer assistance helps teachers and facilitates successful school gardening.

In summary, there is overall agreement between the survey and the interview results that there are several logistical and educational factors that are important to the successful implementation of school gardening into the elementary school curriculum. These factors are grouped into five areas. First, there must be ownership of the school gardening program by all persons involved. There must be ownership by a person, or persons, who is responsible for school gardening activities. At most schools these “persons” have been identified as the teachers. There must also be student ownership of the learning that occurs in the garden and this learning must be integrated across the curriculum. In addition, the principal must be supportive and interested in school gardening.

The second area concerns the practical features of school gardening that must be addressed for school gardening to be successful. There must be a growing site, water, gardening tools, and the necessary funding for gardening supplies. Third, the preparation and instructional time necessary to engage in school gardening must be made available to teachers. Fourth, the

educational needs of the teachers must be met for them to successfully implement school gardening into the curriculum. Teachers must understand the purpose of school gardening and its value as a teaching resource. They must also be knowledgeable in basic gardening practices and in methods to integrate gardening into the curriculum. Last, the volunteer assistance needed to successfully use school gardening must be met through the community or through the school.

The results of this study indicate that school gardening is being used as the focus of interdisciplinary educational units in the elementary school classroom. In the area of how school gardening is used in the curriculum, 99% of the surveyed teachers and 100% of the interviewed teachers stated that they use school gardening as part of an interdisciplinary curriculum. Survey results indicated that the garden was predominantly used as the focus for learning in science and environmental education. However, teachers also used the garden to teach one or more of the following subjects: mathematics, language arts, art, health and nutrition, ethics, and social studies. Music and physical education were the two school subject areas that were not integrated as frequently as other school subjects. These results indicate that despite the emphasis of science in studies of plant growth, school gardening is used as the focus of an integrated unit that can address most academic subjects.

Teachers also indicated that school gardening can be used as an interdisciplinary teaching strategy to instruct all age groups found in an elementary school, from prekindergarten to sixth grade. In addition, school gardening was used to teach students in special education, English as a Second Language, summer school, and after-school care.

The results of this study indicate that educators who have used school gardening in the curriculum believe that they need additional education to improve their use of school gardening. In the area of a teacher's educational needs, surveyed and interviewed teachers indicated that they are relying primarily on their own gardening knowledge when using school gardening. They expressed a desire to improve their gardening knowledge and to obtain more information on how to integrate gardening into the curriculum. They also indicated that they are most interested in obtaining this education through in-service training by a school gardening expert, Master Gardeners training, or continuing education or graduate level classes in school gardening at the local institution of higher learning. The majority of the surveyed teachers (92%) felt that they would benefit from additional education in the use of school gardening as a teaching strategy. As previously discussed, 75% of the interviewed teachers indicated that they felt adequately prepared in using school gardening. However, to enhance their use of school gardening these same teachers also requested more information concerning the integration of gardening into the curriculum and environmental education.

The results of this study indicate that educators who have utilized school gardening in their curriculum believe that school gardening is an effective teaching strategy. The majority of the surveyed teachers (96%) felt that school gardening was a successful teaching strategy in enhancing the learning of their students. Of the interviewed teachers, 96% indicated that using school gardening as a teaching strategy assists students in learning and understanding new ideas and concepts, 93% indicated that student learning improves when gardening is used in the curriculum, and 93% indicated that school gardening is an effective teaching strategy. In addition, 100% of the interviewed teachers indicated that student attitudes toward the environment became more positive when gardening is used in the curriculum. The positive responses received from

these experienced teachers provides the evidence that the interdisciplinary use of school gardening is a very effective teaching strategy.

General Recommendations

The results of this study indicated that experienced teachers who have used school gardening as a teaching strategy are not only convinced that school gardening enhances student learning, but they are looking for assistance to improve their use of school gardening. The experienced teachers of the test population have been given the opportunity in this study to express their opinions concerning the factors that are important to the successful use of school gardening, to describe the additional education that would be useful to them to improve their use of school gardening, and to describe their needs for additional practical help. It is essential to look at these features and determine methods in which the horticulture community can further assist and benefit elementary school teachers in their use of school gardening. The following recommendations result from the study findings:

Teacher Education. Now is time for the horticulture community to give priority to educating teachers in the use of gardening as a teaching strategy. Motivation for school gardening is coming primarily from the teachers themselves, and these same teachers are expressing a need for further education in gardening practices, environmental education and the interdisciplinary use of horticulture in the curriculum. Therefore, educating teachers should be the prime focus of efforts aimed at improving and expanding upon the use of school gardening. The education of teachers in the use of gardening as a teaching strategy would also provide these teachers with the tools necessary to build student ownership of school gardening.

Education in school gardening should be included at the university level for prospective teachers. Educating new teachers on the value and logistics of school gardening could result in a greater number of teachers becoming interested in the use of this teaching strategy. Established teachers have also requested graduate education in school gardening. Universities have a place in providing the education teachers need to utilize all the positive features of this valuable teaching tool.

The teachers who participated in this study also requested further education through on-site workshops or in-service training by school gardening experts. These “school gardening experts” can be horticulture students educated through the university in the fields of horticulture and education. The horticulture educational community can provide the professional horticulturists who will be able to address the logistical and educational issues and needs of school gardening within the elementary school system.

The Cooperative Extension Service is a local, accessible source for horticultural information. Horticulture Extension Agents, who could be trained in the educational aspects and benefits of school gardening, could combine their knowledge of horticulture and education to provide the school gardening expertise needed by school personnel.

Another form of school gardening education that teachers requested was Master Gardener training. Master Gardener training for teachers needs to be made available at hours during which teachers can attend. Teachers should also be able to pay back their Master Gardener volunteer hours through gardening with their students beyond regular classroom activities for which they

are paid. This interaction between the Master Gardener-trained teacher and the students in the garden is a valuable form of volunteer service.

An alternative to teachers acquiring the complete Master Gardener training, is for a School Gardener class to be devised which addresses the specific needs of teachers. This class could be conducted and taught by trained Master Gardeners and delivered to teachers through workshops or in-service training.

Again, if the use of school gardening starts with the teachers, then the teachers must become the focus of school gardening education. The concept of providing teachers with in-service training and a structured, corresponding curriculum has led to the successful education of teachers on environmental issues through "Project Learning Tree," "Project Aquatic," and "Project WILD." This gives strong justification for the compilation of a comparable program supported by the commercial horticulture industry and the horticulture educational community that provides in-service, school gardening education for teachers.

The horticulture community can also assist teachers who are interested in using school gardening by developing practical horticultural techniques and curriculum materials specifically related to the defined parameters of gardening in a school situation. Growing plants with young children in a school situation has limits that are not found under normal growing conditions. Teachers need information on how to nurture plant life and learn from gardening within these parameters.

Interviewed teachers asked for practical information such as the types of seeds and plants that could ensure successful planting when used by young children. Furthermore, they indicated an interest in learning more about specific horticultural plants that are part of our everyday lives and obtaining learning activities related to those plants. These teachers indicated that they are limiting themselves to a few types of plants because of their inexperience, and the lack of knowledge concerning the variety of plants available to them for student learning and exploration. These are but a few of the practical areas of gardening and growing plants where teachers are seeking information and asking questions. Horticulturists have the answers.

The information that horticulturists can provide is not limited to the practical process of growing plants. Horticulturists possess a wealth of knowledge concerning the science of growing plants, but it is important to pursue other facets of everyday life that have been affected by plants in the past, present, and future. Increased attention and study should be focused on integrating school gardening into the many subject areas that make up the elementary school curriculum. Expanding beyond mathematics and science allows teachers to extend school gardening in every academic direction. Teachers are asking for more information on plants in these topical areas, and horticulturists have the ability to provide these resources through a variety of venues such as the development of instructional materials and teacher education.

Addressing the Logistical Features of School Gardening. The Youth Gardening Grant from the National Gardening Association was devised as a way for schools to obtain some of the materials that they need for school gardening. This grant is supported by the commercial horticulture industry. The Youth Gardening Grant is an excellent, efficiently administered program, but it may behoove the industry to look further into ways that it can assist schools. The commercial horticulture industry already has developed garden-related fund-raisers for schools where schools receive a percentage of the sales when students sell plants, seeds, gardening T-

shirts, or other garden-related items. Companies also sell at a low price, or donate, dated seed to schools, or match funds for student-driven, community horticultural projects. These programs currently exist, but the industry could do more to assist schools in their use of school gardening. Those working in each specialized area of horticulture can visualize ways that they can help schools at the local or national level to access funding or supplies for school gardening.

Teachers can also help each other. Teachers are finding a plethora of creative ways to deal with the many logistical needs of school gardening such as funding, tools, gardening sites, sources of water, educational materials, and plant materials. They need to share these ideas with each other through an easily accessible communication format. A state or national newsletter that provides a forum for idea exchange would be useful to address this need. The National Gardening Association currently provides this resource through its publication *Growing Ideas*, but this periodical is available only to subscribing teachers. A possible source for the origin of a state-wide school gardening newsletter would be the Cooperative Extension Service in conjunction with the State Department of Education. The horticulture industry needs to encourage the Cooperative Extension Service to work as an outreach to the educational community.

Time. Surveyed and interviewed teachers indicated that one of the most time-consuming parts of school gardening was the time spent preparing for gardening activities. This preparation time included searching for horticultural information to assist them in the integration of school gardening into the curriculum, and acquiring the necessary tools and plant materials needed for school gardening projects. In addition, teachers are limited in the amount of time they have available for school gardening within the school day due to the myriad of scheduled itinerant classes and the necessity of meeting other academic requirements. These restraints limit the amount of time available for learning through the use of school gardening.

It is important to address areas that can decrease the amount of time teachers spend preparing for school gardening activities. Preparation time can be decreased through the easy accessibility of tools, plant materials, educational materials, water, and gardening sites. It can also be decreased with the help of volunteers who will take on the responsibility of preparation for gardening activities.

To increase instructional time, school gardening must be seen as a way to meet the educational standards mandated by the school system. In doing this, teachers can justify the time spent learning in the garden. The education of teachers in the use of school gardening to meet these educational requirements can be met through previously discussed educational formats.

Volunteers. Surveyed and interviewed teachers indicated that Master Gardeners are one of the most used sources of volunteer help. The Cooperative Extension Service needs to assist teachers in their use of school gardening through its training of Master Gardeners. A specific curriculum should be developed to educate Advanced Master Gardeners in methods that will allow them to help teachers as either horticultural experts, or as school gardening volunteers. Master Gardeners need to be taught why gardening is used in the educational curriculum and how they can truly aid teachers when gardening with students. This additional training would improve the assistance that Master Gardeners provide, and it would result in greater benefits to student learning.

School-Gardening Curricula. Although surveyed and interviewed teachers rated the availability of a garden-based curriculum as one of the least important factors that affect the

successful use of school gardening, some of the surveyed teachers' comments indicated that they were interested in accessing information through this medium. It also must be pointed out that the teachers who responded to both the survey and the interview questions were highly motivated in the use of school gardening. These teachers have already spent time searching out information and making connections between school gardening and curriculum subjects. These teachers have succeeded without a garden-based curriculum, but this does not mean that it would not be useful to them. A structured curriculum is also a method to reach and support teachers who are interested in using school gardening but do not feel adequately prepared to use this teaching strategy.

The availability of garden-based curricula could decrease preparation time by providing the necessary materials and information needed to support school gardening activities. It could also increase instructional time by providing the link between state-mandated educational requirements and learning in the garden. A garden-based curriculum could provide ideas and information that expand the use of school gardening by experienced and non-experienced teachers.

It would be beneficial to teachers if the horticulture community would develop garden-based curricula that are grade appropriate, interdisciplinary, and geographically and socially relevant. Also, considering that teachers are not receiving outside or additional funding for school gardening, this curricula should be low-priced or free for educators. The *Lifelab* and *GrowLab* curricula are currently the most comprehensive curricula available that feature school gardening. Despite the fact that both *Lifelab* and *GrowLab* are science-based curricula, they are partially interdisciplinary and meet teachers' requests for an integrated curriculum across some subject areas. In addition, developed curricula which are plant-based, such as *Ag in the Classroom* which integrates the broad field of agriculture across the elementary curriculum, are also available. However, an array of interdisciplinary gardening curricula need to be constructed to meet each state's distinct geographical needs and varying state-mandated requirements for education, and to address all appropriate academic subjects areas.

The need for curriculum integration may be an avenue for the horticultural community to assist teachers in their use of school gardening. Providing information on plants and plant growth that are outside the realm of "science," and that is grade appropriate, would benefit teachers and the use of school gardening. This information could include such topics as the influence of plants on history; plants in art and music; plants and religion; plants in literature; plants and human interactions; plants and their relationships to health problems such as tobacco, drugs, and alcohol; and, plants and their importance to medicine, human health, and nutrition. The entire list of educational topics that can be addressed through a study of plants is too lengthy to include here.

There are a variety of student populations that have accessed the benefits of school gardening. Many special education schools or classes are using school gardening in their curriculum. It would be an asset for the teachers of this special needs group to have the gardening materials and teacher education that address the varying needs and goals of these particular students. A curriculum for these students would differ greatly from the standard elementary school garden-based curriculum, as it would need to redefine learning goals and student learning expectations.

The inclusion of prekindergarten children into the elementary school is becoming widespread. These children have been determined to be "at-risk" and require early intervention to

address their individual educational and social needs. Interviewed and surveyed teachers indicated that using school gardening with these children provided both a social and an educational benefit. The provision of garden-based curricula and appropriate learning materials that address the specific needs of these “at-risk” children would assist both teachers and students.

In some school districts, school gardening is being used to involve students, for whom English is not their native language, in the learning process. The connections between plants, geography, history, and culture makes the garden an ideal place for exploring language, the diversity of people in culture, the diversity of plants in cultivation, and the international community. It would be difficult to write complete gardening curricula for every language or culture that presents itself in a school system. It would be possible, however, to provide garden-based learning materials in the most commonly found languages to assist in the learning of English through the gardening experience. These same materials can be used by English-speaking students in conjunction with learning units on international studies.

A garden-based curriculum that provides teachers at year-round schools with appropriate information and learning activities that can be carried through the summer months would differ greatly from a curriculum that is used during a standard, September- to-June school year. With the advent of year-round schools, there will be, in all probability, an increase in interest in school gardening. Year-round schools provide an excellent forum for school gardening as students can maintain and learn from gardening throughout the entire growing season. As this change in school scheduling becomes more common, the usefulness of school gardening in the curriculum will increase, and some of the problems faced by teachers using school gardening may decrease. The development of school gardening educational materials for year-round schools is an important need for the future of school gardening.

Recommendations for Future Study

Using this study’s findings and conclusions as a basis for further research, the following recommendations are offered to expand upon this information

Useful information was obtained from personal interviews conducted with a small population of the elementary school teachers who are using school gardening in their curriculum. However, it would be informative to conduct in-depth interviews with a larger population of teachers who have used school gardening, in a larger geographic or more diverse demographic area. These interviews could pinpoint problems of school gardening implementation that are geographically or socially specific. These interviews also could determine if there are differences among the differing demographic communities that use school gardening.

This study survey and interviews determined that school gardening is used at every grade level found in elementary schools. It would be of value to research the differences in the use and application of school gardening at different grade levels.

It would also be informative to locate schools that have access to a greenhouse. A study of these schools and their utilization of the greenhouse could describe a venue where horticultural assistance could be of great help. Teachers who are employed at schools with greenhouses indicated that they are often unable to thoroughly utilize this facility. Where can they get the

special training needed to run and use a greenhouse facility? How can the horticulture community help teachers use a greenhouse in their curriculum?

This study looked into the different ways that schools are administering their school gardening programs. The information obtained from this study did not determine if there is a correlation between the administration of school gardening and school gardening success. It would be useful to ascertain the impact on the long range health of a school gardening program of the active input of a large group of people. Do programs run by a committee last longer and have greater depth within the school than those run by one or two people?

It would be very informative to survey teachers who are experienced in the use of school gardening, regarding the methods, education, and materials they would recommend for teachers who are inexperienced in the use of school gardening. These recommendations would assist educators and horticulturists in defining areas in which they could assist teachers who are new to the idea of school gardening.

Additional research that quantifies increased student learning through the use of school gardening in the curriculum is recommended to provide evidence of student learning through this teaching strategy. Sheffield (1990) quantified learning using a garden-based curriculum for underachieving elementary students, but this information should also be obtained for normally achieving elementary school students. The survey results in this study indicated that school administrations are not providing significant financial support to school gardening. Research that quantifies levels of student achievement with the use of school gardening in the curriculum could provide the evidence necessary to enable school administrators to recognize the beneficial influence of school gardening in the learning success of their students. Recognition of these benefits would encourage financial and logistical support from the school district.

Finally, a study into the various methods schools are using to incorporate school gardening into the curriculum would be informative to teachers who are contemplating the use of school gardening. What methods are most adaptable to students of varying physical sizes? What methods are more conducive to meeting the various educational needs of the students?

The interdisciplinary use of school gardening in an elementary school curriculum is an idea that is gaining momentum in the educational community. A variety of future studies can be undertaken to assist the horticulture community in identifying and implementing ways in which they can assist elementary school teachers in effectively using this creative, hands-on teaching strategy.

APPENDIX A

School Gardening Survey, Cover Letters, and Follow Up Correspondence

Department of Horticulture, Virginia Tech
Survey on the Implementation of School Gardening into an Elementary School Curriculum

GENERAL SCHOOL GARDEN INFORMATION

1. Please mark the type(s) of school gardening activities that you are using with your students. Please check all that apply.

<input type="checkbox"/> Outdoor garden	<input type="checkbox"/> Raised Beds
<input type="checkbox"/> Indoor 'grow' lights	<input type="checkbox"/> Container Gardening
<input type="checkbox"/> Windowsill	<input type="checkbox"/> Other; please specify
<input type="checkbox"/> Greenhouse	

PLEASE REMEMBER THAT 'SCHOOL GARDENING' CAN TAKE ANY OF THE ABOVE FORMS

2. Please mark the subject area(s) into which you have incorporated school gardening. There can be more than one answer.

<input type="checkbox"/> Art	<input type="checkbox"/> Mathematics	<input type="checkbox"/> Social Studies/History
<input type="checkbox"/> Environmental Ed.	<input type="checkbox"/> Music	<input type="checkbox"/> None
<input type="checkbox"/> Health/Nutrition	<input type="checkbox"/> Physical Education	<input type="checkbox"/> Other, Please Specify
<input type="checkbox"/> Language Arts/English	<input type="checkbox"/> Science	
	<input type="checkbox"/> Ethics (responsibility and nurturing)	

3. Please indicate the goals of school gardening at your school. Please check all that apply.

<input type="checkbox"/> Academic	<input type="checkbox"/> Recreational	<input type="checkbox"/> Other, please specify
<input type="checkbox"/> Social development	<input type="checkbox"/> Therapeutic	

4. Please circle the grade levels in your school that use gardening in the curriculum.

K 1 2 3 4 5 6 special education

5. Please indicate the number of years that school gardening has been part of your school's curriculum.

6. Please indicate if school gardening is to be incorporated into your school's curriculum next year.

YES NO

GENERAL SCHOOL INFORMATION

7. Please indicate if your school is a public, private, alternative or magnet school.

☐ Public School ☐ Private School ☐ Alternative School ☐ Magnet School

8. Please indicate the approximate number of children currently enrolled in your school.

9. Please indicate the type of environment in which your school is located

☐ Rural ☐ Suburban ☐ Urban

10. In which State is your school located? _____

INFORMATION FOR SUCCESSFUL SCHOOL GARDENING

11. Several factors have been determined to be important to the successful implementation of school gardening into an educational curriculum. Please answer the following questions.

		Could school gardening be successful without this factor?		Is this factor adequate at your school?		Check the five (5) factors that are absolutely essential for school gardening success
a.	small class size	Y	N	Y	N	<input type="checkbox"/>
b.	availability of funding for supplies	Y	N	Y	N	<input type="checkbox"/>
c.	teachers' gardening knowledge	Y	N	Y	N	<input type="checkbox"/>
d.	availability of a site to grow plants	Y	N	Y	N	<input type="checkbox"/>
e.	addressing safety concerns	Y	N	Y	N	<input type="checkbox"/>
f.	support of the principal	Y	N	Y	N	<input type="checkbox"/>
g.	teachers' science knowledge	Y	N	Y	N	<input type="checkbox"/>
h.	adequate amount of instructional time	Y	N	Y	N	<input type="checkbox"/>
i.	adequate amount of preparation time	Y	N	Y	N	<input type="checkbox"/>
j.	availability of garden-based curricula	Y	N	Y	N	<input type="checkbox"/>
k.	availability of gardening equipment	Y	N	Y	N	<input type="checkbox"/>
l.	availability of volunteer help	Y	N	Y	N	<input type="checkbox"/>
m.	management of student behavior	Y	N	Y	N	<input type="checkbox"/>
n.	availability of outside, expert help	Y	N	Y	N	<input type="checkbox"/>
o.	availability of storage for supplies	Y	N	Y	N	<input type="checkbox"/>
p.	availability of a summer garden maintenance program	Y	N	Y	N	<input type="checkbox"/>
q.	availability of support materials for garden curriculum	Y	N	Y	N	<input type="checkbox"/>
r.	a person with responsibility for school gardening activities	Y	N	Y	N	<input type="checkbox"/>

12. Please indicate what outside, expert source(s) have been used to assist in school garden education at your school.
- | | | |
|--|---|--|
| <input type="checkbox"/> professional consultant | <input type="checkbox"/> garden club member | <input type="checkbox"/> interested parent |
| <input type="checkbox"/> Co. Extension Hort. Agent | <input type="checkbox"/> commercial horticulturist | <input type="checkbox"/> other, please specify |
| <input type="checkbox"/> Master Gardener | <input type="checkbox"/> botanical garden/arboretum | <input type="checkbox"/> |
13. Please indicate which form(s) of volunteer help have been used when gardening with students at your school.
- | | | |
|--|---|--|
| <input type="checkbox"/> Master Gardeners | <input type="checkbox"/> senior citizens | <input type="checkbox"/> university students |
| <input type="checkbox"/> interested parents | <input type="checkbox"/> garden club members | <input type="checkbox"/> other, please specify |
| <input type="checkbox"/> older students from your school | <input type="checkbox"/> 4-H members | <input type="checkbox"/> |
| | <input type="checkbox"/> High school students | |
14. Please indicate the person (or persons) primarily responsible for coordinating school gardening activities at your school.
- | | | |
|--|--|--|
| <input type="checkbox"/> the principal | <input type="checkbox"/> a parent volunteer | <input type="checkbox"/> a parent committee |
| <input type="checkbox"/> an interested teacher | <input type="checkbox"/> a teacher committee | <input type="checkbox"/> an interested |
| <input type="checkbox"/> a lead teacher | <input type="checkbox"/> a committee of parents and teachers | <input type="checkbox"/> community volunteer |
| | | <input type="checkbox"/> other, please specify |
| | | <input type="checkbox"/> |
15. Please indicate what you consider **adequate** adult/student ratio when participating in school garden activities.
16. Please indicate the primary source(s) of information used to assist in the incorporation of school gardening into your school's curriculum.
- | | | |
|--|---|--|
| <input type="checkbox"/> teacher in-service training | <input type="checkbox"/> LifeLab | <input type="checkbox"/> personal knowledge |
| <input type="checkbox"/> Growlab/Growing Ideas | <input type="checkbox"/> 4-H educ. materials | <input type="checkbox"/> friends/volunteers |
| <input type="checkbox"/> County Extension service | <input type="checkbox"/> Master Gardener training | <input type="checkbox"/> other, please specify |
| <input type="checkbox"/> Educ. Journals/Publications | <input type="checkbox"/> local college | <input type="checkbox"/> |
17. Please indicate the types of educational material(s) used in the classroom to support the use of school gardening in the curriculum.
- | | | |
|--|---|--|
| <input type="checkbox"/> library books | <input type="checkbox"/> computer software | <input type="checkbox"/> Internet |
| <input type="checkbox"/> videos | <input type="checkbox"/> filmstrips | <input type="checkbox"/> personal books |
| <input type="checkbox"/> text books | <input type="checkbox"/> experiments | <input type="checkbox"/> other, please specify |
| <input type="checkbox"/> trade books | <input type="checkbox"/> gardening catalogs & magazines | <input type="checkbox"/> |

18. Please indicate who maintains the school garden(s) when school is closed through the summer months
- | | | |
|---|--|--|
| <input type="checkbox"/> student garden club | <input type="checkbox"/> interested students | <input type="checkbox"/> interested teachers |
| <input type="checkbox"/> 4-H club | <input type="checkbox"/> local garden club | <input type="checkbox"/> Master Gardeners |
| <input type="checkbox"/> interested parents | <input type="checkbox"/> not an issue, we have | <input type="checkbox"/> other, please specify |
| <input type="checkbox"/> we do not maintain the gardens | <input type="checkbox"/> year-round school | _____ |
19. Please indicate the primary source(s) of financial support for school gardening at your school.
- | | | |
|---|--|--|
| <input type="checkbox"/> science budget | <input type="checkbox"/> grants | <input type="checkbox"/> donations |
| <input type="checkbox"/> PTA budget | <input type="checkbox"/> school administration | <input type="checkbox"/> other, please specify |
20. What type of garden set-up(s) are used at your school?
- | | | |
|---|--|---|
| <input type="checkbox"/> small group gardens
(2 to 5 students) | <input type="checkbox"/> large group gardens
(6 to 10 students) | <input type="checkbox"/> topic gardens for all
classes |
| <input type="checkbox"/> individual student gardens | <input type="checkbox"/> a class garden | <input type="checkbox"/> other, please specify |
| | | _____ |
21. Please indicate the types of additional school gardening training you, as an educator, would be interested in obtaining.
- | |
|--|
| <input type="checkbox"/> In-service by school gardening expert |
| <input type="checkbox"/> Continuing education credit offered at the community college or botanical gardens |
| <input type="checkbox"/> Continuing education credit offered at the University/College |
| <input type="checkbox"/> Graduate credit offered through the University/College |
| <input type="checkbox"/> Cooperative Extension training, such as the 100-hour Master Gardener Program |
| <input type="checkbox"/> no further training |
22. Please indicate how you would rank the success of school gardening as a teaching strategy to enhance student learning.
- | | | | | |
|--------------------|------------------------|--|--------------------------|----------------------|
| Very
Successful | Somewhat
Successful | Neither Successful
nor Unsuccessful | Somewhat
Unsuccessful | Very
Unsuccessful |
|--------------------|------------------------|--|--------------------------|----------------------|
23. Please add any comments that you wish to make concerning the success or failure of school gardening at your school.
- _____
- _____
- _____
- _____
- _____

Thank you for participating in this survey!

Please return it by October 25, 1996 using the enclosed, self-addressed, stamped envelope.

GARDENING WITH CHILDREN
A National Survey

October 15, 1996

Dear Principal,

School gardening has become an exciting way for educators to provide hands on opportunities for their students to learn in a living environment. Interest in school gardening is growing rapidly, and its use as a thematic teaching tool has been recognized nationwide. As a winner of a Youth Gardening Grant from the National Gardening Association your school has shown interest in the use of school gardening within its curriculum. We are hoping that you can provide the expertise needed to assist other educators in the successful implementation of school gardening at their schools.

The objective of this survey is to determine those factors that are crucial to the successful implementation of school gardening into the elementary school curriculum. It is **your school's** experience and interest in school gardening that will help define those factors.

This is a survey of elementary schools in the United States that have received a National Gardening Association Youth Gardening Grant. This survey is endorsed by the National Gardening Association and The Horticulture Department at the Virginia Tech University.

Please distribute the enclosed survey packet to a teacher who is actively involved in school gardening at your school. The survey packet includes a cover letter, a questionnaire, and a pre-addressed, stamped envelope for returning the survey by Friday, October 25, 1996

Your participation and assistance are greatly appreciated. If you should have any questions or need clarification, please contact Laurie DeMarco. Telephone: (540) 389-6594, FAX: (540) 231-3083, E-Mail: ldemarco@vt.edu

Sincerely,

Laurie W. DeMarco
Doctoral Candidate, Virginia Tech
VirginiaTech

Dr. Diane Relf
Department of Consumer Horticulture,

GARDENING WITH CHILDREN
A National Survey

October 15, 1996

Dear Teacher,

School gardening has become an exciting way for educators to provide hands on opportunities for their students to learn in a living environment. Interest in school gardening is growing rapidly, and its use as a thematic teaching tool has been recognized nationwide. As a winner of a Youth Gardening Grant from the National Gardening Association your school has shown interest in the use of school gardening within its curriculum. We are hoping that you can provide the expertise needed to assist other educators in the successful implementation of school gardening at their schools.

The objective of this survey is to determine those factors that are crucial to the successful implementation of school gardening into the elementary school curriculum. It is your school's experience and interest in school gardening that will help define those factors. This is a survey of elementary schools in the United States that have received a National Gardening Association Youth Gardening Grant. It is endorsed by the National Gardening Association and The Horticulture Department at the Virginia Tech University. All surveys will be kept strictly anonymous.

Your participation and assistance are greatly appreciated. If you should have any questions or need clarification, please contact Laurie DeMarco. Telephone: (540) 389-6594, FAX: (540) 231-3083, E-Mail: ldemarco@vt.edu

Sincerely,

Laurie W. DeMarco
Doctoral Candidate, Virginia Tech
Tech

Dr. Diane Relf
Department of Consumer Horticulture, Virginia
Tech

Please return your completed survey by Friday, October 25, 1996 in the enclosed stamped envelope.

If you are interested in receiving further information on children and gardening, please fill out your name and address below and return with the survey. This page will be kept separate to maintain survey confidentiality.

NAME: _____

ADDRESS: _____

_____ Please check if you would like the brochure 'Gardening with Children' from the Virginia Tech Office of Consumer Horticulture.

_____ Please check if you would like a copy of the survey results

October 22, 1996

Dear Principal,

Last week a survey was mailed to you that requested your participation in a study on the use of school gardening in elementary schools. As a recipient of a Youth Gardening Grant from the National Gardening Association your school is a leader in the use of school gardening. Your participation is vital to the success of the study, and the future use of school gardening by elementary school teachers.

If the selected teacher respondent has already completed and returned the survey, please accept my sincere thanks. If not, please complete it today.

If for some reason you did not receive the school gardening survey, or it was misplaced, please call me collect at (540) 389-6594 and I will send a survey to you today.

Thank you for your help in this study of school gardening.

Respectfully Yours,

Laurie W. DeMarco
Doctoral Candidate
Virginia Tech

Dr. Diane Relf
Dept. of Consumer Horticulture
Virginia Tech

November 5, 1996

Name
School
Address
City, State Zip

Dear Principal,

About three weeks ago I wrote asking for your participation in a research study focusing on school gardening in elementary schools. At this point, I have not received a survey back from your school.

I am writing to you again to stress the importance of each survey to the study. As a recipient of a Youth Gardening Grant from the National Gardening Association your school has shown an interest in school gardening. You are the 'experts' who have already gone through the process of using school gardening in the curriculum. It is your experiences that will aid other schools in the implementation of school gardening within their curriculum. Your participation in this study is essential.

For your convenience, I have enclosed an additional survey and pre-addressed envelope to be filled out by a teacher who is actively using school gardening in the curriculum. Would you please take a few minutes to select a teacher who can best provide information about school gardening at your school. Encourage the selected teacher to return their survey by November 15, 1996. It is very important that all surveys be returned.

Thank you for your participation in this research project. Your help is greatly appreciated. If you have any questions, please contact me at: Telephone: (540) 389-6594, FAX: (540) 231-3083, E-Mail: ldemarco@vt.edu

Respectfully yours,

Laurie W. DeMarco
Doctoral Candidate

Dr. Diane Relf
Office of Consumer Horticulture

APPENDIX B

Personal Interview Form and Informed Consent Form

Date _____

Interview # _____

Grade taught _____

INTERVIEW FORM

Q. 1

In the past years, many definitions of school gardening have been discussed; there is not an accepted 'right' definition. How would you define school gardening ? Keep in mind that there are not right or wrong definitions. (Item 1)(A card will be handed to the respondent to fill out with their definition)

To make it possible later to compare interview responses we will be using this definition of school gardening for the rest of the interview. It is not any better than the one that you gave me, but it guarantees that all interviews will be based on the same definition

(Set definition in front of respondent and read).

School gardening is.... an educational strategy in which any or all school related subjects are taught through the use of growing plants and learning in a garden. The gardening activities can involve growing plants indoors or outdoors in a variety of ways that differ with every schools situation. For example, gardening can occur in such places as windowsills, under grow-lights, in containers, in a terrarium, or in a plowed garden plot.

Q. 2

In which of the following subject areas do you include gardening and growing plants as the focus of a discussion or an activity? (Open ended; check all named by respondent)

<input type="checkbox"/> Art	<input type="checkbox"/> Mathematics	<input type="checkbox"/> Reading
<input type="checkbox"/> History / Social Studies	<input type="checkbox"/> Music	<input type="checkbox"/> Science
<input type="checkbox"/> Language Arts / English	<input type="checkbox"/> Physical Education	<input type="checkbox"/> Other, specify
	<input type="checkbox"/> None	_____

Q. 3

Where in the school curriculum is school gardening the most useful? (Open ended; record answer verbatim)

Q. 4

What do you find is the most difficult part of using school gardening as a teaching strategy? (Open ended; record answer verbatim)

Q. 5

What things do you feel contribute most to the amount of time school gardening takes? (Open ended; record answers verbatim.)

Q.6

Have you had additional training or education in how to use gardening as a teaching strategy?

Y N

As nearly as you can recall, where did you obtain this training?

___ Course Title _____

___ Workshop Title _____

Q.7

Do you feel adequately prepared to use gardening as a teaching strategy in your classroom?

Y N

Q 8

What areas of additional education would you be interested in obtaining to improve your use of gardening as a teaching strategy?

___ Environmental education

___ Soils

___ Gardening skills

___ Garden pest control

___ Basic plant science

___ Weed control strategies

___ Integrating gardening into the curriculum

___ Other

___ Basic science

Q. 9

On each of the cards in your deck is a factor which others have described to affect the successful use of school gardening as a teaching strategy. Please separate these cards into three piles as follows:

In the first pile, place those factors you feel are most important to the successful use of school gardening. (Place card labeled “Most Important” in front of respondent.)

In the next pile place those factors that you feel are important, but not necessarily most important, to the successful use of school gardening. (Place card labeled “ Important” in front of the respondent)

In the last pile, place those factors which are not important. (Place card labeled “Not Important “ in front of respondent)

If there are any that you feel are missing, you can write them on these black cards and rank them with the others. (Place blank cards and pen in front of respondent; allow time for cards to be separated.)

Now take the first pile you have selected as most important and select the five factors that you feel are absolutely **essential** to the successful use of school gardening. (Record ranking in the appropriate cells using the numbers on the back of the cards.)

Most important	Important	Not important
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Q 10

Please circle the word which indicates how true you believe each statement to be.

Check Here	Always True	Often True	Sometimes True	Never True	If Don't Know
1. I am comfortable using school gardening as a teaching strategy. in the areas that I teach	Always	Often	Sometimes	Never	_____
2. I have a good background for using school gardening in the curriculum	Always	Often	Sometimes	Never	_____
3. Using gardening in the curriculum is worthwhile.	Always	Often	Sometimes	Never	_____
4. Using gardening as a teaching strategy assists students in learning and understanding new ideas and concepts.	Always	Often	Sometimes	Never	_____
5. Gardening is best used in the science curriculum.	Always	Often	Sometimes	Never	_____
6. Student attitudes toward the environment become more positive when gardening is used in the curriculum.	Always	Often	Sometimes	Never	_____
7. I feel ineffective when using gardening in the curriculum	Always	Often	Sometimes	Never	_____
8. Student behavior improves when gardening is used in the curriculum.	Always	Often	Sometimes	Never	_____
9. Student learning improves when gardening is used in the curriculum	Always	Often	Sometimes	Never	_____
10. School gardening is an effective teaching strategy.	Always	Often	Sometimes	Never	_____

Item 1

School gardening is.....

Item 9

CARDS

- 1 - availability of storage for supplies
- 2 - adequate amount of preparation time
- 3 - availability of a site to grow plants
- 4 - availability of garden-based curriculum
- 5 - availability of a summer garden maintenance program
- 6 - teacher's gardening knowledge
- 7 - management of student behavior
- 8 - availability of support materials for garden curriculum
- 9 - a person with the responsibility for school gardening activities
- 10 - availability of gardening equipment
- 11 - availability of volunteer help
- 12 - support of the principal
- 13 - addressing safety concerns
- 14 - teachers' science knowledge
- 15 - adequate amount of instructional time

- 16 - small class size
- 17 - focus as to the purpose of the gardening program
- 18 - pressure to meet other academic requirements
- 19 - availability of a water source
- 20 - help from support staff for mowing, plowing etc.
- 21 - accessibility of the gardens to the students
- 22 - support from the school district
- 23 - vandalism
- 24 - teachers viewing the garden as a resource
- 25 - availability of outside, expert help
- 26 - faculty interest in school gardening
- 27 - long-range plan for the gardening program
- 28 - availability of funding
- 29 - integrating gardening with other subject matter
- 30 - student ownership of the gardening project

Sample Introduction Used for Interviews with Teachers

Hello, my name is Laurie DeMarco. I am a graduate student at Virginia Tech, and this interview is part of a research project. I really appreciate the time you're giving me. This interview will be used to clarify results received from the school gardening survey conducted this last fall. The interview will take about 15 minutes, and consists of a series of questions that will give us input about your perceptions of school gardening. I'd like to stress that there are no 'right' or 'wrong' answers to these questions, and that your care in responding to each question is absolutely essential to the success of this study. I'll be doing some writing as we go along since several of the questions are open-ended and I want to record your answers as accurately as possible. Your answers will be entirely confidential, of course. You'll be known only by a number to the principal researcher. So, let's begin.

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants of Investigative Projects

Title: The Factors that Affect Elementary School Teachers' Use of School Gardening

Principal Investigator: Laurie W. DeMarco, Dr. P. Diane Relf

Justification of This Research:

The purpose of this research is to identify the factors that are most important to the successful implementation of school gardening into an elementary school curriculum. School gardening is gaining recognition as an effective, thematic teaching tool that provides students with hand's on learning experiences in the living environment. Many schools have already incorporated school gardening into their curriculum. It is the intent of this research to tap the expertise of these schools to identify those factors that are essential to the implementation of a successful school gardening program. Educators at nine elementary schools in Virginia will participate in this research project.

Procedures:

The procedures to be used in this research are (1) the completion of a personal interview, and (2) a statistical analysis of the data collected. The participants will be asked to respond to a structured interview. The time required by the participants to respond to the interview questions will be one session of approximately 15 minutes.

Risks and Benefits of This Project:

There will be no personal or physical risk to the participants in this project. The benefits to the educators and the schools will be a better understanding of the parameters that define a successful school gardening program.

Extent of Anonymity and Confidentiality:

Individual interview responses will be kept strictly confidential with the researchers. At no time will the researchers release the responses to anyone other than the individuals working on the project. There will be no names on the interview forms to relate the interview responses to a given participant.

Compensation:

There will be no compensation for participating in these interviews.

Freedom to Withdraw:

Participants will be free to withdraw from the interviews at any time. Participants are free not to answer any questions that they choose without penalty.

Subject's Permission:

I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent for participation in this project.

If I participate, I may withdraw at any time without penalty. I agree to abide by the rules of this project.

Signature

Date

APPENDIX C

Teachers' Comments From the School Gardening Survey

This is a huge success in our school We will be purchasing a greenhouse in March. Funds were raised through an annual Mother's Day plant sale. We net \$600.00 per year! - Massachusetts.

Our gardening program has been very successful. All involved has benefited greatly. - Massachusetts

We are really just beginning and expect our program to grow and involve more teachers and students. - Rhode Island

My biggest problem is that for years I have been the sole person responsible for our courtyard. During the last few years, I have been able to interest other teachers through my Courtyard Festival, Adopt-a-Plot program, etc., But I am still the main gardener and do the many jobs not desired by others. I teach all subjects in my 4th grade class and have a great deal of difficulty fitting everything in. - New Jersey

Despite any complications, gardening and enjoying the garden with (families and) students has been increasingly fulfilling. Again, best advice would be to start small and add to gardening projects. It is difficult to cut back...much easier to add when things are running smoothly. It is easy to burn out your energy! Butterflies are a great help to us in building enthusiasm for gardening - so are other animals. - New Jersey

I teach all subjects in my classroom, thus it has been very difficult to find the time to do this. Gardening must be done in small groups, so you need volunteers and then must find other things for the students in the classroom. I very often relinquish my lunch time in order to work with small groups in the garden. Summer maintenance and is a huge problem. Until this summer, I did it all, which meant that I never truly had a summer vacation from school since I came to water 2-3 times per week. I have now decided to plant pumpkins and flowers in the spring, or crops with very low maintenance. - New Jersey

Our gardens have been successful due to hard work of students and a few parent volunteers - orchestrating is at times hard to do when you teach all day and spent pre-school hour and recess with kids gardening. I am the art teacher and I run the garden club and have to be instrumental in acquiring grants and doing other fund raising. But it is an undertaking - I do it because I want the kids to fully enjoy their school and take pride in it. It is great to hear their excitement in the beauty they see as they enter the building, but at times squeezing it in 3 days a week makes me wonder! -New Jersey

My own personal motivation is the one element that keeps this program alive here. I know nothing about gardening when I started and I grew with the children - New Jersey
Our school garden is struggling! We have a problem with vandalism that can be very discouraging. We need a summer maintenance program. Also teacher enthusiasm and participation is more sporadic than on going. However, we have a newly formed Garden Club and are in the process of writing another grant! - New York

Sometimes we simply play with soil. Miniature landscapes to demonstrate seasonal changes is a special feature of our program. We visit 14 different classes. The follow-up varies from group to group - New York

Our school garden has been successful due to the cooperation of volunteers, community groups and dedicated staff and supportive administration. We have grown thanks to grants and donations. Please come visit! - New York

It is a truly wonderful experience. The children get a lot of hands on experience and learn a lot. Teachers need more prep time to accomplish all of the goals. - New York

We will need more support from volunteers outside the classroom and time - this has been an issue from the start. It is difficult to fit this component into the classroom program and we do not need another add on program. This is why we work at lunch time in small groups. We have a plan and a master gardener began the gardens with the students. - New York

The teacher that got the grant retired. So 6 and 5 grade gardens were 1 year only. The flower (annuals) have been planted by the students for 5 years. - New York

School gardening has given my students (emotionally disturbed) invaluable opportunities to develop socialization skills, build self esteem, strengthen life science knowledge, and develop outside interests or hobbies. - New York

The support of our school districts administration was severely lacking from the principal to superintendent. As a result, faculty interest was not sustained and our gardens have become projects for 1 teacher and a few parent volunteers. - Pennsylvania

Teachers need more time and expert help to make the garden work - the design is not user friendly for classroom use - Pennsylvania

We were very grateful for the support we received from the National Youth Gardener's Grant! It truly jump started our program. Our greatest challenges continue to be a shortage of time and volunteer help and an overabundance of pressure to meet other academic requirements. Six forms of testing really interfere with the ability of upper grades to participate in gardening, especially in the Spring. Thank you! I've become aware of alternative support systems just from completing your survey. - Maryland

Gardening has added another dimension to thematic learning (we can grow Bok Choi when studying Asia under grow lights for example). We have started composting to nourish our garden which has included math patterns, insect study and decomposition. - Pennsylvania

We are a small (very small) school. Each student (years 1-8) chooses a vegetable to collect seed and ones to start seed indoors and transplant to the garden. Each class has a flower bed and the grades 5-8 have a fruit to care for. They choose from the strawberry, raspberry or blueberry beds or the seed garden. Third grades always have a daisy bed, 4th grades a wild flower garden, 1st grades a perennial bed. It's great! -Virginia

Sorry for the delay in responding. I would love to see a curricula. I feel like I am starting from square one each year. - 1) photosynthesis with tinker toys for chemical model of H₂O, O₂, CO₂, glucose, 2) littering 3) decomposition 4) recycling - landfill 5) trade issues 6) plant evolution. Please send suggestions! I try to address the needs of our school community. Give the threat of discrimination in our society as well as littering and our need to recycle I connect those critical needs with beautifying the school with color and flowers. Would love to see a curriculum - Virginia

As a special education school a lot depends on our students physical as well as their mental abilities. Also behavior plays an important part as well. We do potted plants, hanging baskets. In the spring we do a lot of vegetable plants outside flowers. This is also when we plant a small garden. I think we have a good program and the students really enjoy 'greenhouse'(this is what we call the program). - Virginia

Although we have begun a garden program, enthusiasm and involvement is shrinking in its now 2nd year. - Virginia

Our school gardening is done on a voluntary basis - only those teachers and classes participate that want to. No teacher is forced to use the garden curriculum. The ones who do use the curriculum usually see the benefits and stay with it. - Virginia

I believe most teachers at my school feel too pressured by covering the regular curriculum to make time for going in the garden I know Fishburn Park Elementary in Roanoke VA has the environment as the focal point of their curriculum. Without that focus, or more direction from the administration, the garden program here won't get past the individual teacher's inclination to use the garden or not. If a separate environmental garden resource teacher position was created that would take pressure off the classroom teacher and activities in the garden could be scheduled just like Art, Music or PE - Virginia

It is critical to have a teacher's interest (not necessarily knowledge) supported by parent or outside helper to coordinate the preparation and activity. To be effective, follow through activities are important so that a gardening project becomes an on going rather than one time activity. - Virginia

Gardening is a wonderful way for children to relax or let go during the day. A wonderful learning experience. - Virginia

It has been a source of pride for some otherwise unmotivated students. - Virginia

There are only two classes that use the regular vegetable garden. It was started by us and it's success has kept us going despite the extra work. Our students really enjoy it! We use it more every year (next year we add a butterfly garden). - Virginia

Our success in gardening ultimately depends on teachers taking it up with enthusiasm and engendering this enthusiasm and interest in the children - North Carolina

Success lies in the design and accessibility of the gardens to the students (raised beds, fenced, central location) Less successful has been teachers involvement, difficulty in fitting this into their schedules and maintaining a group of volunteers to participate in upkeep. - South Carolina

Interested, dedicated teachers are an absolute necessity. Maintaining a garden is a lot of year round work. - South Carolina

I have watched our program grow from 20 to 44 students - We plant around our school, in the community and are now beginning a historic restoration project. My children compete in poetry, poster and educational contests. They raise plants for their friends, families and public display. They conduct Arbor Day, Earth Day and mentoring programs. Our program is most successful because students have ownership, responsibility and a love for the work we do. This program was begun by a senior group of gardeners, ages 73 to 96, 12 ladies who wanted to perpetuate stewardship and ownership. They hold joint meetings with us 3-4 a year. - South Carolina

Our garden is growing each year with the help of grant money, PTA, school and parent support. Each year my students add something special to the garden. We have a birdfeeder, bird bath and four bluebird houses (4 babies). This year we will add a pond and home-made stepping stones. These additions bring 'ownership' of the garden to all past and presents students. They love to come back and visit. - Georgia

My garden started in the classroom years ago in pots and bedding trays, then to a back porch areas and then to a real garden where each year has gotten better. Now we have two rows of veggies, herb tray and compost area - two gardens a year! I love it! - Florida

We have a class gardening competition once a year. The local garden club provides the judges and the prizes. - Florida

Our school has been placed on the critical low achieving list by our State (very urban) I do not feel that I get the support needed since all our emphasis is being placed on "getting off the list" I really believe that activities that can be integrated with gardening/academics. There is a new administration and this has been an obstacle since, but I am working on it "I do believe" - Florida

The children adore our garden, spending many additional hours before and after school. We started with a butterfly - environmental garden which includes a fish pond and have expanded to a veggie-herb-fruit garden which is currently under construction. If it wasn't for my interest in gardening then this garden would not be as successful as it is. - Florida

Enclosed is an article about my garden. Parents love it and request me for their students. Science and Math scores are up for students who have been on the "Rainbow Gardening Team"!! - Kentucky

Students have a need for hands on training in this field (can use in every day life) (some teachers are definitely novices) (few teachers totally unsupportive - would be that way for anything they or buddies didn't present) Most are supportive! Wonderful support from parents; garden club members, Organizations - source of much help Extension/Conservation Offices Businesses - supportive - Kentucky

It is very hard for classroom teachers to always find the time to take their students out to garden on a regular basis. Also, not all teachers are interested in gardening so they don't participate. Looking back, we should have started with a smaller plot and prepared the soil more before planting. - Ohio

Thanks to the Youth Garden Grant we were able to make this garden a reality. Maintenance and vandalism has become an issue. - Ohio

This is a school goal. We are writing grants to add to our outdoor lab. We are still in beginning phases. - Indiana

Our school is unique in the respect that we are a school for visually impaired students. Our population consists of students K - 12 including special needs populations. The Horticulture Department primarily served upper school students until the past 3 years. As elementary students have become involved, our needs and experiences have changed. We are grateful for the opportunity to expose younger children to gardening! - Indiana

I think the excitement and direction of the teacher is very important - Ohio

Unfortunately for us the weather wasn't cooperative. We had 2 flooding occurrences in June which wiped out our gardens. We will replant this spring. - Indiana

The success of using it as a learning tool depends on the teachers. All are given ways to teach with it but not all are using it. Lots of extra work for teachers involved. Need lots of local building and district support. Has been an extremely positive experience here! - Michigan

Because our schedules are tight, staff members are sometimes reluctant to use the garden as often as I wish they would. - Wisconsin

We have been very successful with our gardening program. Interest and support are the main reasons why we have been successful. - Minnesota

My class is really the only one involved. Others have been offered supplies and help in getting started. Our situation is not ideal. The garden plot is far from the building with no water available. I would like to see the program succeed. My class loves this life skill they are learning by doing. Perhaps I need to be the gardening person, like a science teacher. - Illinois

One teacher has taken the lead in developing our gardening curriculum. She is doing most of the organizational work. - Illinois

We have a beautiful garden - butterfly garden, prairie pond, Japanese garden and George Washington garden - all the dream of a dedicated parent. - Illinois

Inner city is a challenge. Best hope for solving education of these children is through this concept - Cabrini Green - Illinois

It is very important that the students do most or all of the work. Teachers should just be a guide - but it is for the students to learn. - Louisiana

We need to get more teachers interested in becoming involved. We need more help from support staff for mowing, plowing etc. - Oklahoma

Because our school served very poor students; most on welfare, some homeless, this gardening project was a 'light' in a very dark tunnel. It was therapeutic and helped many students work out anger and anxieties. One student rarely spoke in class but would speak to the plants. The gardening grant really helped our school. It also helped our volunteer and teaching staff. One teacher did not know strawberries grow on little plants, she thought they grew on trees! - Oklahoma

After our first year, we have had to go back and review our plans. We have gone back to the drawing board to make our garden more simplified. We are struggling to keep the garden an important part of our school. - Texas

Our National Gardening Grant really was a tremendous boon to our gardening program. We received tools and supplies we would otherwise never obtained. - California

Each class grades 2-6 has their own garden based on their social studies theme. For example: 4th grade studies Japan - they have planted a Japanese garden. Sixth grade studies the Mediterranean - they planted a Mediterranean Garden. - California

A paid year around garden coordinator is essential - California

We developed our garden using SIP funds. We trained teachers in Life Lab with District mentor teacher funds. We had a garden aide with mentor funds. We have a CA State Environmental Education grant to pay teachers for ACPE training this year and provide literature. The key factors are participation, teacher interest in gardening, and parent volunteer support. - California

Management is difficult - both time management and how to work the area with 120 students. Also find it difficult to maintain the garden during off-track times (We're a year round school) We find gardening with children to be so successful though. Kids love it and gain so much from the experience. We have tried to use parents to maintain the gardens during the summer but haven't had much success- - California

In our experience the most important variable concerning the success at the school garden is the interest of the teacher in each class. - California

I would like to feel more involved. Would like it to begin early in year and be continuous throughout the school year. Would like to be in the garden myself at a time during the day we have it. - California

The garden is a great success because I love the garden and spend a lot of energy caring for it. You need one adult who really will take charge and care for the garden. A garden needs love - students will also love the garden if they see that it is cared about by their teacher. The students do much work, but I must constantly supervise and instruct. It is a labor of love that takes a lot of time and energy. - California

Financial resources are difficult to come by. - California

Our garden (class plots) is being relocated this year due to portables moving in. - California

Some money or regular donation source is essential. Having regular volunteer help greatly increases opportunities for students. It can be done without but students don't get as much out of it. - California

We are really just beginning - As of now we have 40 raised beds, water to beds, weed barrier and wood chips in. It is difficult to get teachers involved in maintaining and realizing that there are incredible benefits to school gardening. - California

The kids that get involved are very engaged in their learning experience. Many of the kids continue activities of garden maintenance on their own. As a counselor I don't have a class so I am always rounding up kids in different ways. I think it would be easier for a teacher to carry out a project because of their ability to have the kids daily. But I keep selling the garden project to whom ever will listen! - Washington

Teachers will get invested if they integrate their garden theme with curriculum, Parents and volunteers can make a big difference but teachers need to own it. - Massachusetts

We are a private school with a population of adolescent sex offenders. Therefore, our interaction with the community and volunteers is extremely limited - Massachusetts

A strong garden curriculum needs to be a “community” effort between teachers and volunteers - programs need to have bearing on curriculum within school (i.e. social studies, science) as elementary programs are packed with curriculum to teach. - Massachusetts

Our garden has been run entirely by interested volunteer parents and a couple of teachers, and a library aide. We would really benefit from training and a wider commitment. We are trying to move toward greater use by improving the maintenance of the garden (raised beds with mulched pathways; a garden plan) but I feel we need more training as well - Rhode Island

Our garden is for the most part one of enjoyment - it is not curriculum driven - as much as it is just an aesthetic place. - Maine

Success can be increased if gardening was part of a core-curriculum. - Vermont

We started off slowly with a parent volunteer just tilling the ground and worked our way up to raised beds, compost bins, picket fence, shaped beds, brick walk and bird feeders. - Connecticut

Most successful when incorporated into curriculum - using class time as opposed to a voluntary club activity. - Connecticut

The school gardening program is a great addition to our school Support is essential to keep it going-support from teachers, administrators and parents. Our main problem has been weed control and people who are more concerned about the garden’s appearance than what is grown in it. - New Jersey

The success of our courtyard project is directly attributable to the involvement of parent volunteers - New Jersey

We have received many compliments from the local community regarding the beautification of the neighborhood as a result of the school garden - New York

Not enough time given to this activity. Not enough garden space at school. Not enough follow-up in classrooms. Difficulty in obtaining teacher preparation time. Need more support from the district. - New York

Working with severely handicapped students (autistic and emotional) our progress can be somewhat limited at times since the focus is on learning. We are quite limited with funds but do the best we can with fund raisers and donations. - New York

Our school has just started a junior garden club as a spin off of our Natural Habitat. It has 118 students. Our 4th and 5th graders also study the square kilometer around our school as part of the Selbourne project. - New York

We have a wonderful time with our gardening projects! It has been a great success - New York.

It would be ideal if a school could have an outside person or a teacher who does nothing but gardening experiences with the children. As teachers, we are almost too pushed with “musts” during the day. - Pennsylvania

Our program is successful mainly because we use native plants. Gardening is the one program that is effective for all students - Delaware

We have found our school garden to be of benefit to students from regular and special education programs. For some students it is a way of demonstrating competence that we would otherwise not see in an academic environment. - Pennsylvania

Teachers don't need a lot of gardening know how, they can learn with their students... a let's see what happens attitude are risks the kids are willing to take - it sparks discussion and interest in researching the answer - an outdoor site is not absolutely necessary - classroom/container gardening and warm boxes can reach many of the same lessons/learning! - Maryland

I believe that educating staff is essential to the usefulness of our project. Without ongoing education, all you have is a nice landscaping project, not a true resource. Staff backgrounds are extremely varied. If you don't give them concrete information to pass along, many of them will never venture out into the garden with their students. - Maryland

School gardening has helped our students cooperate, feel successful, and share the fruits of their labor. Flowers are used to decorate the office, tables for parties, and teachers desks. Children have learned to share and give of themselves. They have also learned that one can begin with something very little (seeds recycled) and a few tools and reap the benefits of plants without spending a lot of money. - Virginia

Our Master gardeners have done a wonderful job of helping our school to have a good gardening program. They began by starting a butterfly garden and have expanded to have class gardens, differing types of gardens, gardens begun at different times of the year, planting trees and landscaping the school grounds, and giving tremendous support to our 4th grade girls science club which started a bird sanctuary and which is trying to plant black alders and marsh mallows to help a wetland to develop in the bird sanctuary. This program has been tremendously exciting for our teachers and students alike!!! PS We now have two personnel from the Smithsonian involved in

helping our class to make a book of pressed flowers and plants from our butterfly garden This has been just Wonderfu!! - Virginia

The development of our outdoor Nature Classroom has required a lot of time to obtain funding and organize its construction and maintenance. The children and parents who help/work/participate show a great deal of enthusiasm. Vandalism and lack of more teacher participation have been our major areas of concern. - Virginia

It served as a springboard for teaching all areas of the curriculum. The Garden Project was a successful and exciting experience for all. - North Carolina

My program would have been even more successful if I had extensive training in hortotherapy. My kids have both mental and physical disabilities. I am literally 'learning as we garden.' Special task positioning for gardening, stimulation techniques for the more developmentally challenged are just a few of the problems I face daily. Access to experts, book and materials would be extremely beneficial. - North Carolina

Our garden currently operates with the assistance of two parents coordinators who aid teachers with learning projects, recruit parent volunteers, and solicit community support. - South Carolina

The problem we have with our school gardening program is the lack of teacher involvement or interest. Maybe 5 of 20 teachers will actually take the kids out for hands on experience. - South Carolina

The NGA grant was a much needed boost. Teachers of regular classes have had to learn strategies for managing 25 children in the garden all at once. Vandalism has been a problem a few times. We have had to learn things to plant in fall and items that are ready for harvest in late summer since our school is not in session over the summer when the garden is peaking. We have not yet developed a summer program to give interested students opportunities to continue gardening the entire season. - Georgia

We are just getting started - We need a Master Gardener who can take classes to each outdoor habitat and assist teachers in presenting the lessons. This will help others gain confidence and use classes more often. - Georgia

The three schools involved - 1 private, 2 public, have different standards and are at different levels of success. One public school has had gardens for the Kindergarten classes for 5 years and is a huge success. The private school is also very motivated to involve gardening and habitat restoration. Our garden provided for us by the St. Johns Hummingbirds 4-H group and Beverly Fleming has been a great asset to St. Johns Grammar School. Daily the students observe their garden, provide water when it is needed and pull weeds. The children actively participate in the garden and discover the different stages of plant development. The children are learning about herbs and the difference between edible and non edible plants. The garden reinforces our science

lessons and complements the ongoing 4-H program at the school. Students are excited that the food raised in our garden will be shared with our families and donated to the Food Bank. - Florida

Our schools garden is becoming a Botanical Garden - Florida

We have really enjoyed the gardening program at our school The children love to work in the garden. Florida

We have enjoyed tremendous success at our school. Kids look forward to 3rd grade because they “get to do the garden” It is the highlight of our church and school campus. It is the joy of my life - so tremendously rewarding. - Florida

Our school garden project attracted the attention of a local bank who in turn have set up a partnership program with our school. Bank volunteers work 1 hour per week at the school with at-risk students. Students provide the branch banks with flowers from the school garden and do other joint projects throughout the year. Much community pride and cooperation has been fostered through the project also. - Tennessee

To create the love for growing things is a big goal and then to follow through with the work necessary. A wonderful therapy for our girls.

Our school gardening is successful because all of our students are involved and they all feel successful because their gardening efforts are stress free. Our students think it is a reward to dig, plant, and pull weeds! - Tennessee

It is very difficult for teachers to find the time to be in the garden. the subjects seem to be more important. Also, time factor. We need to have a time when all can participate. - Kentucky

I have initiated an Environmental Education Center starting with our garden. Every teacher signed up for a particular type of garden. It has just mushroomed. We now have pond, greenhouse, nature trail, and soon to be amphitheater. It has been wonderful! - Kentucky

My students who gardened this summer were 7th graders who attended our school as youngsters. There were only 2 of them, but gardening was a source of great pride to them. . . They are seen planning their futures to include gardening! - Ohio

Planting and caring for our flower and vegetable garden was as rewarding as I expected. The summer experiences with weeding and watering with student volunteers was especially fun and relaxing. The most surprising plus was to see those who helped plant and weed show off “their “ garden in the fall to parents and other students - They were so proud! What a beautiful environment out our window! - Iowa

We need better weather to get started this spring. We need to find ways to interest and get kids and parents involved in helping throughout the summer. We need time to plan and coordinate efforts. - Iowa

Our school is very actively involved in school gardening primarily because of many volunteer efforts. Teachers willingly participate but have very little time to plan yet another area. If others coordinate the plans and assist, they become very involved and more willing to do some on their own with advice and reminders. - Indiana

The gardening experience in itself has been extremely positive but has also lead to other learning experiences for example Monarch raising, connecting children with Internet in a useful way. - Minnesota

Very successful, very time consuming, and often worrisome. We at Jordan have come to see our plants and flowers as our children, and when our babies do not thrive, we feel sad. While we run the projects with only a handful of interested workers, and we could always use more hands, the impact has been positive schoolwide. - Illinois

Success comes from continuing the garden project from year to year. It must be on-going or it fails. Be prepared to have special projects each year encouraging student ownership. It is a great extension of the classroom. Also, proper funding is necessary for success. - Illinois

The gardens are a focus of pride for the students as well as an educational tool. We had a total school salad from our garden last spring - it was a great hit. - Missouri

Having “mastered” gardening techniques we branched out to our community by beautifying the Cleveland Health Care Center. Our students felt good about helping others and the elderly patients enjoyed seeing the students work on the gardens. It was a “big deal”! - Missouri

This has been a terrific learning experience for our students. They have been enhanced with a true respect for nature and living things. It also gives them a sense of pride and helps to develop their self esteem. - Kansas

We have only just begun. The future for gardening at our school is bright. - Louisiana

Students love working in the garden. It has been difficult convincing some teachers to get down in the dirt and grow things but these same teachers have been observed taking walks through the gardens with their students. It is a start and I am sure, soon, the whole school will be active gardeners. - Oklahoma

Since the PTA has taken over the school garden responsibility, gardening has become an exciting part of the classroom curriculum. The National Gardening Grant gave a big boost to our program as well as the kids growing with Dutch Bulb award. - Oklahoma

Teachers need more time to plan and prepare the gardens - Texas

As a Montessori magnet school with a focus on environmental education gardening is a vital link to our zoology, botany and functional geography curriculums - Texas

A garden project takes persistence, needs long-range planning. - Texas

After 7 years, we have students who have been in the program since their entry into school at the Pre-K level. We have many indications that our work with students has been successful. Teachers, however, have never taken the initiative to use the garden as a resource. Outside of their regularly scheduled times in the garden when a lesson is in place. As Director of the program, I consider that to be its biggest failure. - Texas

The kids are thrilled to come out and participate, and disappointed when they are not. - Arizona

Our garden grant was extremely beneficial in furthering our students gardening skills and interests. - California

Our school has received 2 grants which have enhanced our ability to continue with our garden. Funding and an interested teacher are absolutely necessary. - California

It has been going well and every year we've added two interested teachers, and we've formed an after-school "Garden Club" for those in classes that don't use the garden. - California

Test scores went up 11% after introduction of gardening! - California

Vandalism is a problem. Weeds are devastating. Preparing the soil and the rows/whatever is so difficult and time consuming. Sampling the harvest is fantastic! - California

I am looking for a way to get more teacher and parent involvement because the students really want to be in the garden - California

We saw Life Lab when our school was in the planning stage and knew it could be an unifying factor between the grades K-3. We opened the school with that in mind and had our gardens going before Xmas. Our principal was totally committed to our vision and has led us and run interference with the D.O. when necessary. Her leadership made it all happen - California

Our kindergarten loves a garden. and we garden in rain or shine - California

Many of the goods promised from individual patrons from the National Youth Garden Grant were never delivered. We are still having a problem coordinating volunteers to maintain the garden throughout the summer - California

A very inspirational program for all. - California

Interest in our school garden is growing among staff members. We still have a few reluctant gardeners, but they are supportive in other ways. The students love the garden. We want to use our garden as an outdoor learning lab and in the process make it more beautiful each year! We will be a school of gardeners- California

Any gardening program using all the classes takes a bit of planning. We have a committee that meets monthly to plan. Our principal, three teachers and our “gardener” are on that committee. PTF gives each teacher a yearly amount of money to spend on gardening supplies. PTF also funds larger projects in our gardening area. -California

Time is needed for staff to plan how to integrate gardening rather than adding it on to other subjects. California

Don't give up! Even a small garden is better than no garden! Doesn't have to be fancy - just has to be done! Getting a grant to start a garden is nearly impossible. Once you've begun and others see the success, they're willing to assist. - California

A small group of committed, hard-working teachers put in all the extra hours it takes because of the tremendous benefits for all. The other teachers appreciate the effort but there is an imbalance of time put in at school. We rely on constant fund-raisers to keep the program growing. The community has been involved from the beginning and is very supportive. With so many students involved our garden really needs a coordinator for many reasons. - California

I have gardened with children in an educational setting for 10 years. I am excited to see such interest in school gardens. - California

Time to fit it all in seems to be the issue at my school. We have so many tasks, responsibilities, and curriculum to cover that it is hard to do it all. - California

Our garden is made of native Hawaiian plants, endemic and indigenous. - Hawaii

Highly successful teaching strategy to promote self esteem for fully included special education students. Handicapped and regular education students work side by side as peers on “equal ground” toward common goals. - Hawaii

It was much harder to coordinate when 5 classrooms were involved as opposed to 1 or 2. It was also much harder to work with teachers who were not gardeners! - Oregon

Big problem getting all students in the school out to garden regularly - need more volunteer and staff support to take small groups out. Some classes have more parent interest and get kids out more - some kids rarely go to garden. - Washington

Ruel C. Martin School

I have been out of the state taking care of sick relatives, but I did want to let you know that this school was changed by LISD to a Head Start School and the principal was transferred. We had a great program going and all the kids really enjoyed the gardening program. One Mom had her child transferred to the school because of our program. We have transferred some of our Master Gardeners to other community gardens (include. schools) in the Lubbock Green Community Gardens program. This is a division of the South Plains Food Bank. In the last year, I recommended that they join the American Community Gardening Association and affiliate with Texas Garden Clubs, Inc. They have done both and have been very pleased. Representatives from the various gardens (including those who work with schools) meet monthly at the Food Bank. Our meetings are well attended. The video I purchased from you was shown at one of the meetings and I donated it to the Texas Garden Clubs film library, so that others may check it out for meetings.

We learned alot from the Martin School Project. Although all our teachers and students got transferred we have started over again at other locations. Please send the brochure and survey report, so that I may report your activities at one of our meetings. Thanks for your assistance. - Elaine Shields

APPENDIX D

Personal Interview Results

Q1. In the past years, many definitions of school gardening have been discussed; there is not an accepted 'right' definition. How would you define school gardening? Keep in mind that there are not right or wrong definitions.

School Gardening is...

1. An opportunity for students to learn about plants - how they grow, what it takes to make them grow - how they can be used. The students must use a hands-on approach for the learning to take place.
2. A process for helping students learn about living things through hands on experiences. It provides opportunities for investigating, questioning, hypothesizing, and determining results. It strengthens the child's sense of beauty and responsibility.
3. Enjoyable, easily taught, successful for all, an improvement to "hands on" learning and educational
4. Outside classroom - math, science, history etc. - all can be used by using plants, dirt, growth. Nature is the blackboard.
5. The opportunity for students to experiment with their own "plot" of soil. Many students never have a chance to plant, grow, and harvest their own garden space.
6. The development of a classroom culture that centers on gardening through teaching units and themes.
7. The concrete extension of classroom content.
8. The practical application of educational concepts - reading, math application - and enjoyment of laboring collectively in God's world enjoying the physical activity and the rewards of fresh produce, flowers and herbs. It is also helping to artistically design beds for eye-pleasing arrangements and to "pay" back our trustees who give us permission to garden.
9. Giving students an opportunity to realize the need and importance of gardening as it applies to our study of native Americans and the basic needs of all.
10. Expanding the curriculum to the outside world for children.
11. A vehicle for integrating curricular areas in an engaging and meaningful, hands-on experience our children will enjoy, remember and hopefully apply late in their lives.
12. The opportunity for children to get out and get into the earth - under the supervision of someone who knows a lot and can help them be better gardeners.

13. Integrating hands on gardening into the existing curriculum.
14. Indoor and outdoor - integration of academics with gardening. Instill a love of planting which may last for a lifetime!
15. To teach hands-on skills of planting and caring for a living thing and to help students with fine motor skills.
16. Becoming familiar with plants, their growth and impact of the environment.
17. Allowing students to know how to plant flowers, bushes. With seeds, to plant, and allow them to watch the plant, flower or vegetable grow or not grow. What it takes to have a successful garden, the jobs for it to be successful. To see the end results. To see how the flowers, plants grow each year.
18. The learning of environmental problems and success in the growth of plants and the process used to do gardening. It is the study of all procedures necessary to be successful at growing and caring for plants and the environment.
19. The children learning about the environment around them. They are making their environment at school a pleasant place to be. Plus they are able to say what they contributed to beautify the school. It gives them a sense of accomplishment.
20. Learning through doing. By getting involved with the soil and with living plants, the children learn more about plants than they ever would just indoors.
21. Cooperation, fun and educational. It is a release of energy and the children love helping.
22. Integrating life skills and math and science into the school program.
23. Experiencing the fun of digging the dirt, watching something spring from the earth and the joy of sharing and eating the goods that we grow.
24. The preparation of soil, growing, weeding, harvesting and general total care of flower and vegetable gardens by a school community, with education, pride and responsibility.
25. A way to learn, with hands-on experiences, the many opportunities that nature has to teach us life cycles, plants, birds, etc. that causes and appreciation of nature. A way to correlate science and English and math.
26. Getting kids involved in a hands-on way with any type of plants, hopefully doing it outside in a garden setting.

27. A hands-on opportunity to follow up on classroom units and a fun place to explore and unwind.

28. An opportunity for children to understand how plants grow, how food is produced, and how nature interacts with man. It is interdisciplinary learning.

Q2. In what subject areas do you include gardening and growing plants as the focus of a discussion or an activity?

4. poetry

10. health

13. technology

15. business, fine motor skills (Ind. Hill School)

22. life skills, responsibility

23. life skills

25. poetry

27. behavior management - a reward to garden - free exploration

28. nutrition and eye-hand coordination

Q3. Where in the school curriculum is school gardening the most useful?

1. hard to separate - We do whole language approach to teaching - Math, art, language arts are combined. It is hard to separate where it is most important.

2. connecting it with Virginia history and geography. Community outreach. The students share plants with people who are sick, or a student who has lost a family member, or as gifts to aides to show appreciation.

3. any subject

4. math and science

5. sciences, language arts and mathematics

6. science is the most useful - it gives meaning to the students. Reading - I use science stories to relay information. Teach kids to read by developing science. stories.
7. science
8. math and science
9. Social studies and Native Americans
10. Enhances the science program - hands on experiences and the materials are readily available.
11. science
12. Such an integrated part of what you do that I can't single out a certain area.
13. science
14. reading - it is related to other parts of the curriculum
15. To try to follow directions and staying on task which is very much part of their life (Independent Hill School)
16. Reading , language arts, math with estimation, physical education - we use with everything that I do. We will touch on it with a story, look at the math side - it is all integrated. The only way you can teach it to present it in as many ways as possible. The more ways you present - the easier it is for the child to understand it. Not all children learn the same.
17. science, language and reading. They can see and relate to the garden - it is a very concrete experience.
18. Science - they write reports, use computers, go through the research process.
19. science and writing reports which is language arts. They bring in different things from outside and we make such things as leaf books.
20. Meeting science and math objectives.
21. Math and science
22. science - we integrate so much that you can't separate one from the other.

23. we do integrated curriculum here - reading, writing, etc. - we could break it down but we don't.
24. we break down more so for grading into science and social studies - geography and climate.
25. Reading and language - writing about what you see, it is a springboard for ideas, paragraph ideas.
26. science
27. Language arts
28. science and language - to discuss the world around you

Q4. What do you find is the most difficult part of using school gardening as a teaching strategy?

1. The time involved. Wanting the children to have hands-on experiences. It is hard to have the opportunity for 23 children.
2. time. It would be nice to have 30 minutes 2 to 3 times a week to fit it in. Now we use PE time, when we come in the morning. Children must show responsibility.
3. One teacher to 21 bodies. Every person wants to plant at the same time. We do not use volunteers when we are planting.
4. the process of getting the materials together and of getting to and from the garden
5. Getting enough time to do all the things in the garden that we want to do.
6. Just the materials. It is expensive and the cost falls on the teachers. Getting and financing materials. We use lots of recycling (which I do on my own). Getting the custodial staff educated. The custodian threw out the composter - lack of involvement of the custodians - mess is a big item in a school.
7. I don't find it difficult at all. Maybe, getting through Virginia clay! We've been very successful so I can't find anything too difficult. Student management and keeping the plants alive from June to September when the students get back from summer break.

8. Taking time from the standard curriculum - from traditional math and science. We are limited by our schedule. I would like to have more but I can't justify taking from the other curriculum. I take the students out every Friday morning to garden.
9. The time element. Not enough time to do everything. Student behavior. the students think that when they are outside they can run and have fun.
10. Managing all of the children (first grade) and trying to have them understand that they must wait their turn. We garden with six children at a time and the others investigate with a microscope when they are gardening (until it is their turn) Often takes more time to maintain their focus. They are so thrilled!
11. Inconsistency of the weather - had to start late due to rain. Started indoors to compensate.
12. Have someone to help you gather your materials - gardening materials. Everything you need is not in the science closet.
13. I don't find it difficult. PTA sponsors dug the soil so that isn't an issue. The expense of the materials.
14. Finding the time to integrate.
15. The number of kids. As in any situation all you need is one to take all of your attention. The others are not getting what they deserve. Student behavior.
16. The time - I do fit it in but not as frequently as I would like. It has to fit in the curriculum.
17. The time to get it done - once you get started you don't want to stop (specialist get in the way - library, computer class, etc.) There is a time limit.
This is a community school so we have vandalism.
18. Don't have time or space to dig up like you are really gardening. Make shift gardens. 27 kids - and no place to put indoor gardening projects and experiments. Not place outside for all these kids.
19. Time and 1 teacher to 25 students. Hard to keep them entertained - everyone wants to 'help' and I have no parent help.
20. Time - we aren't here long enough. We garden outside but we are gone in June. We need to plant early to see results. Larger varieties we don't get to see.
21. Time and money. We get a lot of parent involvement but we have no summer maintenance. I do it, but this year there will be none because the parent moved. Storage is a problem.

22. Having enough hands to help when you are teaching a whole class. We get volunteers but everyone can't be in the garden at the same time. Time and people management.
23. Having enough time to spend outside, and enough adult hands and eyes.
24. Find the time to get out to the garden. People management is not hard.
25. Other classes down there - scheduling of use of the garden. I only have a certain amount of time. I can't always have a pretty day. Garden is not used to its fullest extent.
26. Finding the time to take them out to do the activity. So many other things I have to do.
27. When weather is bad and our plan is to go out! Our gardens are accessible to wheelchairs - easy to get there.
28. dirty children! You have to sometimes do other activities dirty after gardening. Weather - we are flexible but it affects planning. We do not have a busy itinerant schedule so finding time to garden is not a problem.

Q5. What things do you feel contribute most to the amount of time school gardening takes?

1. Getting the projects all together.
2. Trying to let every child have something to do. You want every child to take part.
3. waiting for the plants to grow!
4. planning to make sure materials are together
5. mulching and weeding
6. It is worth the time. Anything you do in hands-on science. The success of the children is worth it. Preparation, go through it, then clean up.
7. When we went outdoors - plowing and preparing the ground. Get into it and then we have to leave it. We have to do it piecemeal.
8. Turning over the soil. Well worth it. Two little first grade girls were found counting to 68. What are you counting? Earthworms. We don't get a lot done each time we go out to garden -

but we always learn. Dig the garden and stop and look at strange creatures that we find. Even had slug races!

9. Preparation of the bed. Harvest is through the summer and the children can't see what is growing. There is lack of follow through.

10. Keeping it going with the academic curriculum. - the mini-lesson, writing, thinking of the children.

11. The actual hands-on nature of it. Record-keeping, actual planting and upkeep.

12. Planning ahead - shopping for seed, ask neighbors for cuttings, Preparation for getting ready for gardening activities.

13. Preparation - getting the materials together.

14. The garden is already turned. (That took a long time when it was first done) When the kids help to water the plants in the atrium.

15. Preparation - I try to let them do the whole process - setting up, cleaning up.

16. Preparation - teaching and the physical part, time to follow through especially with first graders. I need a book on gardening - how it can be incorporated so I will not spend time finding materials.

17. Getting everything set up - it takes 3 to 4 adults to get it together. It is also expensive - all out of my own pocket.

18. Taking care of the soil (using compost)

19. I need a volunteer to help set up and it gets expensive.

20. getting set up - materials. Getting organized to go out.

21. Getting parents to help. To turn the soil.

22. Preparation - gathering tools, getting the students out. Our plant sale for fundraising.

23. Getting people to follow through. Weeding, staking, watering. Most done after school by adults. The first year we had no materials. The fourth year has been easier.

24. getting out to plant - time from the curriculum.

25. Planning of the activity. To obtain the materials - tools, watering cans, etc.

26. The actual activity itself. Things are under control - well planned.
27. getting everything together.
28. Getting the garden ready - pulling out the weeds in the spring (the kids do it and are interested, but would rather plant.) General maintenance.

Q6. What additional training or education in school gardening have you had?

1. none (mentioned that she was raised on a farm)
2. Teaching with an experienced teacher. An inservice on using the GrowLab by the experienced teacher. VA Wildlife Center - Principal of an Environmental Based Magnet school spoke to the teachers on using gardening in the curriculum.
3. 4-H Conference called something like "Opportunities for Growing" College classes - 12 hours of Life Sciences.
4. Project Learning Tree and worked at an environmental based magnet school. I was raised on a farm.
5. Project Learning Tree
8. I've been gardening since I was 8 years old. Member of 4-H program. I now belong to AHS.
9. Grew up on a farm
10. AHS 4-H training for one week.
science supervisor did Saturday workshops (all day) , Nature Centers - classes, went to a school in Washington DC when I was little that had a garden - each class had a big area. It made an impression on me.
11. A class on natural gardens - on how to attract wildlife through our PET program. Used a nature trail.
13. Science coordinator gave a workshop - not a gardening class
14. In Montana on an Indian reservation - my parents had a love of the soil
17. my own experience growing up

- 18. my family gardening - I know what to do. My husband enjoys gardening.
- 22. Lifelab in-service. Garden at home and raised on a farm
- 23. garden when I was young. garden at home
- 24. gardened when I was young
- 25. Project Wild; garden at home all the time. I am a rose gardener.
- 26. Gardening with Kids from the Dept. of Game and Fisheries. Project Wild Shenandoah Park Service Nature training.
- 28. In Vermont in 1974 or 1975. National Gardening Association Gardening with Children.

Q8. What areas of additional education would you be interested in obtaining to improve your use of gardening as a teaching strategy?

- 2. To solve my garden problems I go to Gary's Garden Shop to get answers to questions. We have lots of reference books that I don't mind using. We bought a series of books to help us use gardening in the curriculum.
- 3. Master Gardening program available evenings - Not weekends, Not during the day. Also Master Gardeners need to be trained to help during classroom hours. Gardening is not just farms.
- 4. Project Wild, hands on field trips for teachers, and graduate credit classes
- 6. Plant cycles. To use local arboretums and botanical gardens to augment the curriculum
- 7. Soil preparation. The most practical information is the most important. Garden pest control without being lethal to the rest of the environment.
- 8. Looking for a practical application of school subjects. Organic garden pest and weed control strategies. Always looking for new things to try.
- 12. inservice and go outside and have a walk through of the gardens. Tell me what to do...but we never have any time to do it.
- 13. present conditions - for example: acid rain, something that is happening now or in the future

15. Interested in Master Gardeners. There are so many ways to get plants started. I would like to be more knowledgeable.
16. Appropriate plants for certain areas - shade plants and sunny areas. I must look for information - I have to investigate.
22. connect plants today with the past - social studies; connect better with herbs, plants for dying, native plants
25. what other schools have done. Direction on where to start. Teachers need strategies on how to use the garden.
27. classes on horticultural topics for refreshers if nothing else.
28. Historical connections of plants to do at school with younger kids; non-chemical pest control.

Additional Comments:

6. The most important factor is teacher education. Teachers must be excited - know a lot about ownership and have a training rich in science. Teams of teachers to teach using the garden. The custodian must be interested and understand the value of the garden to the students and learning. We keep observation books - amaryllis, pussywillow for visual observations. We will make tea of mint, wintergreen and dandelion, and witch hazel syrup to observe the differences in taste in nature.
19. The children are very proud of their work.

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VITAE

Laurie Whipple DeMarco graduated with a B.S. in Horticulture from The Pennsylvania State University in 1977. She then graduated with a M.Ag. in Plant Pathology from The University of Florida, and accepted a position at The Conard-Pyle Co., a ornamental container growing nursery, in West Grove, Pennsylvania. Here she was the Assistant Production Manager in charge of all aspects of production including propagation, pruning, fertilization, pest control, shipping, and crew management. She also managed the Department of Research and Development, developed an ornamental plant breeding program, was an All American Rose Selection judge-in-training, oversaw field-grown rose production, and greenhouse, cut rose production and evaluation. In 1984 she started her own B&B ornamental tree nursery in Crossroads, Pennsylvania. She also taught continuing education courses at The Pennsylvania State University - York Campus. In 1994, she began teaching classes in horticulture at The Virginia Western Community College in Roanoke, Virginia.

In the meantime, Laurie became the mother of three children who provided the insight, and sparked her interest, in combining education and horticulture. Work was begun toward a Ph.D. in Horticulture in 1992. Her doctoral research examined the factors that affect teachers' implementation of school gardening into the elementary school curriculum.