

**THE TEXAS MASTER GARDENER PROGRAM: AN ASSESSMENT OF
CURRICULUM DELIVERY AND CONTRIBUTION TO COMMUNITY
DEVELOPMENT**

A Thesis

by

CHYREL A. MAYFIELD

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

December 2004

Major Subject: Agricultural Education

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ABSTRACT

The Texas Master Gardener Program: An Assessment of Curriculum Delivery and
Contribution to Community Development. (December 2004)

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Extension programs across the nation have been given the task of education and outreach to citizens of their respective states. Master Gardener programs have been seen as a way to provide horticultural education, while also providing outreach using the program's service requirement.

Extension professionals have used a variety of training methods throughout the years. These methods include face-to-face workshop trainings, interactive television, and more recently World Wide Web methodologies. This study sought to test the effectiveness of CD-based training materials versus a traditional face-to-face training. Turfgrass management modules chosen for testing in this study included nutrient, water, and pest topics. Participants' knowledge levels were measured using a pre-test/post-test design. Student satisfaction with the learning materials and their perceptions of lawn care also were measured during the study. Results indicated that CD-based materials were more effective than were face-to-face workshops for teaching difficult turfgrass material to the Master Gardener trainees.

Community development is one of the four focus areas for Texas Cooperative Extension. A secondary purpose was to determine if the Master Gardener program affected community development. Descriptive statistics were used to compare participants' past experiences with their anticipated experiences after completion of the Master Gardener program. Results indicated that community development activities were being completed, but the extent and type of development could not be measured.

This study revealed several surprising and far-reaching implications for extension programming. These implications and recommendations for improvement of extension programs are discussed further. Recommendations for additional research also are included.

DEDICATION

Three people have shown their love and support throughout the challenge of graduate studies and this thesis. It is to them that I dedicate this thesis. My parents, Glenn and Arna, have been there from the beginning. Mom has always supported me and been there when I just needed to talk to someone. Dad is the silent supporter. To my husband, Kerry, I say thanks for loving me and putting up with my weird moods and me the last two years. Without the three of you, this thesis would not be possible. Thanks for believing in me, even when I did not believe.

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CHAPTER I

INTRODUCTION

Background

The Smith-Lever Act of 1914 created the Cooperative Extension Service to educate the public about agriculture, home economics, rural energy, and related subjects. Practical application and transfer of research knowledge is the key to cooperative extension work. The transfer of knowledge can be accomplished through public demonstrations, workshops, youth activities, and publications (Smith-Lever Act, 1914). Since the early 1900s, new technologies such as computer applications, e-mail communications, and World Wide Web methodologies have allowed greater access to knowledge transfer.

Texas Cooperative Extension is committed to providing quality, relevant outreach and continuing education programs and services to Texans. These programs are in the areas of agriculture and natural resources, family and consumer sciences, 4-H and youth development, and community development. The Texas Master Gardener program is one example of Texas Cooperative Extension's attempt to meet programming needs in these focus areas.

According to the 2003 Texas Master Gardener Annual Report, 5,450 volunteers participated in programs in 110 Texas counties. Volunteers provided a total of 353,643

This thesis follows the style of the *Journal of Agricultural Education*.

service hours to Texas Cooperative Extension, equating an economic value of \$5.8 million (Texas Master Gardener Web site, 2004a).

Master Gardeners receive 50 hours of intensive training on various topics including gardening, turf management, and pest management. After training is completed, participants must provide 50 hours of volunteer service to become a Certified Texas Master Gardener (Texas Master Gardener Web site, 2004b).

Turfgrass management is a key component of the Master Gardener curriculum. There are over 3.5 million acres of turfgrass in Texas, according to *The Economic Impact of the Texas Turfgrass Industry* (Lard, Hall, & Berry, 1996). Total acreage included colleges and universities, golf courses, businesses, municipalities, and single-family homes. Single-family homes account for 58% of the total acreage and turf-related expenditures contribute over \$6 billion to the Texas economy.

The statewide impact of the turfgrass industry makes it important for Texans to receive scientifically based education and training on turfgrass related issues. The Texas Master Gardener program is one way for Texas Cooperative Extension to provide education and training to clientele. As acreage increases, the statewide impact increases, and the need to reach additional clientele increases. Providing more Master Gardener turfgrass management training opportunities would allow Texas Cooperative Extension to certify a larger number of volunteers with quality turfgrass management knowledge. These volunteers would be invaluable in Texas Cooperative Extension's efforts to educate homeowners about turfgrass related issues.

Master Gardener training sessions are generally conducted in a face-to-face workshop setting. The Trans-Texas Videoconference Network (TTVN) and digital slide presentations are used when necessary to train Master Gardeners (Texas Master Gardener Web site, 2003). Although these technologies are being used, other options remain available. One available technology, compact disc (CD), is not being used currently. The CD-based training format would provide flexibility for both instructor and participants.

Nine CD-based modules in turfgrass management titled, *Turf for Texans*, have been developed by the Departments of Soil and Crop Sciences and Agricultural Education at Texas A&M University. The *Turf for Texans* CD is a tool for teaching turfgrass management to Texas Master Gardeners. While some programs are turning to World Wide Web methodologies (Rost & VanDerZanden, 2002), the *Turf for Texans* program chose the CD-format to forego connectivity problems in rural areas (Federal Communications Commission, 2004). The goal of the *Turf for Texans* CD is to allow extension personnel to convey a consistent curriculum to a larger number of people with less travel, therefore at a lower cost (M. Hussey, personal communication, November 22, 2002). The ability to reach more clientele at a lower cost is important, but participants must also receive quality-learning experiences (D. Chalmers, personal communication, May 29, 2003).

Community development has become a buzzword for cooperative extension programs across the nation. As one of the focus areas for Texas Cooperative Extension, community development should be a part of all extension programs. With its large

number of volunteers and required hours of community service, the Texas Master Gardener program is considered by many extension personnel to be a community development program.

Previous research (Rohs & Westerfield, 1996; Finch, 1997; Schrock, Meyer, Ascher, & Snyder, 2000; Schrock, Meyer, Ascher, & Snyder, 2000a; Rohs, Stribling, & Westerfield, 2002) has shown that individuals also feel the Master Gardener program is a community development program. These studies all indicated that opportunities for community service and community development were high on the list of reasons why people were involved in the Master Gardener program. Community related reasons were second only to *access to horticultural knowledge* as reasons for joining the program. Based on this evidence, it is warranted to assess the Master Gardener program for its effect on community development.

Statement of the Problem

Previous research has shown no significant differences between learning levels when using computer multimedia (Marrison & Frick, 1993), Internet (Aragon, Johnson, & Shaik, 2002; Litchfield, Oakland, & Anderson, 2002; Cecil & Feltes, 2002; Lippert, Plank, Camberato, & Chastain, 1998; Lippert, Plank, & Radhakrishna, 2000; Neuhauser, 2002; Rost & VanDerZanden, 2002; Sexton, Raven, & Newman, 2002), closed circuit television (Branson & Davis, 1985), cable television (Sunnarborg, Bradley, & Haynes, 1988), satellite television (Dooley, Van Laanen, & Fletcher, 1999; Ricketts, Hoelscher-Day, Begeman, & Houtkooper, 2001; Staats, 1995; Struempfer, Jelinek, Brown, &

Sanders, 1997; Swistock, Sharpe, & Dickison, 2001; Warmund & Schrock, 1999), video based instruction (Hathaway, Akridge & Downey, 1993) and computer based instruction (Henry, Midden, & Lieske, 2004; Swann, Katz, Merzdorf, Brown, Luba, & Talbert, 2000) with traditional classroom formats. A meta-analysis study of learning formats (Machtmes & Asher, 2002) provided the same results. No previous research was found where investigators used CD-based materials to teach turfgrass management to extension clientele. The ability to provide convenient and effective training to an increasing number of clientele with limited resources has implications for extension programs in Texas.

Cooperative Extension programs stress community development as a key focus area, however little is done to evaluate programs for community development. Research studies have focused on defining community development and outlining the practice of community development (Christenson, Fendley, & Robinson, Jr., 1989; Summers, 1986; Theodori, 2003; Voth & Brewster, 1990; Wilkinson, 1970, 1999). Little research (Dhanakumar, Rossing, & Campbell, 1996; Hughes, 1998; Rebori, 2001; Bowling & Brahm, 2002) was found that evaluated extension community development programs and no research was found that evaluated existing extension programs for their effect on community development. The ability to evaluate extension programs for community development goals would give extension personnel another measure of the impact that programs have on their respective communities.

Purpose and Objectives

The purpose of this study was to determine if Texas Master Gardener program participants' learning levels differed when taught nutrient, water, and pest management topics using CD-based materials versus traditional workshop settings. A second purpose was to determine if the Texas Master Gardener program contributed to community development. The following objectives guided this study.

1. Compare knowledge levels between Master Gardeners who are taught in face-to-face workshop settings versus those taught using CD-based materials.
2. Evaluate students' satisfaction with the learning materials.
3. Determine if relationships exist between learning and an individual's perceptions of nutrient management, water management, and pest management topics.
4. Determine if Texas Master Gardeners participate in community development activities.

CHAPTER II

REVIEW OF LITERATURE

Background

Two distinct concepts, learning formats and community development were examined in this research study. The Texas Master Gardener program served as the unifying element tying the two concepts together. The program has elements of both concepts as its structural base. To fully comprehend the reasoning behind the study, one must have a good understanding of the concepts of learning formats and community development.

A review of literature related to computer multimedia, Internet, closed circuit television, satellite television, and traditional classrooms shows that much research focused on three different areas of education. These areas include secondary education, extension clientele education, and extension agent in-service training.

Secondary education, considered formal education, is “the hierarchically structured, chronologically graded educational system running from primary school through the university and including, in addition to general academic studies, a variety of specialized programs and institutions for full-time technical and professional training” (Etling, 1993, p. 73). Extension clientele education and extension in-service training are considered nonformal education techniques. Nonformal education is less structured, more learner-centered, and content is adapted to the unique interests of the students.

Studies included in this literature review were conducted in both formal and nonformal educational settings.

The second aspect of this study dealt with the concepts of community and community development. A review of the literature related to community and community development yielded a wealth of information. A large portion of the literature focused on theoretical definitions and 'how-to' perform community development. Little research was found that evaluated extension programs for community development.

Learning Formats

Interactive, online, and distance education learning formats have been compared with traditional classroom instruction (Aragon, Johnson, & Shaik, 2002; Hathaway, Akridge, & Downey, 1993; Henry, Midden, & Lieske, 2004; Litchfield, Oakland, & Anderson, 2002; Machtmes & Asher, 2000; Marrison & Frick, 1993; and Neuhauser. For the purpose of this study, learning format referred to the instructional methods used to teach students, including computer multimedia, Internet, closed circuit television, and satellite television.

Hathaway, Akridge, & Downey (1993) studied the effectiveness of video-based instruction in an undergraduate agricultural business course. Four sites were chosen for the study, with video-based instruction at three sites and face-to-face instruction at one location. The learning formats were evaluated based on student achievement, course evaluations, and video student feedback surveys. Midterm and final exam scores

indicated no difference in learning based on learning format. The course evaluations indicated that students in the video sections were slightly less satisfied than were the face-to-face students. The video-based students ranked the instructor less effective than the face-to-face students. This is interesting since the same instructor was used for all courses. This could be indicative of the lack of student-instructor interaction in the video course (Hathaway, Akridge, & Downey, 1993). Overall, the study indicated that video-based instruction could be as successful as traditional face-to-face instruction.

Marrison and Frick (1993) compared multimedia instruction and traditional classroom instruction to determine if a difference existed between learning levels. For their study, multimedia was defined as a “multi-faceted approach to computer-based education that brings together text, graphics, animation, video, still images, audio, and motion video” (p. 31). Marrison and Frick’s study was conducted in a formal education setting with undergraduate college students in an agricultural economics class. No significant differences were found in learning levels when using multimedia instruction versus traditional classroom instruction.

A meta-analysis of telecourses (Machtmes & Asher, 2002) was conducted using studies from 1943-1997. The 19 studies analyzed compared traditional and distance education and were true or quasi-experimental studies. The types of learning formats used in the studies included satellite, closed-circuit television, compressed video, and videotape. The results indicated no difference in learning based on learning format. This study reinforces the finding that learning format does not affect achievement.

Aragon, Johnson, and Shaik (2002) looked at the effect of learning styles in a traditional classroom and an online environment. Thirty-eight graduate students of similar demographics were studied. The course was instructional design for human resource development professionals. The researchers reported success levels for students to be similar in both learning formats, regardless of the preferred learning style. Although this study focused on learning styles, it indicated that students could have similar success rates in both face-to-face classrooms and online environments.

The relationship between computer attitudes and online instruction was examined by Litchfield, Oakland, and Anderson (2002). Using interns in a dietetic training program, the researchers were interested in determining if students' attitudes toward computers and previous computer experience affected their use of online instruction. Results indicated that computer attitudes and previous experience had no effect on the use of the online technology. The researchers also found that student attitudes did not change as a result of the online instruction. This study provides evidence that online instruction can be appealing to a large number of clientele regardless of their attitude and previous experience with computers.

Neuhauser (2002) compared asynchronous online and traditional face-to-face classroom settings. Students self-selected to participate in the online or face-to-face workshop setting. The study population contained a large number of non-traditional students (>22 years). The online group's percentage of nontraditional students was 91%, while the traditional group's percentage was 63%. This indicates that older students are more likely to choose the online method of instruction. The results showed no significant

differences in test scores, assignments, participation grades, or final grades. Neuhauser's research supports the claim that no significant difference in learning occurs when comparing traditional and non-traditional learning formats.

One of the latest studies regarding learning levels and learning formats was conducted by Henry, Midden, and Lieske (2004). These researchers studied the effectiveness of a landscape construction software program by comparing it with a traditional lecture course. The undergraduate student audience participated in landscape horticulture at Southern Illinois University Carbondale. Pre-test and post-test scores were used to measure learning. The results indicated that both the software program and the lecture were effective in increasing learning. While there was a significant increase in post-test scores, there was no significant difference found based on the learning format. This current study again enforces the fact that traditional and distance education methods can be equally effective in teaching material to students.

Cooperative Extension has used various learning formats to deliver educational programs. The formats included closed circuit television, cable television, satellite television, interactive video, and World Wide Web methodologies. Research in Indiana (Branson & Davis, 1985), Minnesota (Sunnarborg, Bradley, & Haynes, 1988), New York (Staats, 1995), Texas (Dooley, Van Laanen, & Fletcher, 1999), Alabama (Struempler, Jelinek, Brown, & Sanders, 1997), South Carolina and Georgia (Lippert, Plank, Camberato, & Chastain, 1998; Lippert, Plank, & Radhakrishna, 2000), Missouri (Warmund & Schrock, 1999), Illinois and Indiana (Swann, Katz, Merzdorf, Brown, Luba, & Talbert, 2000), Arizona (Ricketts, Hoelsher-Day, Begeman, & Houtkooper, 2001),

Pennsylvania (Swistock, Sharpe, & Dickison, 2001), Illinois (Cecil & Feltes, 2002), Mississippi (Sexton, Raven, & Newman, 2002), and Oregon (Rost & VanDerZanden, 2002) has examined extension agent in-service education and extension clientele education for learning comprehension in non-traditional educational settings. These educational programs are considered nonformal education based on the definition provided by Etling (1993).

Closed circuit television was used in Indiana to teach swine breeding topics to extension clientele. Topics included reproduction, housing, nutrition, and disease immunity. The closed circuit television sessions replaced county swine meetings. A pre-test/post-test was used to measure learning comprehension. Results of the study showed that participants' learning scores increased by over 27% (Branson & Davis, 1985). This early research illustrated that extension clientele were open to using new technologies to learn technical agricultural content.

A program on weight control and exercise was delivered via cable television to 300 community leaders from northeastern Minnesota (Sunnarborg, Bradley, & Haynes, 1988). Fifty experimental subjects were selected from the pre-registrants, while 50 control subjects were selected from previous extension program participants. The control group was not allowed to view the cable television program. A pre- and two post-tests were administered to the groups. A total of 25 control and 21 experimental subjects completed all the tests. The experimental group increased their knowledge scores by 23%. The experimental group also had a higher percentage of participants who followed a planned exercise plan after the program. Participants from each group exercised three

or more times a week and reduced their caloric intake. Television was used effectively to teach weight control and exercise issues to extension clientele.

In New York, a specialists' training program on maple syrup production has been replaced with satellite technology. Although learning levels were not tested, participant satisfaction with the program was evaluated. Staats (1995) found that most participants indicated high levels of satisfaction with the satellite broadcasts. It was also found that specialist time commitments and travel costs were reduced by approximately 90% of the seminar costs. While the study pointed out many positive aspects of the satellite broadcasts, it was also noted that transmission problems and a potential audience member loss were problems related to this learning format (Staats, 1995). While distance education methods can be successful in teaching material, educators need to be cognizant of the possible obstacles related to alternative learning formats.

Researchers in Texas used the interactive Trans-Texas Videoconference Network (TTVN) to produce a seven-hour, Food Protection Management instructor training seminar. Dooley, Van Laanen, and Fletcher (1999) found a majority of students (71.9%) felt the training-at-a-distance was as effective as face-to-face training. Students recommended (96.6%) that technology be used for future trainings. Students' self-reported knowledge levels also showed a substantial increase in knowledge of food protection management techniques. Students who reported their knowledge levels as "very knowledgeable," increased from 14.6% to 51.7%. Prior to the training session, those reporting little knowledge of the material was 21.4% of the population. No students reported they had "little knowledge" after the training. Although this study used

distance education techniques only, it can be concluded that this delivery method was successful in teaching food protection management techniques to students in Texas.

Pre-test and post-test scores of extension educators were used to measure the effectiveness of a satellite program on food nutrition labels. Struempler, Jelinek, Brown, and Sanders (1997) presented a satellite program to 67 county extension offices in Alabama. Researchers found the mean post-test scores to be significantly higher than the mean pre-test scores. Again, this study used only distance education methods, but it can be concluded that extension educators were able to learn about food nutrition labels through a satellite program.

Lippert, Plank, Camberato, and Chastain (1998) studied extension agent in-service training. The purpose of their study was to determine if the Internet could be used to teach extension agents the basic principles of land application of animal waste. Their results indicated that agents in South Carolina and Georgia could be engaged using Internet training when learning about land application of animal waste. This study showed that the Internet could be used for teaching technical content to extension agents over a regional area. Students in separate states were able to learn the same technical content using an Internet based learning format.

A regional Internet-based training entitled “Soil Acidity and Liming” was presented to 150 county agents in six southern states. Pre-test and post-test scores were used to evaluate the learning levels of participants. Lippert, Plank, and Radhakrishna (2000) found knowledge gains on 20 of 25 questions. The five questions that showed no gains were not statistically significant. It can be concluded that Internet-based training

was a viable option to teach extension agents theoretical and applied agricultural concepts. The researchers also found that a majority of agents (55%) felt the Internet-based training could be as successful as a face-to-face training.

Missouri researchers (Warmund & Schrock, 1999) conducted a study on perceptions of Master Gardener training delivered via interactive television versus face-to-face instruction. Learning levels were not measured in this study. When asked about the delivery method and ease of learning, a majority of the face-to-face participants felt it would be easier to learn the material in a face-to-face setting. Meanwhile, one-third of the interactive television students felt there would be no difference or that using the interactive television for program delivery would make learning easier (Warmund & Schrock, 1999). It was concluded that distance education methods were acceptable for use in Master Gardener training in Missouri.

Swann, Katz, Merzdorf, Brown, Luba, and Talbert (2000) distributed a computer based instructional program on freshwater aquaculture to extension educators in Illinois and Indiana. The program consisted of a CD-ROM and a workbook. The researchers found that educators were willing to use the computer-based instruction for in-service training. No formal evaluation of learning was conducted as part of this study. Nonetheless, it can be concluded that computer based instruction was seen as a viable in-service training option. It should be noted, however, that this program was targeted toward extension educators and not extension clientele.

Researchers in Arizona compared students in a traditional sports nutrition workshop with students in a workshop taught using satellite television. Ricketts,

Hoelsher-Day, Begeman, and Houtkooper (2001) reported no significant difference between groups in average scores on evaluation items. The results of this study support the idea that learning comprehension is not dependent on the format used to teach the subject. This is another study in the body of knowledge that supports the idea that different learning formats can achieve the same level of learning comprehension.

A traditional water quality workshop was compared with a satellite broadcast in Pennsylvania. Swistock, Sharpe, and Dickison (2001) found the satellite program to be as effective as the traditional workshop. The objective of having 20% of the participants test their water after the program was met easily by both the traditional and satellite students. Researchers also measured how many attendees learned at least two new ideas in both formats. Results indicated that twice as many individuals in the satellite program learned two new ideas when compared to learners in the traditional workshop. Another finding revealed that the cost of the satellite program was 2.3 times less than the cost of the traditional workshop sessions. This study supports the idea that distance education formats can be as effective, and less expensive to deliver, as traditional face-to-face workshops.

Extension clientele in Illinois were presented with an insect identification program via the Internet and teleconferencing (Cecil & Feltes, 2002). The program was a three-part series in which participants were required to attend a session on basic entomology and then attend one of two advanced sessions on urban or agricultural entomology. Several insights were gained through this study. First, the researchers (Cecil & Feltes, 2002) found that participants ranked being able to apply knowledge

gained during the program very high. This item received a ranking of 4.03 on a five-point scale. The researchers also found a cost savings associated with the distance education method versus the face-to-face method. Lastly, an overwhelming percentage of participants (94.75%) indicated they would attend another distance education based training. This study again showed that extension clientele are accepting of distance education methods and that knowledge gains are attainable through alternative learning formats.

Learning comprehension of Mississippi 4-H agents was examined using traditional and World Wide Web methodologies. Sexton, Raven, and Newman (2002) found that at lower levels of cognition, using Bloom's taxonomy, the training methodology used had no significant effect on learning comprehension. They also found that when material was presented at higher cognition levels using the World Wide Web methodology, 4-H agents had a higher rate of learning failure. This study showed that learning comprehension at higher cognition levels was adversely affected by the training methodology. Students in the online course were less likely to comprehend the higher cognition level skills than students in the traditional course. This study revealed that the learning format used was significant when teaching material at higher levels of cognition. Students more familiar with computer technology were able to learn more at higher cognition levels than students less familiar with computer technology.

Rost and VanDerZanden (2002) used an online module on basic soils developed for the Oregon State University Extension Service Master Gardener Program to compare learning performances of two groups of extension clientele. One group of participants

completed the online module at home, while another completed the module in a face-to-face classroom setting. Learning of basic soils was evaluated using the pre-/post-test design. The researchers found no significant difference in learning levels between the two groups. Their results indicated that learning format was not a factor in learning comprehension.

The aforementioned studies demonstrate a variety of research on learning in formal and nonformal educational settings using various learning formats. However, no studies have been found where research was conducted that tested the learning levels of extension clientele in a nonformal educational setting using the CD-based format.

Community and Community Development

Before one can begin to evaluate any program for its effect on community and community development, one must have a grasp of the concepts of community and community development. A review of the concept of community finds the word “community” difficult to narrow to one definition (Freilich, 1963; Hillery, 1955; McMillan & Chavis, 1986; and Sutton & Kolaja, 1960). Even with the myriad of definitions, a compilation (Hillery, 1955) revealed one common factor, social interaction. Wilkinson (1999) stated, “Interaction is thus a core property of the community, one without which community, as defined from virtually any sociological perspective, could not exist,” (p. 2). Community, thus, is defined as a territorially based process of interrelated actions through which residents, engaging in the common

concerns of life, express a shared sense of identity (Theodori, 2003). Interaction among people is the key to community.

Having defined community, one can begin to identify community. Kaufman (1959) first proposed the idea of community as a 'social field.' Wilkinson (1970; 1972; & 1999) elaborated upon the concept and proposed that community was an holistic, emergent, dynamic, and unbounded social field. Fields are constantly changing and they differ from the sum of their parts. "Unbounded" literally means that fields have no boundaries. Fields blend into one another and must be delineated by their core properties. In the end, fields are holistic, meaning they have systemic unity (Wilkinson, 1972).

Interactional field theory uses the field concept to describe social and community fields (Kaufman, 1959; Wilkinson, 1970; Theodori, 2003). The social field is an *arena of interaction* through time with some distinct outcome involving structure and elements that are continually changing (Wilkinson, 1970). There are locality-oriented social fields in given localities. These social fields have local actors and beneficiaries, their actions are public, and the goals represent interests of local residents. These fields tend to be oriented toward a single, specific interest within the locality (Wilkinson, 1972; Theodori, 2003). Examples of common social fields found in many communities include government, education, religion, and gardening. A community's Texas Master Gardener program could be considered a social field.

The community field results from the emergence of interaction between social fields (Wilkinson, 1999; Theodori, 2003). It is at this point that different social fields

interact with one another regarding some shared interest. Individuals, organizations, and associations are free to enter or leave the field at any time (Wilkinson, 1970). This process of interaction provides the backbone of the community field. The community field encompasses the interests of the entire community (Theodori, 2003). Consequently, special interests are set aside and a shared interest is the purpose of interaction. The interaction of the Master Gardener social field with another social field, i.e. schools, would be an example of an emerging community field.

Community development has been defined in several different ways. Voth and Brewster (1990) identified four perspectives. These included community development as an ideology, science, social intervention, and project or program. As ideology, community development shared certain intrinsic values including a belief in the possibility of progress, the idea that communities do act, and the belief in local decision-making. As science, generalizations are made regarding community change processes (Voth & Brewster, 1990). Community development as social intervention involved outside individuals bringing in techniques for community improvement. The last view of community development is as a project or program and focused on specific outcomes.

Christenson, Fendley, and Robinson, Jr. (1989) defined community development as a group of local people initiating a social action process to change their social, cultural, economic, or environmental situation. This definition was developed from an analysis of definitions appearing in the *Journal of the Community Development Society* and the *Community Development Journal*. This indicated some degree of agreement

from professional community developers on the definition of community development. Yet, in practice, the idea of community development remains elusive.

Community development has been defined as being positive, purposive, structure-oriented, and existing in the efforts of people (Wilkinson, 1999; Theodori, 2003). There must be a distinct reason for the activity and this purpose must be positive. Efforts should be focused on ways to improve, not harm, communities. Community development is also structure-oriented. It helps to build relationships between groups of people. Finally, community development is focused on the efforts of people. It is not focused on goal achievement. Community development can be successful without attaining a final set goal. The *process* of building relationships is more important than goal achievement (Wilkinson, 1999; Theodori, 2003).

Two types of development can be identified in the literature. A distinction is made between development *in* community and development *of* community (Summers, 1986; Wilkinson, 1999). Development *in* the community focuses on goal and task accomplishment. This type of development is focused on economic growth, improved services, and other physical aspects of development. An example of development *in* the community would be a new community center. This type of development uses the community as the location of the development, not the focus of the development (Summers, 1986).

Development *of* community focuses on the building of relationships (Summers, 1986; Wilkinson, 1999). This development focuses on creating and maintaining social structures. It is here, again, that interaction plays a key role. Development *of* community

would be achieved by having several entities working together to build a new community center. This is not to say that one type of development is better than the other. In fact, they are both necessary. They can and should compliment one another. Development of one should lead to development of the other.

Evaluation of Community Development

Community development has become a key concern for government agencies, especially the Cooperative Extension Service, in recent years. As such, research (Dhanakumar, Rossing, & Campbell, 1996; Hughes, 1998; Rebori, 2001; and Bowling & Brahm, 2002) has been conducted that attempted to evaluate programs for community development.

Dhanakumar, Rossing, and Campbell (1996) performed an evaluation of the Wisconsin Rural Leaders Perspective Program. One objective of the study was to determine if the seminar influenced alumni's participation in civic and community activities. The results indicated that individuals with a higher socioeconomic status were less likely to participate in community affairs after the leadership development class. Individuals with lower socioeconomic status were more likely to participate after the seminar. This study indicated that extension programs could influence community participation but it did not specifically address community development activities.

Another leadership development program was evaluated by Hughes (1998). The Southern University Cooperative Extension program leadership seminar entitled "Building Opportunities through Leadership Development" was evaluated for serving as

a change agent. This study evaluated a program that consisted of three connected communities. The Mississippi River served as a landmark connecting the three communities. A significant development of this program was the formation of the Tri-Parish Community Development Corporation. The corporation is a 501(c)3 corporation that is working to address problems such as housing development and economic development. The results of this study indicate a definite success with the creation of the development corporation, yet no concrete evidence is given to indicate social structure building.

Rebori (2001) attempted to evaluate a community development program. In her assessment, Rebori analyzed the development and evaluation of the program rather than the results. No attempt was made to evaluate the program for community development activities. The focus was instead on the program development phase.

Another study (Bowling & Brahm, 2002) indicated that extension programs could be used to shape communities. Using the appreciative inquiry method, the researchers asserted that by getting community members to reflect on positive experiences, one could use the information to develop healthier communities. This study provided a feel good approach toward community development; however, no concrete evidence was given to indicate that community development occurred.

One weakness of the aforementioned studies was that community and community development were never defined. A program cannot be evaluated for an outcome that has not been defined. Prior to evaluating a program for community development, one must define community and the type of development that will occur.

A second weakness of the studies was that all the programs studied were developed specifically for the purpose of leadership or community development. One would expect these types of programs to have some positive effects on community development. No research was found that attempted to evaluate an existing extension program for community development.

As one of four focus areas for Texas Cooperative Extension (2004), community development should be a part of extension programs. The Texas Master Gardener program, due to its focus on service, has the potential to move toward community development. Yet, no research was found that studied the effect of the Master Gardener Program on community development.

Texas Master Gardeners

Texas Master Gardeners are local community members, representing Texas Cooperative Extension, who are enthusiastic about gardening and who are willing to share their knowledge with others in the community. Master gardeners are primarily college-educated females over age 50 (D. Welsh, personal communication, December 18, 2002).

The first class of the Texas Master Gardener Program was held in 1979 in Montgomery County. Texas Cooperative Extension made an official commitment to the program in 1987 with the hiring of a statewide coordinator.

Master gardeners participate in 50 hours of specialized instruction. Topics include lawn care, ornamental plants, pest management, soil and plant nutrition,

vegetable gardening, and water conservation (Texas Master Gardener Web site, 2004b). Extension specialists primarily lead training in three to four-hour workshop sessions. Digital slide presentations are available for entomology and plant health diagnosis. Some Master Gardener training sessions are held via the Trans-Texas Videoconference network (Texas Master Gardener Web site, 2003).

After receiving training, participants must volunteer for at least 50 hours in the year following their training. The volunteer service is required before participants can be certified as Texas Master Gardeners. Master Gardener volunteers participate in different projects throughout the year. Projects include answering gardening phone calls at the county extension office, working with 4-H youth, conducting workshops, and planting community gardens (Texas Master Gardener Web site, 2004b).

Only one study was found that profiled a Texas Master Gardener chapter. Finch (1997) undertook a study to profile the Bexar County Master Gardeners. The study results revealed that applicants heard about the Master Gardener program through the newspaper and friends. This study also profiled several projects that Bexar County Master Gardeners have undertaken from 1990-1996. Some of the more interesting results of the study involve the reasons why people become a Master Gardener. The top three reasons for joining the program were: 1) access to horticultural information, 2) opportunity for community service, and 3) interaction with other gardeners (Finch 1997). This study provided a snapshot of a successful Texas Master Gardener program.

Due to its large scope and focus on volunteer service, the Texas Master Gardener program could affect community development. According to the 2003 Texas Master

Gardener Report, there are Master Gardener programs in 110 counties in the state. More than 5,450 volunteers contribute 353,643 hours to Texas Cooperative Extension, providing an economic benefit of \$5.8 million to the State of Texas (Texas Master Gardener Web site, 2004a).

The Texas Master Gardener Program is a large component of the Texas Cooperative Extension Service. To continue to serve the large number of interested Master Gardener clientele, the Texas Master Gardener program needs to seek alternative educational technologies that allow more training of individuals, without requiring additional extension personnel traveling across the state.

Statement of the Problem

Previous research has shown no significant differences between learning levels when using computer multimedia (Marrison & Frick, 1993), Internet (Aragon, Johnson, & Shaik, 2002; Litchfield, Oakland, & Anderson, 2002; Cecil & Feltes, 2002; Lippert, Plank, Camberato, & Chastain, 1998; Lippert, Plank, & Radhakrishna, 2000; Neuhauser, 2002; Rost & VanDerZanden, 2002; Sexton, Raven, & Newman, 2002), closed circuit television (Branson & Davis, 1985), cable television (Sunnarborg, Bradley, & Haynes, 1988), satellite television (Dooley, Van Laanen, & Fletcher, 1999; Ricketts, Hoelscher-Day, Begeman, & Houtkooper, 2001; Staats, 1995; Struempler, Jelinek, Brown, & Sanders, 1997; Swistock, Sharpe, & Dickison, 2001; Warmund & Schrock, 1999), video based instruction (Hathaway, Akridge & Downey, 1993, and computer based instruction (Henry, Midden, & Lieske, 2004; Swann, Katz, Merzdorf, Brown, Luba, & Talbert,

2000) with traditional classroom formats. A meta-analysis study of learning formats (Machtmes & Asher, 2002) provided the same results. No previous research was found where investigators used CD-based materials to teach turfgrass management to extension clientele. The ability to provide convenient and effective training to an increasing number of clientele with limited resources has implications for extension programs in Texas.

Cooperative Extension programs stress community development as a key focus area, however little is done to evaluate programs for community development. Research studies have focused on defining community development and outlining the practice of community development (Christenson, Fendley, & Robinson, Jr., 1989; Summers, 1986; Theodori, 2003; Voth & Brewster, 1990; Wilkinson, 1970, 1999). Little research (Dhanakumar, Rossing, & Campbell, 1996; Hughes, 1998; Rebori, 2001; Bowling & Brahm, 2002) was found that evaluated extension community development programs and no research was found that evaluated existing extension programs for their effect on community development. The ability to evaluate extension programs for community development goals would give extension personnel another measure of the impact that programs have on their respective communities.

Purpose and Objectives

The purpose of this study was to determine if Texas Master Gardener program participants' learning levels differed when taught nutrient, water, and pest management topics using CD-based materials versus traditional workshop settings. A second purpose was to determine if the Texas Master Gardener program contributed to community development. The following objectives guided this study.

1. Compare knowledge levels between Master Gardeners who are taught in face-to-face workshop settings versus those taught using CD-based materials.
2. Evaluate students' satisfaction with the learning materials.
3. Determine if relationships exist between learning and an individual's perceptions of nutrient management, water management, and pest management topics.
4. Determine if Texas Master Gardeners participate in community development activities.

CHAPTER III

METHODOLOGY

This chapter on methodology includes a description of the research design, population and sample, curriculum, instrumentation, data collection method, and data analysis used for this study.

Study Design

A pre-test/post-test experimental design, used to test the effect of extraneous factors (Borg & Gall, 1989), was used for this study. Two groups of study participants, a control group and an experimental group, must be included in the study (Borg & Gall, 1989). For this study, the experimental group was Master Gardener participants receiving their training via a CD-ROM-based curriculum. The control group consisted of Master Gardener participants receiving their turfgrass training in a face-to-face workshop setting. Approval to conduct this study was granted through the Texas A&M University Institutional Review Board (#2004-0035).

Two separate dependent variables were the center of the study. The dependent variables included learning levels of Texas Master Gardener participants and participation in community development activities. Independent variables of interest included individual's perceptions of nutrient, water, and pest management, and past participation in activities.

Population and Sample

The population for this study was Master Gardener participants in the 107 Texas counties that have active Master Gardener programs. The Texas Master Gardener Program office in College Station, Texas, provided the researcher with a list of counties with active Master Gardener programs as of December 2003. These programs either had training sessions underway or had graduated participants in the past. One problem encountered was that counties are only removed from the list as the county extension agent notifies the program office that a program no longer exists in that county (S. Feagley, personal communication, December 17, 2003). There was a possibility that a county on the list no longer had an active Master Gardener program.

A proportional stratified sample (Borg & Gall, 1989) was drawn from these 107 counties for the study. A proportional stratified sample was chosen to ensure that Master Gardener programs from all 12 Texas Cooperative Extension Districts were appropriately represented. Based on the distribution of programs throughout the state, one test program out of every ten programs would represent each district. Therefore, sixteen test programs statewide were considered for the sample.

Test programs were selected using demographic information provided by the Texas State Data Center. Demographic averages in race, income, and education level were calculated for each Texas Cooperative Extension district. Using the calculated averages (Appendix A), the county program most representative of the district was chosen for inclusion in the study.

Once test counties were identified, the researcher contacted the Texas Cooperative Extension agent responsible for the Master Gardener program in each county to schedule a training session. An electronic mail notice (Appendix B) was sent asking each agent to participate in the study. After three weeks and no response, a second reminder notice (Appendix C) was sent to the agents. After another week and no response, the researcher began contacting the agents via telephone. Agents were presented a brief synopsis of the study and asked to participate in the study during the telephone conversation. At this time, a date was also set for the face-to-face workshop training. Once an agent agreed to participate in the study, an email (Appendix D) was sent with details regarding the study and a tentative schedule based on the scheduled face-to-face training.

One county in far west Texas contacted the researcher and expressed an interest in being a part of the study. Due to scheduling opportunities and a limited response rate from other counties, it was decided to include the county in the study. Overall, six counties participated in the study, resulting in a response rate of 37.5%. These counties represented four of the 12 Cooperative Extension Districts in Texas. Counties that chose not to participate in the study indicated that their trainings were complete, they did not have an active Master Gardener program, or their trainings were held during the fall.

Curriculum

Three of the nine *Turf for Texans* modules were tested. Testing modules included Nutrient Management, Irrigation Matters in Texas, and Pests and Integrated Pest

Management (IPM). These three modules contained abstract concepts that are more difficult to grasp. The issues of nutrient, water, and pest management also have implications away from the home lawn. Misapplication of nutrients, water, and chemicals can have adverse effects on the environment (Bowman, Cherney, & Rufty, Jr., 2002; Haith & Rossi, 2003). It will be important for homeowners to understand that their actions in the areas of nutrients, water, and pests can have far-reaching effects. Therefore, these three modules were chosen for testing based on their level of difficulty, importance to understanding turfgrass management, and impact on the environment.

Information used in the development of the modules was collected using descriptive survey methodology with a modified Delphi technique. The most frequently asked questions (FAQs) were requested from individuals related to the Master Gardener program (Mayfield, Wingenbach, & Chalmers, 2004).

The first instrument consisted of open-ended questions designed to obtain a wide range of responses. Using their own Master Gardener experiences, county agents, coordinators, and volunteers identified the top five FAQs for advanced turfgrass management in each of three *Turf for Texans* instructional modules (Nutrient Management, Irrigation Matters in Texas, and Pests and Integrated Pest Management).

A team of extension turfgrass specialists, graduate students, and agricultural education faculty members condensed and combined initial responses into statements without altering their original meanings. A panel of experts from the Departments of Soil and Crop Science and Agricultural Education reviewed the instrument for face validity (Mayfield, Wingenbach, & Chalmers, 2004).

In the second round of data collection, respondents were instructed to read each FAQ for each module and rate the level of importance (Likert-type scale: 1 = Not Important...4 = Very Important) for including the FAQ in its respective turfgrass instructional module (Mayfield, Wingenbach, & Chalmers, 2004).

Upon conclusion of data collection in the second round, all statements were ranked according to their grand mean scores, sorted by level of importance, and posted in a third instrument on a secure Internet site. The third instrument allowed respondents to rate their level of agreement (Likert-type scale: 1 = Strongly Disagree...4 = Strongly Agree) with the importance levels for each FAQ in each turfgrass instructional module (Mayfield, Wingenbach, & Chalmers, 2004).

The identified FAQs were used as the basis for curriculum development for the three *Turf for Texans* modules. The Texas Cooperative Extension state turfgrass specialist, a turfgrass graduate student, and the researcher collaborated to develop the module content. The modules contained text, static graphics, handouts, audio, video, and links to outside information as part of the curriculum. Upon completion, the modules were burned onto CD-ROM and distributed to participants. A second turfgrass extension specialist and faculty in the Department of Agricultural Education provided outside reviews. Module development was completed in Spring 2004.

Instrumentation

Three separate instruments were used throughout the course of the study. These included a pre-test instrument, workshop post-test instrument, and CD post-test

instrument. The researcher developed all three instruments. The pre-test instrument was field tested on a sample of current Certified Master Gardeners to determine face validity.

The pre-test instrument (Appendix E) contained three parts. The first section included turfgrass management knowledge and perception questions developed by the researcher, a turfgrass graduate student and the Texas Cooperative Extension state turfgrass specialist. The questions were equally distributed between nutrient, water, and pest management in turfgrass. Both recall and application questions were included. Examples of questions included: (a) what is the most appropriate way to determine the amount of nutrients to be applied to your lawn; (b) what is potential evapotranspiration; and (c) what is integrated pest management. The perception statements were answered using a four-point Likert-type scale ranging from strongly disagree (1) to strongly agree (4). Statements included: (a) I appreciate turf in the landscape; (b) I am confident in measuring and applying water to my lawn; and (c) I confidently give advice on IPM to other homeowners.

The second part of the instrument consisted of community participation questions developed by the researcher and the Texas Cooperative Extension community development specialist. Questions in this section related to participants' involvement in community activities. Participants were asked to provide information related to their participation in local clubs, groups, and organizations. Other questions asked participants to indicate how they will share their Master Gardener experience with other community members.

The third part of the instrument was a demographic section to collect age, gender, education level, ethnicity, and computer experience.

The workshop post-test instrument (Appendix F) and the CD post-test instrument (Appendix G) consisted of two parts. The first part of the instruments consisted of the same turfgrass knowledge and perceptions questions presented in the pre-test instrument. The order of the questions and answers was changed from the pre-test. The second part of the instruments consisted of questions used to evaluate the program. Participants were asked to rank nine statements using a four point Likert-type scale. The scale ranged from strongly disagree (1) to strongly agree (4). These statements included: (a) the information was easy to understand; (b) the information will help me in giving advice to other homeowners; and (c) the information presented was relevant to my geographic location. One statement related to navigation was relevant only to the CD-based materials, while another statement related to the presenter was relevant only to the workshop presentation. CD-based participants were asked to evaluate both the workshop training and the CD-based training. A second scale asked the CD-based participants to evaluate the usefulness of the components (video, audio, handouts, etc.) used in the CD-based materials. The scale was a four-point scale that ranged from not useful (1) to very useful (4). Three other questions dealt with the usefulness of the information, behavior change, preference for training, and overall satisfaction with the program.

One ambiguous question was deleted from the knowledge portion of the instrument. Reliability for the knowledge portion was calculated using the KR-20 method. The Kuder-Richardson 20 alpha coefficient was calculated to be .68.

Cronbach's coefficient alpha for the perception scale was calculated to be .82 (workshop pre-test), .84 (CD-based pre-test), .75 (workshop post-test), and .86 (CD-based post-test). Cronbach's coefficient alpha for the workshop evaluation scale was .89. Cronbach's coefficient alpha for the CD-based material evaluation was .92 and for the CD-based usefulness scale was .92.

Data Collection

Participants had two options for training. Master Gardener participants completed the workshop entirely in a face-to-face setting, or completed two-thirds of the workshop in a face-to-face setting and one-third using the CD-based materials. The Texas Cooperative Extension state extension turfgrass specialist conducted all workshops to maintain consistency throughout the face-to-face training sessions.

Prior to beginning the training, a brief description of the study was provided to all participants. Participants were made aware that this was a voluntary study and there was no penalty for not participating. An informed consent form (Appendix H) was included as part of the pre-test instrument. A sign-up sheet was passed around and participants were asked to provide their name, email address, and indicate if they would participate in the face-to-face training or use the CD-based materials. The researcher asked that approximately one-half of the class complete the CD-based training. Ninety-four students completed the pre-test. Of that total, 51 students completed the face-to-face training and 43 students agreed to complete the CD-based lessons.

Once the introduction to the study was complete, a pre-test was administered to all participants. All participants attended the first two-thirds of the basic turfgrass training. An introduction to turfgrass, growth, adaptation, establishment, mowing, and cultural practices were topics covered in this portion of the training. Participants who self-selected to complete the three CD-based lessons were dismissed before the instructor began the nutrient management discussion. The remaining students continued the training in the face-to-face setting. Upon completion of the workshop, the post-test was administered to the remaining participants. Fifty-three students completed the workshop post-test.

Participants using the CD-based materials were dismissed after two-thirds of the turfgrass training. CDs were distributed and the participants were asked to complete the lessons at home. The participants had ten days to complete the course. Upon completion of the CD-based course, participants completed a post-test by connecting (via the Internet) to a secure server. Approximately five days after the face-to-face training, the CD-based participants were sent a reminder email (Appendix I). The email reminded the participants of their commitment to the study and their expected completion date. On day ten, the participants were again sent an email indicating that they should have completed the CD-based lessons and the post-test. On day eleven, email addresses were compared and individuals who still had not completed the post-test were sent a final reminder (Appendix J). A link to the secure server hosting the post-test was sent with each email reminder. Thirty-seven students completed the online CD post-test.

Data were collected during late spring and early summer 2004. This timing was chosen to coincide with module development. It was also indicated that 75% of Master Gardener trainings were held during spring of each year (D. Welsh, personal communication, February 24, 2003). This indicated that spring would be an ideal time to conduct the study.

Data Analysis

Data were analyzed using the statistical software package, SPSS[®]. Mean scores of participants were calculated to determine their knowledge levels. Independent sample t-tests were used to compare mean scores on the knowledge tests. Means, standard deviations, and independent sample t-tests were used to evaluate the participants' satisfaction with the materials. Pearson's product moment correlation was used to determine relationships between learning and lawn care perceptions (Borg & Gall, 1989). Descriptive statistics were used to identify Master Gardener participants' levels of community activity.

Limitations of the Study

The first limitation of this study was allowing the students to self-select to complete the CD-based materials or the face-to-face workshop training. Examining the two groups of participants, results show that the students using the CD-based materials rated themselves higher in their computer frequency and computer proficiency than did the workshop students. Students that were more comfortable with computers were more

likely to use the CD-based materials. Using demographic information to determine the two groups prior to the training could alleviate this possible bias in future studies.

Another limitation was having the CD-based participants complete the post-test via the Internet. Several CD-based students indicated trouble connecting to the secure website. However, communication between the participant and the researcher was able to resolve the problem in all but one situation. In this situation, the participant completed the online test, printed a copy, and faxed the test to the researcher. The CD-based learning format was used to negate the issue of connectivity associated with Internet access. Although the issues were solved in this study, connectivity could be a problem with a large number of students and limited instructor time. In this study, the problems were resolved because the researcher had ample time to work with each participant who experienced problems. A course instructor or moderator, may not have the same leisure of time when using the curriculum with a larger number of students.

The timing of the study may have limited the number of county programs participating in the study. Many of the county agents contacted to be a part of the study indicated that their Master Gardener trainings were held during the fall of the year. It is possible that a higher response rate could have been obtained had the study been conducted during the fall of the year.

CHAPTER IV

FINDINGS

Purpose and Objectives

The purpose of this study was to determine if Texas Master Gardener program participants' learning levels differed when taught nutrient, water, and pest management topics using CD-based materials versus traditional workshop settings. A second purpose was to determine if the Texas Master Gardener program contributed to community development. The following objectives guided this study.

1. Compare knowledge levels between Master Gardeners who are taught in face-to-face workshop settings versus those taught using CD-based materials.
2. Evaluate the students' satisfaction with the learning materials.
3. Determine if relationships exist between learning and an individual's perceptions of turf management including nutrient management, water management, and pest management topics.
4. Determine if Texas Master Gardeners participate in community development activities.

Participant Demographics

Ninety-four individuals participated in the study. Participants were primarily white (97%), married (78%), college educated (86%) females (68%) with a median age

of 55 years (Table 1). A majority of participants (84%) also indicated they took care of their own lawns (Table 2). Results are sorted by descending frequency counts.

Table 1

Demographic Frequencies for Respondents (n = 94)

Variable		<i>f</i>	Percent
Race	White	91	96.8
	Hispanic	1	1.1
	Native American	1	1.1
	Missing	1	1.1
Marital Status	Married	73	77.7
	Single	16	17.0
	Other	5	5.3
Education	Graduate	28	29.8
	Some College	20	21.3
	4-yr Degree	20	21.3
	2-yr Degree	13	13.8
	HS-GED	12	12.8
	Some HS	1	1.1
Gender	Female	64	68.1
	Male	27	28.7
	Missing	3	3.2
County	Ector/Midland	31	33.0
	Howard	18	19.1
	Brazos	14	14.9
	Comal	13	13.8
	Jefferson	11	11.7
	Rusk	7	7.4

Note. Frequencies may not add up to 100% due to missing data.

Table 2

Demographic Frequencies for Respondents' Lawn Care Options (n = 94)

Variable	<i>f</i>	Percent
Take care of own lawn	79	84.0
Use lawn care service	6	6.4
Neglect lawn	4	4.3
Don't have a lawn	3	3.2

Note. Frequencies may not add up to 100% due to missing data.

Primary reasons for being involved in the Master Gardener program included the training received (92%), association with other gardeners (70%), and/or to give back to the community (64%) (Table 3).

Table 3

Why Did You Get Involved with the Master Gardener Program? (n = 94)

Variable	<i>f</i>	Percent
Training	86	91.5
Association with other gardeners	66	70.2
Give back to the community	60	63.8
Other	17	18.1

Note. Respondents were able to choose multiple items.

Individuals learned about the Master Gardener program from four primary sources: friends (44%), media (44%), other Master Gardeners (34%), and/or from their county extension agents (31%) (Table 4).

Table 4

How Did You Learn about the Master Gardener Program? (n = 94)

Variable	<i>f</i>	Percent
Friends	41	43.6
Media	41	43.6
Other Master Gardeners	32	34.0
County extension agents	29	30.9
Other	9	9.6

Note. Respondents were able to choose multiple items.

Objective One

The first objective was to compare knowledge levels between Master Gardeners who are taught in face-to-face workshop settings versus those taught using CD-based materials. Mean scores were calculated for each of the four test types. Independent samples *t*-tests were used to compare the mean scores. The tests revealed that no significant differences in knowledge levels occurred between the two pre-tests, indicating that the students had somewhat equal knowledge of turfgrass management topics prior to beginning the course. *T*-tests conducted between the two post-tests revealed a significant difference in knowledge levels between the workshop post-test scores and the CD-based post-test scores (Table 5). Using post-test scores to analyze individual modules revealed no significant differences based on learning format (Table 6).

Table 5

Post-test Comparison of Knowledge Comprehension – All Modules

Module	Test Type	<i>n</i>	<i>M^a</i>	<i>SD</i>	<i>t</i>
All ^b	Workshop Post-Test	53	15.87	3.84	-2.00*
	CD-Based Post-test	37	17.38	3.01	

Note. ^a Total scores were equal to 21 with a range from two to 21. ^b21 knowledge questions related to nutrients, water, and pests.

**p* < .05

Table 6

Post-test Comparison of Knowledge Comprehension by Module

Module	Test Type	<i>n</i>	<i>M^a</i>	<i>SD</i>	<i>t</i>
Nutrients ^b	Workshop Post-test	53	5.57	1.38	-1.83
	CD-Based Post-test	37	6.05	1.03	
Water ^b	Workshop Post-test	53	5.42	1.40	-0.99
	CD-Based Post-test	37	5.70	1.31	
Pests ^b	Workshop Post-test	48	5.40	1.16	-0.79
	CD-Based Post-test	37	5.62	1.46	

Note. ^aTotal scores were equal to seven and ranged from zero to seven; ^bEach module consisted of seven knowledge questions related to the subject area.

While both groups of students made gains, students using the CD-based materials had higher gains from the pre-tests ($M = 13.70$, $SD = 3.41$) to the post-tests ($M = 17.38$, $SD = 3.01$) These results indicate that the CD-based materials were more effective, overall, in teaching turfgrass management topics to Master Gardeners, than the traditional workshop format.

Objective Two

The second objective was to evaluate students' satisfaction with the learning materials. The workshop students and the students using the CD-based materials were asked to evaluate the face-to-face workshop setting. Students indicated their satisfaction by agreeing or disagreeing with eight statements. The statements were measured on a four-point scale (1=strongly disagree to 4=strongly agree). Results are sorted by descending grand means (Table 7). An independent samples t-test revealed no significant differences between students' satisfaction levels based on the learning format used to complete the course. Both workshop students and CD-based students were

satisfied with the workshop setting. Students were most satisfied with the presenter's knowledge of the subject. They were least satisfied with the ease of understanding the information.

Table 7

Student Satisfaction with the Workshop Learning Format (N=87)

	Workshop			CD			Total		
	<i>n</i>	<i>M^a</i>	<i>SD</i>	<i>n</i>	<i>M^a</i>	<i>SD</i>	<i>n</i>	<i>M^a</i>	<i>SD</i>
The presenter was knowledgeable about the subject.	49	3.69	.47	37	3.65	.48	86	3.67	.47
The examples used were relevant and meaningful.	49	3.53	.50	37	3.38	.55	86	3.47	.52
The information presented was relevant to my geographic location.	50	3.50	.51	37	3.43	.55	87	3.47	.52
The information will help in decisions about my own situation.	48	3.35	.48	37	3.41	.50	85	3.38	.49
The information was presented in a logical, easy to follow manner.	50	3.34	.63	37	3.24	.60	87	3.30	.61
The pace of the program was appropriate.	50	3.18	.69	37	3.22	.63	87	3.20	.66
The information will help me in giving advice to other homeowners.	49	3.14	.46	37	3.16	.65	86	3.15	.54
The information was easy to understand.	48	2.92	.54	37	3.14	.48	85	3.01	.52

Note. ^aScores were calculated using a four-point scale (1 = Strongly Disagree, 4 = Strongly Agree).

Participants who used the CD-based materials were asked to evaluate both the workshop presentation and the CD-based materials. Students reported high levels of satisfaction for both the workshop and the CD-based materials. The CD-based materials were given higher ratings in five of the seven categories that pertained to both learning formats. The categories included ease of understanding, making decisions related to their own situation, giving advice to others, program pace, and presentation of the material.

The results indicated that students were pleased with the CD-based materials. Results are reported in Table 8.

Table 8

CD-Based Participants' Evaluation of Learning Formats (n=37)

Statement	CD-Based Materials		Workshop Presentation	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
The information will help in decisions about my own situation.	3.43	.50	3.41	.50
The information was presented in a logical, easy to follow manner.	3.39	.55	3.24	.60
The pace of the program was appropriate.	3.38	.55	3.22	.63
The examples used were relevant and meaningful.	3.35	.48	3.38	.55
The information will help me in giving advice to other homeowners.	3.32	.58	3.16	.65
The information was easy to understand.	3.30	.52	3.14	.48
The course materials were easy to navigate. ^a	3.27	.80	—	—
The information presented was relevant to my geographic location.	3.22	.53	3.43	.56
The presenter was knowledgeable about the subject. ^b	—	—	3.65	.48

Note. Scores were calculated using a four-point scale (1 = Strongly Disagree, 4 = Strongly Agree).

^aStatement was relevant only to the CD-based materials. ^bStatement was relevant only to the workshop presentation.

The individual components of the CD-based materials were also evaluated for their usefulness. Students were asked to categorize the different CD components as useful or not useful. Results are presented in Table 9.

Table 9

Evaluation of Components Used in CD-Based Materials (n=36)

Component	<i>M</i>	<i>SD</i>
On-screen text	3.34	.59
Static graphics	3.28	.62
Links to outside information sources	3.26	.66
Handouts (i.e. Adobe Acrobat files)	3.11	.62
Video clips	2.69	.72
Audio clips	2.26	.86

Note. Items were measured on a four-point scale (1 = Not Useful, 4 = Very Useful).

Overall, the students were pleased with the usefulness of the components used in the CD-materials. The components receiving the lowest rankings were the audio and video clips. The component receiving the highest ranking was the on-screen text.

A final question regarding overall satisfaction with the course was asked of both the workshop and CD-based participants. Students were asked to rank their satisfaction with the course using a four-point scale (1=very unsatisfied, 4=very satisfied). The CD participants were satisfied ($M = 3.38$, $SD = .72$) with their overall experience, while the workshop participants were more satisfied ($M = 3.52$, $SD = .81$) with their experience than were the CD participants. An independent samples *t*-test indicated no significant difference in overall satisfaction levels.

Individuals were also asked to indicate how they would prefer to see future Master Gardener trainings presented. An overwhelming majority of the workshop students (77%) indicated they would prefer to see trainings in a face-to-face format. Approximately one-half of the CD students indicated they would prefer to have face-to-face trainings, while a large group (38%) indicated that a combination of training methods would be preferred. Results are depicted in Table 10.

Table 10

Respondents' Learning Format Preference

Training Method	CD (n=37)		Workshop (n=50)	
	<i>f</i>	Percent	<i>f</i>	Percent
Face-to-face	19	51.4	41	77.4
CD-based	2	5.4	3	5.7
Internet based	2	5.4	2	3.8
Other ^a	14	37.8	4	7.5

Note. ^aThe majority of responses indicated a combination of methods was preferred.

Objective Three

The third objective was to determine if relationships existed between learning and an individual's perceptions of turf management including nutrient management, water management, and pest management topics. Both pre-test and post-test data were analyzed to determine any relationships. Pearson's Product-moment correlation coefficients for the pre-tests are depicted in Table 11.

Table 11

Pre-test Correlations between Perceptions and Knowledge of Turf Management Topics

Test Type	Perceptions	Knowledge			
		Water	Pest	Nutrients	Total
Workshop Pre-test	Overall	.28	.25	.21	.30*
	General	.30*	.16	-.001	.18
	Nutrients	.22	.22	.17	.21
	Water	.13	.11	.15	.17
	Pests	.16	.26	.36*	.37**
CD-Based Pre-test	Overall	.40*	.17	.39**	.48**
	General	.15	.23	.39**	.43**
	Nutrients	.47**	.12	.36*	.47**
	Water	.38*	.09	.22	.34*
	Pests	.31	.10	.30	.36*

Note. Perceptions were calculated by totaling responses to 13 statements (Appendix E, question 23). Responses were rated on a four-point scale (1 = strongly disagree, 4 = strongly agree).

** $p < .01$. * $p < .05$.

Pre-tests for the workshop participants indicated that a significant relationship existed between an individual's perceptions of overall turf management and their total knowledge. Perceptions of general turf management topics and water knowledge were significantly correlated. Concurrently, a relationship existed between perceptions of pest management and nutrient knowledge and total knowledge. The CD-based pre-test results indicated that perceptions of overall turf management topics were significantly correlated with water, nutrient, and total knowledge. A relationship was also found to be significant between perceptions of general turf management topics and nutrient and total knowledge. Perceptions of nutrient management were correlated with water, nutrient, and total knowledge. An individual's perceptions of water were significantly correlated with water and total knowledge. Perceptions of pest management were significantly correlated only with total knowledge.

The post-test data were also analyzed to determine if a relationship existed between perceptions and knowledge. Pearson's Product-moment correlation coefficients are depicted in Table 12.

Table 12

Post-test Correlations between Perceptions and Knowledge of Turf Management Topics

Test Type	Perceptions	Knowledge			
		Water	Pests	Nutrient	Total
Workshop Post-test	Overall	.09	.10	.08	.07
	General	-.21	-.01	-.17	-.16
	Nutrients	.10	.18	.23	.17
	Water	.19	-.02	.07	.13
	Pests	.15	.14	.07	.03
CD-Based Post-test	Overall	.45**	.65**	.42*	.65**
	General	.38*	.43**	.49**	.54**
	Nutrients	.54**	.66**	.40*	.59**
	Water	.20	.47**	.09	.34*
	Pests	.34*	.65**	.29	.56**

Note. Perceptions were calculated by totaling responses to 13 statements (Appendix F and Appendix G, question 23). Responses were rated on a four-point scale (1 = strongly disagree, 4 = strongly agree).

** $p < .01$. * $p < .05$.

The workshop post-test results indicated no significant relationships existed between perceptions and knowledge. The CD-based post-test results indicated a large number of significant relationships. Perceptions of overall turf management, general turf management, and nutrient management were significantly correlated to water, pests, nutrient, and total knowledge. Perceptions of water showed a significant relationship with pest and total knowledge. Perceptions of pests were significantly related to water, pest, and total knowledge.

Objective Four

The fourth objective was to determine if Texas Master Gardeners participate in community development activities. Items used to determine participation included answering extension calls, landscaping projects, demonstration gardening, youth gardening, speaking engagements, and other activities. Forty-four participants indicated they had no previous experience with any of these activities before joining the Master Gardener program. Forty-eight participants indicated they had completed one or more of the activities prior to joining the Master Gardener program. The results indicated some slight differences between those individuals with previous experience and those with no experience. Individuals with no prior experience were more likely than others to have found out about the program from the media (55%), while individuals with prior participation were more likely to have heard about the program from county extension agents (38%), other Master Gardeners (44%), or friends (52%). This indicated some previous knowledge of the program. Exactly one-half of the women were included in the group with no previous experience, while the majority of male participants had previous experience. Individuals with no past experience reported lower levels of education than those individuals with prior experience. Results are presented in Table 13.

Table 13

Demographic Comparison of Respondents Based on Past Experience

Variable		No Past Experience (n=44)		Some Past Experience (n=48)	
		<i>f</i>	Percent	<i>f</i>	Percent
Education	Some HS	1	2.3	—	—
	HS-GED	4	9.1	7	14.6
	Some college	12	27.3	8	16.7
	2-yr Degree	7	15.9	5	10.4
	4-yr Degree	8	18.2	12	25.0
	Graduate	12	27.3	16	33.3
Gender	Female	31	70.5	31	64.6
	Male	11	25.0	16	33.3
	Missing	2	4.5	1	2.1
Marital Status	Single	6	13.6	10	20.8
	Married	35	79.5	37	77.1
	Other	3	6.8	1	2.1
Learned about Master Gardener program ^a	County agent	11	25.0	18	37.5
	Other MG	10	22.7	21	43.8
	Friend	15	34.1	25	52.1
	Media	24	54.5	17	35.4
	Other	2	4.5	7	14.6
Reason for joining Master Gardeners ^a	Training	42	95.5	43	89.6
	Give back to Community	27	61.4	32	66.7
	Association with other gardeners	31	70.5	34	70.8
	Other	3	6.8	12	25.0

Note. Frequencies may not add up to 100% due to missing data.

^aRespondents were able to choose multiple answers.

Participants were also asked to indicate if they would participate in the same activities after completion of their Master Gardener training. A comparison of past experience with anticipated behavior is depicted in Table 14.

Table 14

Comparison of Previous Experience and Anticipated Experience after Master Gardener Program Completion

Previous Experience	Anticipated Experience						
	<i>n</i>	1	2	3	4	5	6
No past experience	44	27	42	35	28	15	8
Answer Calls	6	5	5	5	1	3	1
Landscaping-beautification	36	20	36	32	20	18	6
Demonstration gardening	14	8	13	12	10	10	2
Youth gardening	11	6	10	9	11	7	4
Speaking-media	20	12	18	17	12	19	4
Other	7	4	7	4	2	5	2

Note. Respondents were able to choose multiple activities. 1 = Answer Calls; 2 = Landscaping-beautification; 3 = Demonstration gardening; 4 = Youth gardening; 5 = Speaking-media; 6 = Other.

All individuals indicated that they would participate in some type of activity. The forty-four individuals with no past experience were most likely to get involved in landscaping and gardening projects. The results also indicated that individuals were more likely to participate in the same type of activities both prior to and after their Master Gardener training. Speaking engagements-media was the least likely specific activity for individuals to pursue after their training.

Individuals were also asked identify what community groups they would share their Master Gardener experience with in the future. Individuals were more inclined to state that they would share their experience with educational and school groups (62%), environmental groups (53%), youth groups (51%), and church groups (50%). Results are depicted in Table 15.

Table 15

Organizational Interaction (n=94)

Type of Organization	Individuals	%
Educational/School	58	61.7
Environmental	50	53.2
Youth	48	51.1
Church	47	50.0
Human Service	38	40.4
Homeowner's Association	37	39.4
Government	30	31.9
Civic	27	28.7
Recreational	21	22.3

Note. Respondents were able to choose multiple answers.

A final question asked individuals to indicate if they would continue to share their Master Gardener experience after the required 50 hours of service. Only eight individuals indicated they would not continue to share their experience. All of the individuals were female with some college education. Their primary reason for getting involved in the program was to receive training. Giving back to the community was not a high priority for joining the Master Gardener program. A demographic sketch is provided in Table 16.

Table 16

Demographics of Respondents Not Planning to Continue Service after 50 Hours (n=8)

Variable		<i>f</i>	Percent
Education	Some college	2	25.0
	2-yr Degree	2	25.0
	4-yr Degree	3	37.5
	Graduate	1	12.5
Gender	Female	7	87.5
	Missing	1	12.5
Marital Status	Single	1	12.5
	Married	6	75.0
	Other	1	12.5
Learned about Master Gardeners ^a	County agent	1	12.5
	Other MG	1	12.5
	Friend	4	50.0
	Media	3	37.5
Reason for joining Master Gardeners ^a	Training	6	75.0
	Give back to community	1	12.5
	Association with other gardeners	3	37.5
	Other	2	25.0

Note. Frequencies may not add up to 100% due to missing data.

^aRespondents were able to choose multiple answers.

CHAPTER V

SUMMARY AND CONCLUSIONS

This chapter provides an overall summary of this research study. A brief summary of the research methods and participants is provided. The bulk of the chapter focuses on the conclusions and recommendations as they relate to each objective of this study.

The purpose of this study was to determine if Texas Master Gardener program participants' learning levels differed when taught nutrient, water, and pest management topics using CD-based materials versus traditional workshop settings. A second purpose was to determine if the Texas Master Gardener program contributed to community development. The following objectives guided this study.

1. Compare knowledge levels between Master Gardeners who are taught in face-to-face workshop settings versus those taught using CD-based materials.
2. Evaluate the students' satisfaction with the learning materials.
3. Determine if relationships exist between learning and an individual's perceptions of nutrient management, water management, and pest management topics.
4. Determine if Texas Master Gardeners participate in community development activities.

Summary of Methodology

This research study used a pre-test/post-test research design as described by Borg and Gall (1989). Participants were asked to complete a pre-test, consisting of three sections, prior to their exposure to the lesson. The first section of the test concerned turf knowledge and perceptions, the second section concerned community development activities, and the third section collected demographics. Participants using the CD-based materials completed two-thirds of the course during a workshop presentation and the last third of the curriculum was completed using the CD-based materials. The control group, or workshop participants, completed the entire course at a workshop presentation. After completing their training, participants were asked to complete a post-test. The post-test included the same turf knowledge and perception questions from the pre-test along with evaluation questions related to the respective learning formats. Workshop participants completed the post-test before leaving the workshop presentation. Participants using the CD-based materials finished the lesson and completed the post-test by connecting to a secure server via the Internet within ten days of their training.

Summary of Participants

A proportional stratified sampling technique (Borg & Gall, 1989) was used to select the sample for this study. The population consisted of 107 counties with Master Gardener programs from the state of Texas. The sample consisted of 16 counties that were identified using averages of selected demographics including race, income, and education level. The study participants included 94 individuals from six counties,

representing four of the 12 Cooperative Extension districts within the state. The effective response rate was 37.5%. Due to the low response rate, the results of this study cannot be generalized to the entire state of Texas. Yet, results can be generalized for the four districts participating in the study. These districts include the Far West, East, Southeast, and Southwest districts of Texas Cooperative Extension.

Objective One

Key Findings

The first objective was to compare knowledge levels between Master Gardeners who are taught in face-to-face workshop settings versus those taught using CD-based materials. The key finding from this part of the study resulted from the independent samples *t*-test calculated on the post-test scores. The results indicated a significant difference occurred between the workshop post-tests and the CD-based post-tests. This indicated that students using the CD-based materials had higher gains from the pre-test to the post-test than did the workshop students.

Conclusions

It can be concluded that the CD-based materials were more effective in teaching nutrient, water, and pest management turfgrass topics to Master Gardener trainees than were the face-to-face workshop settings. The results indicated that CD-based materials could be used to teach extension clientele difficult subject matter. These results contradict previous research (Branson & Davis, 1985; Sunnarborg, Bradley, & Haynes, 1988; Hathaway, Akridge, & Downey, 1993; Marrison & Frick, 1993; Machtmes &

Asher, 2000; Ricketts, Hoelsher-Day, Begeman, and Houtkooper, 2001; Swistock, Sharpe, and Dickison, 2001; Aragon, Johnson, & Shaik, 2002; Neuhauser, 2002; Rost and VanDerZanden, 2002; Sexton, Raven, and Newman, 2002; and Henry, Midden, & Lieske, 2004) that found no differences in knowledge levels based on learning format. Possible explanations exist in that participants in the current study have greater computer literacy skills, less computer technology anxiety, or were much more attuned to the learning materials. As such, additional study is needed to isolate these factors in the learning environment. Another possible explanation exists in that the CD-materials were self-paced. Students using the CD-based materials had ten days to complete the course, while the workshop students completed the course in approximately one hour. A third possible explanation is that students using the CD-based materials were able to keep the CD, or actual instruction, as a reference, while the workshop students only received handouts. This could help to enhance the learning experience.

Recommendations

Implications of this finding are far reaching regarding extension programming and education in general. While many programs are jumping to Internet based training (Rost & VanDerZanden, 2002), extension professionals should consider CD-based training materials as a viable option when considering delivery methods. CD-based materials would offer students with computers, but without Internet access, access to programs that might not otherwise be available. The same recommendation can be made for education professionals, as well. Programs have gone from traditional classroom

instructional formats to the Web-based format without exploring the technology that lies in the midst of this realm.

It is recommended also that future research be conducted to test the effect of learning formats on long term retention. Additionally, a future study should be conducted to compare knowledge levels between Master Gardeners who are taught in face-to-face workshop settings versus those taught using CD-based materials using the complete *Turf for Texans* curriculum.

Objective Two

Key Findings

The second objective was to evaluate student satisfaction with the learning materials. The results revealed that students were satisfied with both the workshop and CD-based materials. On the overall satisfaction scale, the workshop students were slightly more satisfied than were the students using the CD-based materials. An evaluation of the components used in the CD-based materials indicated that students felt that video and audio clips were somewhat useful. The most useful part of the CD-based materials, as rated by the students, was the on-screen text. The results also revealed that students prefer to have their training delivered in a face-to-face setting, although a large group indicated that a mixture of training methods would be acceptable.

Conclusions

Several conclusions can be drawn from this study. First, the students were satisfied with both training methods used in the process. This concurs with Staats' (1995) study that found student satisfaction with distance learning materials was high.

The second conclusion relates to the components used in the design of the CD-based materials. Students found the audio and video clips somewhat useful, while the most useful items were on-screen text and static graphics. For this particular course, audio and video clips were used as introductory material only. They were not used as key instructional materials, thus it is expected that students would not find them as useful as other components.

Students using the CD-based materials were particularly satisfied with the presentation of the information and the pace of the program. The material was presented in a way that allowed students to pick and choose how they wanted to learn the material. Students could explore the materials much like you would explore a web site. They were not confined to viewing the materials in a linear, step-by-step manner. Students using the CD-based materials were also able to choose their own pace to complete the materials. Students were given ten days to complete the materials and could complete the post-test at any time during that ten-day period.

Finally, individuals in the face-to-face setting indicated a preference for future face-to-face trainings. The students using the CD-based materials showed a preference for face-to-face workshops, yet also indicated they would like to see a combination of

learning formats used in the future. This finding is concurrent with Warmund and Schrock's (1999) previous Master Gardener research.

Recommendations

It is again recommended that extension professionals consider the use of CD-based materials for program delivery. The self-pace and flexibility in presenting the materials make the CD format attractive for both learners and Extension professionals alike. Extension professionals should be cognizant, however, that clientele are satisfied with CD-based materials, but would like a continued specialist presence. It is recommended that the CD-materials be used as the core training materials with a follow-up question and answer session to be held if warranted by the students. For those students still preferring a face-to-face workshop, it is recommended that the workshop be restructured to spend more time on the issues of nutrient, water, and pest management, while spending less time on other less important topics. The CD-based materials could also be handed to participants as a future reference.

The students in this study were asked to evaluate both the workshop format and the CD-based learning format. It is possible that students compared the learning formats rather than evaluated each format on its own merits. Therefore, a future study should be conducted that asks students to evaluate the *Turf for Texans* CD-based curriculum only.

Objective Three

Key Findings

Objective three was to determine if relationships existed between learning and an individual's perception of turf management including nutrient management, water management, and pest management topics. Perceptions were measured using a four-point Likert-type scale ranging from strongly disagree (1) to strongly agree (4). Statements included: (a) I appreciate turf in the landscape; (b) I am confident in measuring and applying water to my lawn; and (c) I confidently give advice on IPM to other homeowners. Both pre-tests and post-tests for each learning format were analyzed for relationships.

Analyzing the pre-tests revealed four significant correlational relationships in the group of workshop students. These relationships included perceptions of overall turf management topics and total knowledge; perceptions of general turf topics and water knowledge; perceptions of pests and nutrient knowledge; and perceptions of pests and total knowledge. Eleven significant correlational relationships, including perceptions of overall turf management topics and water, nutrient, and total knowledge, existed within the group of CD students. Other relationships included perceptions of general turf topics, water knowledge, and total knowledge. Perceptions of nutrient management were related to water, nutrient, and total knowledge. Perceptions of water were correlated with water knowledge and total knowledge. Perceptions of pests were correlated only with total knowledge.

The post-test results revealed similar findings. No significant relationships were found within the workshop students, while 17 significant relationships existed within the group of CD students. The knowledge of pests, which was not correlated with any perceptions in the pre-test analyses, was significantly correlated with all five perception categories in the CD post-test analyses. Perceptions of general turf management topics were correlated with water knowledge. A relationship also existed between perceptions of pests and water knowledge. All existing relationships from the pre-test analyses increased in their correlational strength. It is important to note that the relationship between perceptions of water and water knowledge became insignificant in the post-test analyses.

Conclusions

It can be concluded that more positive perceptions of turfgrass management topics had positive effects on learning of these topics. Because of the difference in relationships among the workshop participants and the students using the CD-based materials, it is possible that the learning format used to teach the subjects had an influence on perceptions and knowledge.

The students using the CD-based materials were able to review the CD more than once and could absorb the material at their own pace. The workshop students were presented the same material in approximately one hour. It is possible that students using the CD-based materials were able to gain a better understanding of the material and the relationships between nutrients, water, and pests. This would influence both their perceptions and their knowledge levels. This is true for all topics except for water

management. Perceptions and knowledge of water were related in the pre-test, yet the post-test revealed no relationship. While students may have felt confident about their water knowledge going into the pre-test, the material could have provided new information that changed their perceptions and their knowledge.

The CD-based materials were presented in a way to allow students to explore the materials at their will. This allowed students to spend more time on topics in which they felt their knowledge was weak and allowed them to go back and explore other topics when questions arose out of the material. The non-linear presentation of the material also made it easier for students to move from module to module, or topic to topic, and thus make relationships between topics more clear.

Recommendations

It is recommended that more time be spent on the topics of nutrients, water, and pest management in turfgrass during the workshop setting. It is possible that this traditional setting does not provide time to adequately cover these subjects. It is recommended also that these topics be developed into lessons to be delivered independent of the main body of material. It is important that the connection between nutrients, water, pests, turf management, and the environment be explored more fully. Making the connection between the issues more evident may have a positive impact on perceptions.

Further research studies should be conducted to more fully explore the relationships between learners' perceptions of these turfgrass management topics and their knowledge of these topics. This type of research would prove useful in developing

instructional materials that could adequately educate extension clientele, particularly homeowners, about the impacts of their actions.

Objective Four

Key Findings

Objective four was to determine if Texas Master Gardeners participate in community development activities. The first community finding was related to the demographics of participants in the Master Gardener program. Demographic analyses revealed that participants involved in the program do not accurately reflect the citizens of their representative counties. Race and education level were inadequately represented. Of the counties in the study, the lowest percentage of Hispanic residents was 8.4%. Yet, the study demographics revealed only 1% of the participants to be Hispanic. Participants in the study tended to be more educated as well. Average demographics of the sample counties indicated the highest percentage of individuals with a bachelor's degree or higher to be 37%, while the study demographics revealed that 51% of participants had a bachelor's degree or higher.

The results also revealed that 44 participants in the program had no past involvement with activities that are considered 'service' under the Master Gardener program umbrella. Comparing these individuals to those with past experience provided interesting results. Those individuals with no past experience tended to be less educated than those with past experience. Males were more likely to have had past experience, while exactly one-half of the females fell into each category. The most revealing finding

came from asking how individuals learned about the Master Gardener program.

Individuals with no past experience were more likely to find out about the program from media sources; whereas, individuals with past experience were more likely to hear about the program from county extension agents, other Master Gardeners, and friends.

To receive Master Gardener certification, trainees are committed to providing 50 hours of community service. Equating community service with community involvement allowed the researcher to look at an individuals' past experience and compare it with their anticipated involvement. The 44 individuals with no past experience indicated they would be heavily involved in landscaping/beautification projects and demonstration gardening. Speaking engagements were the least preferred activity.

The individuals with past experience were also asked about their anticipated behavior. The findings revealed they would continue to be involved. Participants indicated they would be involved in several activities; yet, it is interesting that most of the individuals indicated they would remain involved in the same type of activity in which they were previously engaged. For example, individuals previously involved in youth gardening indicated they would expand into other activities while remaining involved in youth gardening.

Interaction is a keystone of community development (Kaufman, 1959; Wilkinson, 1970; Theodori, 2003), so individuals were asked to indicate what groups they would share their experiences with in the future. Educational, environmental, youth, and church groups topped the list. While this is significant involvement with others, it does not indicate whether individuals are communicating their experience or just

providing their expertise. These organizations correspond well with landscaping, demonstration gardening, and youth gardening. It is possible that development *in* the community is occurring without the development *of* community.

After receiving certification Master Gardeners can choose to continue their involvement and remain active program participants or they can leave the program. Eight participants in the study indicated they would not continue their community service after the required 50 hours. These individuals were married, college educated females. Their primary reason for getting involved with the program was to receive training. Only one individual indicated that giving back to the community was a priority.

Conclusions

From this study, several conclusions can be made regarding the Master Gardener program and community development.

First, examining the demographics of program participants in this limited study it appears that the Master Gardener program does not involve the entire community. A large portion of minority and lower educated individuals are not included in the program.

Second, the results indicate that individuals with past experience have some prior knowledge of the program. It is possible that they are already involved with other extension programs or gardening groups. Individuals with no past experience hear about the program from a second hand source and may be hearing about the program for the first time.

Two observations can be made by looking at participants' past experience and anticipated experience. First, individuals with no prior experience anticipated being involved in community development projects. Second, based on the projects chosen, this group would focus on development *in* the community (Summers, 1986; Theodori, 2003; Wilkinson, 1999).

Whereas, individuals with prior experience were willing to look at other activities, yet remained loyal to their previous activity. It is also possible that some individuals did not anticipate deviating from their previous activity.

It is also noted that individuals can and do join the Master Gardener program only for the training and certification. Several participants indicated a projected lack of involvement after the required 50 hours of service. It is likely that these individuals completed the certification process for personal gain and training only.

The overall picture is that Master Gardener program participants do participate in community development activities. Many Master Gardener activities are development *in* the community rather than development *of* the community. The focus tends to be on task accomplishment rather than structure building. While individuals are involved, they tend to stay in their 'comfort zone' without veering into new areas.

Recommendations

Several recommendations seem appropriate to enhance the community development opportunities associated with the Master Gardener program and they involve program outreach, promotion, and implementation.

Opportunities exist for extension professionals to work to encourage participation in the program from all areas of the local community. Concomitantly, extension professionals would benefit by using media sources to actively promote programs such as the Master Gardener program. It is evident that this type of advertising is attracting individuals into extension programs. These are individuals that are likely not to have been involved with their communities before and by getting involved in outreach programs it is possible they will remain involved in future years.

Procedures should be implemented that would require Master Gardener program trainees to share their experience with someone outside the gardening social field during their 50 hours of required service. This would accomplish two things: it would expose more people to the program and it would work toward true development *of* community. This recommendation would be applicable to extension programs that utilize volunteers to disseminate information to the general public.

An opportunity also exists for extension professionals working with the Master Gardener program to work with community development specialists to create a broader understanding of community development among program participants. This would strengthen the community development aspect of the Master Gardener program and would work to ensure both development *in* the community and development *of* the community.

This study attempted to examine the link between past involvement and anticipated involvement. Future research should be conducted that links anticipated involvement with actual involvement. Future research should also examine prior

organizational interaction and make a comparison with anticipated and/or actual sharing of their Master Gardener experience.

Concluding Comments

The Master Gardener program reaches a large number of extension clientele each year. The program has the potential to reach an even larger number of individuals through innovative teaching and outreach methods. Using a combination of CD-based materials and a specialist presence; working with underrepresented groups; using the media to promote the program; and incorporating procedures that require interaction with community members outside the gardening social field, the Master Gardener program can have an even larger and more positive impact on society.

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APPENDIX A
CALCULATED DEMOGRAPHIC AVERAGES FOR TEXAS COOPERATIVE
EXTENSION DISTRICTS

Table A-1

Calculated Demographic Averages for Texas Cooperative Extension Districts

District	Hispanic ^a	Education ^a		Income ^d
		High School + ^b	Bachelor's degree + ^c	
1	20.4	75.2	16.8	\$34,539
2	40.2	66.2	12.9	29,067
3	13.6	73.0	14.1	30,405
4	10.0	76.5	18.2	38,625
5	7.10	72.6	12.8	30,736
6	50.2	65.4	14.5	29,899
7	21.6	73.3	16.3	30,947
8	13.8	75.4	15.7	35,218
9	14.8	76.0	17.9	39,250
10	33.0	75.2	20.1	36,893
11	31.7	70.8	13.9	33,055
12	78.8	55.4	11.0	24,820

Note. ^aResults reported in percentages. ^bHigh school education or higher.

^cBachelor's degree or higher education. ^dReported in U. S. dollars.

APPENDIX B

INITIAL ELECTRONIC MAIL NOTICE TO COUNTY EXTENSION AGENTS

As you know, I have been working on the *Turf for Texans* CD-based instructional materials for the Texas Master Gardener program for the past several months. Now, I will compare the nutrient, water, and pest management modules against a traditional face-to-face workshop setting for the research component of my Master of Science degree. I also will be assessing effects of the Master Gardener program on community development. Therefore, I need counties with Master Gardener training programs that are willing to participate in this study.

At this time, I ask your participation in my study “The Texas Master Gardener Program: An Assessment of Curriculum Delivery and Contribution to Community Development.” To participate, the turf portion of the Master Gardener training should be scheduled for late spring or early summer.

Trainees would agree to a face-to-face turf management workshop session led by Dr. David Chalmers, State Extension Turfgrass Specialist. One-half of the trainees would complete the course entirely in the workshop. The remainder would participate in two-thirds of the face-to-face workshop, then complete the last one-third (nutrients, water, and pests) using the *Turf for Texans* CD-based materials. Trainees would be asked to complete pre- and post-tests regarding their turf knowledge. I would like participants to take a second post-test six weeks after training to measure long-term knowledge gains. Trainees will be asked questions related to their community involvement.

If your county Master Gardener program is willing to participate in my study, please e-mail me as soon as possible. Provide me with a scheduled date or possible dates of your turf program and an approximate number of participants.

Upon receiving your response, I will contact you by telephone to discuss details regarding the study procedures. I look forward to hearing from you soon. Thanks in advance for your participation in my research study.

Sincerely,
Chyrel Mayfield
Graduate Assistant
Department of Agricultural Education
Department of Soil & Crop Sciences
2116 TAMU
College Station, TX 77843-2116
979-458-1049 - phone
979-845-6296 - fax
cmayfield@aged.tamu.edu

APPENDIX C

SECOND ELECTRONIC MAIL NOTICE SENT TO COUNTY EXTENSION

AGENTS

Everyone:

Earlier, about three weeks ago, I sent an email requesting your participation in my *Turf for Texans* Master Gardener Program research study. As of right now, I have not heard back from any one. This is my second request for consideration in participating in my study "The Texas Master Gardener Program: An Assessment of Curriculum Delivery and Contribution to Community Development." The details of the program are outlined below.

I will begin contacting individuals via phone on Monday, April 19. I look forward to working with you in the near future.

I hope to hear from you soon.

Sincerely,
Chyrel Mayfield
Graduate Assistant
Department of Agricultural Education
Department of Soil & Crop Sciences
2116 TAMU
College Station, TX 77843-2116
979-458-1049 - phone
979-845-6296 - fax
cmayfield@aged.tamu.edu

-----Original Message-----

From: Mayfield, Chyrel
Sent: Thursday, March 25, 2004 10:48 AM
Subject: Turf for Texans research study

As you know, I have been working on the *Turf for Texans* CD-based instructional materials for the Texas Master Gardener program for the past several months. Now, I will compare the nutrient, water, and pest management modules against a traditional face-to-face workshop setting for the research component of my Master of Science degree. I also will be assessing effects of the Master Gardener program on community development. Therefore, I need counties with Master Gardener training programs that are willing to participate in this study.

At this time, I ask your participation in my study "The Texas Master Gardener Program: An Assessment of Curriculum Delivery and Contribution to Community Development." To participate, the turf portion of the Master Gardener training should be scheduled for late spring or early summer.

Second Electronic Mail Notice Sent to County Extension Agents Continued

Trainees would agree to a face-to-face turf management workshop session led by Dr. David Chalmers, State Extension Turfgrass Specialist. One-half of the trainees would complete the course entirely in the workshop. The remainder would participate in two-thirds of the face-to-face workshop, then complete the last one-third (nutrients, water, and pests) using the *Turf for Texans* CD-based materials. Trainees would be asked to complete pre- and post-tests regarding their turf knowledge. I would like participants to take a second post-test six weeks after training to measure long-term knowledge gains. Trainees will be asked questions related to their community involvement.

If your county Master Gardener program is willing to participate in my study, please e-mail me as soon as possible. Provide me with a scheduled date or possible dates of your turf program and an approximate number of participants.

Upon receiving your response, I will contact you by telephone to discuss details regarding the study procedures. I look forward to hearing from you soon. Thanks in advance for your participation in my research study.

Sincerely,
Chyrel Mayfield
Graduate Assistant
Department of Agricultural Education
Department of Soil & Crop Sciences
2116 TAMU
College Station, TX 77843-2116
979-458-1049 - phone
979-845-6296 - fax
cmayfield@aged.tamu.edu

APPENDIX D**ELECTRONIC MAIL NOTICE SENT TO COUNTY EXTENSION AGENTS
UPON AGREEMENT TO PARTICIPATE IN STUDY**

Debbie,

Thanks for agreeing to participate in the Turf for Texans research study. Your cooperation is greatly appreciated. The purpose of my study is to determine if Master Gardeners learn as well with CD materials as they do with face-to-face instruction and to determine if the Master Gardener program contributes to community development.

I do have one last question - What time is the training scheduled for on May 5?

Here are the details of the study.

- 1) Each participant will be asked to complete a pre-test prior to receiving any training, either via the workshop or the CD. The pre-test consists of 41 questions on turf knowledge, community involvement, and general demographics. Each participant would also be asked to provide their name and email address for additional communication.
- 2) All participants will complete part of the training in the face-to-face workshop setting.
- 3) When Dr. Chalmers begins to talk about Nutrient Management, Water Management, and Pest Management, those choosing to use the CD materials will be excused from the training.
- 4) Those that choose to remain in the workshop will complete the training and then complete a short post-test consisting of 28 questions.
- 5) Those students choosing to use the CD materials will have 10 days to complete the training and logon to the Internet and complete their post-test.
- 6) Six weeks after completing their respective training, I would also ask that each participant complete a second post-test that would measure long-term knowledge gains and measure community involvement.

Here is what the schedule would look like for your group.

May 5 - All participants complete pre-tests and workshop group complete post-test.

May 15 - CD participants should have completed materials and post-test. E-mail reminder will be sent at this time.

June 16 - Workshop participants would be e-mailed and asked to complete second post-test.

June 26 - CD participant would be e-mailed and asked to complete second post-test.

If you have any questions, please feel free to contact me via email or phone at 979-458-1049.

Electronic Mail Notice Sent to County Extension Agents Upon Agreement to Participate
in Study Continued

Thanks again for your participation.

Sincerely,
Chyrel Mayfield

APPENDIX E
PRE-TEST INSTRUMENT

**Turf for Texans Master Gardener Training Program
Pre-Test**

Use the following scenario to answer questions 1-3.

John is at his local garden center looking for lawn fertilizer. His soil test results indicate his soil is high in phosphorous and low in potassium.

- 1 What other information does John need before buying his fertilizer?
 - a Credit card
 - b Square footage of his lawn
 - c Ph level
 - d Watering schedule

- 2 Which fertilizer would be best for John's lawn?
 - a 10-0-15
 - b 10-10-10
 - c 10-15-0
 - d 10-15-10

- 3 When applying his fertilizer, John accidentally applies some to his sidewalk. What should he do?
 - a Wash it into the street
 - b Sweep it up and place on the lawn
 - c Leave it blow away in the wind
 - d None of the above

- 4 What is the most appropriate way to determine the amount of nutrients to be applied to your lawn?
 - a Ask a garden center employee
 - b Ask your neighbors
 - c Use the fertilizer bag recommendations
 - d Use your soil test results

Use the following scenario to answer questions 5-7.

Rebecca's lot measures 100 ft. x 100 ft. Her home covers 2,000 square feet. It has been recommended that she apply 1 lb. of nitrogen per 1,000 square feet of lawn.

- 5 What is the square footage of Rebecca's lawn?
 - a 12,000 square feet
 - b 10,000 square feet
 - c 8,000 square feet
 - d 6,000 square feet

- 6 How much total nitrogen will Rebecca apply to her lawn using the 1 lb./1000 square foot rate?
 - a 0.8 lbs.
 - b 1.0 lb.
 - c 1.2 lbs.
 - d 8.0 lbs.

- 7 Using a 10-10-10 fertilizer, how much fertilizer should Rebecca purchase to cover her entire lawn?
 - a 40 lbs.
 - b 60 lbs.
 - c 80 lbs.
 - d 100 lbs.

- 8 To have the least negative potential impact on water quality, what type of nitrogen should be applied?
 - a Any nitrogen type will work
 - b Readily available nitrogen
 - c Slowly available nitrogen
 - d A mixture of nitrogen types

- 9 What is potential evapotranspiration (PET)?
 - a Production of food for the plant
 - b Loss of water from the soil
 - c Loss of water from the plant
 - d Loss of water from the soil and plant

- 10 Applying 1 acre inch of water actually supplies _____ gallons per square foot of lawn.
- a 0.31
 - b 0.62
 - c 0.93
 - d 1.00

Use the following scenario to aid in answering questions 11-14.

Bob called his local county extension office to find out how much water he should apply to his lawn. The county agent found that the annual evapotranspiration (ET) rate in Bob's area is 75" and the annual rainfall is 20". From the Texas ET network, Bob calculated his weekly potential evapotranspiration (PET) rate at 1.4". He also found from the ET network that his warm season grass only needs 60% of its PET rate to persist.

- 11 What is the annual water deficit for Bob's lawn?
- a 18"
 - b 20"
 - c 55"
 - d 75"
- 12 If Bob waters weekly, how much water should he apply when watering his lawn?
- a 0.42"
 - b 0.84"
 - c 1.00"
 - d 1.50"
- 13 All things considered, when should Bob water his lawn?
- a Early morning (before 8 a.m.)
 - b Midday
 - c Late afternoon
 - d Evening (8 p.m. – 12 a.m.)
- 14 What technique should Bob use to apply the proper amount of water?
- a Sprinkle the lawn daily
 - b Water continuously until the soil is saturated
 - c Water as deeply and as infrequently as the soil will allow
 - d None of the above techniques should be used

- 15 What is a sign of water stress?
- a Uniform color
 - b Dense turf
 - c Smooth texture
 - d Leaf rolling
- 16 What is integrated pest management (IPM)?
- a Organic pest control
 - b Chemically dependent approach to pest management
 - c Systematic, information intensive approach to pest management
 - d Finding the fastest way to get rid of pests
- 17 Janet has a problem with her St. Augustine grass. She has circular patches of light brown turf. The leaf blades easily pull away from the runners. What would you suspect is Janet's turfgrass problem?
- a St. Augustine decline
 - b Brown patch
 - c Water stress
 - d Chinch Bugs
- 18 What can Janet do to control this problem?
- a Water more frequently
 - b Improve drainage and irrigation practices
 - c Apply any fungicide
 - d None of the above
- 19 It is mid-August and the Jones family notices small patches of yellow grass that later turn brown in their St. Augustine lawn. What would you suspect is damaging their lawn?
- a Chinch bugs
 - b Fire ants
 - c Grasshoppers
 - d White grubs
- 20 How can the Jones family use IPM to control this pest?
- a Control thatch
 - b Plant resistant varieties
 - c Irrigate properly
 - d All of the above

- 21 In mid-January, you notice small green patches in your dormant Bermuda grass lawn. What can be causing these green spots?
- a Summer annual broadleaf weeds
 - b Stray, weather resistant grass plants
 - c Winter annual broadleaf weeds
 - d Leprechauns
- 22 What management technique could reduce the pest you selected in question 21?
- a Maintaining a dense turf
 - b Using adapted grasses
 - c Using herbicides labeled for control of the weed and labeled as safe for the grass type
 - d All of the above
- 23 Please indicate your level of agreement, by checking the appropriate column, for each of the following statements using the scale:

SD=Strongly Disagree, D=Disagree, A=Agree, or SA=Strongly Agree

Statements	SD	D	A	SA
Turf plays an important role in the landscape.				
I appreciate turf in the landscape.				
Lawn management confuses me.				
I am comfortable taking care of my lawn.				
I am confident in measuring and applying fertilizer to my lawn.				
I confidently give advice on nutrient management to other homeowners.				
Too much fertilizer will harm my lawn.				
I am confident in measuring and applying water to my lawn.				
I confidently give advice on irrigation matters to other homeowners.				
Too much water will harm my lawn.				
I am confident in measuring and applying pesticides to my lawn.				
I confidently give advice on IPM to other homeowners.				
Too many pesticides will harm by lawn.				

The following questions will provide basic information about participants in the Texas Master Gardener Program. Please circle or fill in the appropriate answer.

24 On average, how many hours do you spend in a normal month taking part in any kind of organized or planned group activity or event (not associated with a job or the Master Gardener program) that involves other members of the community?

- a. More than 10
- b. 5 – 10
- c. 1 – 4
- d. Less than 1
- e. I do not participate in group activities

25 Do you belong to any community clubs, groups, or organizations of any kind? This includes civic, recreational, hobby, school, church, and government groups.

- a. Yes
- b. No.... If no, skip to question 28.

26 Please list the organizations to which you belong and any positions you hold.

Name of Organization	Position Held

27 Thinking about the local clubs, groups, and organizations that you belong to, what percentage of their meetings do you generally attend each year?

- a. Almost all (90% or more)
- b. Most (50% to 89%)
- c. Less than half (10% to 49%)
- d. Not very many (less than 10%)

28 Have you engaged in any of the following activities prior to joining the Master Gardener program?

Answering calls at the extension office	Yes	No
Landscaping, beautification projects	Yes	No
Demonstration gardens	Yes	No
Youth gardening	Yes	No
Speaking engagements, media	Yes	No
Other _____	Yes	No

29 Do you plan to engage in the following activities after completion of your Master Gardener training?

Answering calls at the extension office	Yes	No
Landscaping, beautification projects	Yes	No
Demonstration gardens	Yes	No
Youth gardening	Yes	No
Speaking engagements, media	Yes	No
Other _____	Yes	No

30 After completion of your training, do you plan to share your Master Gardener experience with any of the following groups?

Civic organizations (Rotary, Kiwanis, VFW, Elks, etc.)	Yes	No
Recreational groups (softball, soccer, hobby, etc.)	Yes	No
Educational or school groups (school, library, etc.)	Yes	No
Church groups (churches, synagogues, temples, etc.)	Yes	No
Government groups (city, county, state, or federal agencies)	Yes	No
Youth groups (Scouts, 4-H, FFA, etc.)	Yes	No
Environmental groups (nature centers, preserves, etc.)	Yes	No
Human services (hospitals, nursing homes, etc.)	Yes	No
Homeowners' associations	Yes	No

31 Will you continue to share your Master Gardener experience with other community members after you have completed the required 50 hours of community service?

- a. Yes
- b. No....If no, skip to question 33

32 If yes, approximately how many hours per month will you spend sharing your Master Gardener experience with others?

- a. More than 10
- b. 5 – 10
- c. 1 – 4
- d. Less than 1

33 How did you learn about the Master Gardener program? Circle all that apply.

- a. County extension agent
- b. Other Master Gardeners
- c. Friend
- d. Media
- e. Other _____

- 34 Why did you choose to participate in the Master Gardener program? Circle all that apply.
- a. Training
 - b. Give back to the community
 - c. Association with other gardeners
 - d. Other _____
- 35 Currently, I _____.
- a take care of my own lawn
 - b use a lawn care service
 - c neglect my lawn
 - d I don't have a lawn
- 36 How many years of experience do you have using a computer? _____
- a Using a scale of 1-10 (1=never, 10=daily), indicate how often you use the computer. _____
 - b Using a scale of 1-10 (1=novice, 10=expert), rate your proficiency using the computer. _____
- 37 What is your age? _____
- 38 What is your gender?
- a Male
 - b Female
- 39 What is your current marital status?
- a Single
 - b Married
 - c Other
- 40 What is the highest level of education you have completed?
- a Some high school or less
 - b High school or GED
 - c Some college or post high school training
 - d Completed 2-year college degree
 - e Completed 4-year college degree
 - f Graduate or professional training beyond a 4-year college degree

41 What is your racial/ethnic background?

- a White, non-Hispanic
- b African-American, non-Hispanic
- c Hispanic
- d Asian-American
- e Native American
- f Other _____

_____ Please check here and provide your name to the local county agent if you are interested in participating in a third test, similar to this one, six weeks after completing your Master Gardener training program.

APPENDIX F
WORKSHOP POST-TEST INSTRUMENT

**Turf for Texans Master Gardener Training Program
Workshop Training Post-Test and Evaluation**

1. What is potential evapotranspiration (PET)?
 - a. Production of food for the plant
 - b. Loss of water from the soil and plant
 - c. Loss of water from the soil
 - d. Loss of water from the plant
2. Applying 1 acre inch of water actually supplies _____ gallons per square foot of lawn.
 - a. 0.31
 - b. 0.62
 - c. 0.93
 - d. 1.00

Use the following scenario to aid in answering questions 3-6.

Bob called his local county extension office to find out how much water he should apply to his lawn. The county agent found that the annual potential evapotranspiration (PET) rate in Bob's area is 75 inches and the annual rainfall is only 20 inches. From the Texas ET network, Bob calculated his weekly PET rate at approximately 1.4 inches. He also found from the ET network that his warm season grass only needs 60% of its PET rate to persist.

3. What is the annual water deficit for Bob's lawn?
 - a. 18"
 - b. 20"
 - c. 55"
 - d. 75"
4. If Bob waters weekly, how much water should he apply when watering his lawn?
 - a. 0.42"
 - b. 0.84"
 - c. 1.00"
 - d. 1.50"
5. All things considered, when should Bob water his lawn?
 - a. Early morning (before 8 a.m.)
 - b. Midday
 - c. Late afternoon
 - d. Evening (8 p.m. – 12 a.m.)

6. What technique should Bob use to apply the proper amount of water?
 - a. Water as deeply and as infrequently as the soil will allow
 - b. Sprinkle the lawn daily
 - c. Water continuously until the soil is saturated
 - d. Set the irrigation timer once and leave it alone
7. What is a sign of water stress?
 - a. Uniform color
 - b. Dense turf
 - c. Leaf rolling
 - d. Smooth texture
8. What is integrated pest management (IPM)?
 - a. Organic pest control
 - b. Chemically dependent approach to pest management
 - c. Finding the fastest way to get rid of pests
 - d. Systematic, information intensive approach to pest management
9. Janet has a problem with her St. Augustine lawn. It is late summer/early fall and she has circular patches of light brown turf. The leaf blades easily pull away from the runners. What would you suspect is Janet's turfgrass problem?
 - a. St. Augustine decline
 - b. Brown patch
 - c. Water stress
 - d. Chinch Bugs
10. Using IPM methods, what can Janet do to control this problem?
 - a. Water more frequently
 - b. Improve drainage and irrigation practices
 - c. Apply any fungicide
 - d. None of the above
11. It is mid-August and the Jones family notices small but expanding patches of yellow grass that later turn brown in their St. Augustine lawn. What foliar feeding insect would you suspect is damaging their lawn?
 - a. Chinch bugs
 - b. Fire ants
 - c. Grasshoppers
 - d. White grubs

12. How can the Jones family use IPM to help minimize insect problems?
- Control thatch
 - Plant resistant varieties
 - Irrigate properly
 - All of the above
13. In winter, you notice small green patches in your dormant Bermuda grass lawn. What can be causing these green spots?
- Summer annual broadleaf weeds
 - Summer annual grassy weeds
 - Winter annual weeds
 - Leprechauns
14. What management technique could reduce the pest you selected in question 13?
- Maintaining a dense turf
 - Using adapted grasses
 - Using herbicides labeled for control of the weed and labeled as safe for the grass type
 - All of the above

Use the following scenario to answer questions 15-17.

John is at his local garden center looking for lawn fertilizer. His soil test results indicate his soil is high in phosphorous and low in potassium.

- 15 What other information does John need before buying his fertilizer?
- Credit card
 - Ph level
 - Watering schedule
 - Square footage of his lawn
- 16 Which fertilizer would be best for John's lawn?
- 10-0-15
 - 10-10-10
 - 10-15-0
 - 10-15-10
- 17 When applying his fertilizer, John accidentally applies a small amount onto his sidewalk. What should he do?
- Sweep it up and place on the lawn
 - Wash it into the street
 - Leave it to blow away in the wind
 - None of the above

- 18 With the exception of nitrogen, what is the most appropriate way to determine the amount of nutrients to be applied to your lawn?
- a Ask a garden center employee
 - b Use your soil test results
 - c Ask your neighbors
 - d Use the fertilizer bag recommendations

Use the following scenario to answer questions 19-21.

Rebecca's lot measures 100 ft. x 100 ft. Her home covers 2,000 square feet. It has been recommended that she apply 1 lb. of nitrogen per 1,000 square feet of lawn.

- 19 What is the square footage of Rebecca's lawn?
- a 12,000 square feet
 - b 10,000 square feet
 - c 8,000 square feet
 - d 6,000 square feet
- 20 How much total nitrogen will Rebecca apply to her lawn using the 1 lb./1000 square foot rate?
- a 0.8 lbs.
 - b 1.0 lb.
 - c 1.2 lbs.
 - d 8.0 lbs.
- 21 Using a 10-10-10 fertilizer, how much fertilizer should Rebecca purchase to cover her entire lawn?
- a 40 lbs.
 - b 60 lbs.
 - c 80 lbs.
 - d 100 lbs.
- 22 To have the least negative potential impact on water quality, what type of nitrogen should be applied?
- a Any nitrogen type will work
 - b Readily available nitrogen
 - c Slowly available nitrogen
 - d A mixture of nitrogen types

- 23 Please indicate your level of agreement, by checking the appropriate column, for each of the following statements using the scale:

SD=Strongly Disagree, D=Disagree, A=Agree, or SA=Strongly Agree

Statements	SD	D	A	SA
Turf plays an important role in the landscape.				
I appreciate turf in the landscape.				
Lawn management confuses me.				
I am comfortable taking care of my lawn.				
I am confident in measuring and applying fertilizer to my lawn.				
I confidently give advice on nutrient management to other homeowners.				
Too much fertilizer will harm my lawn.				
I am confident in measuring and applying water to my lawn.				
I confidently give advice on irrigation matters to other homeowners.				
Too much water will harm my lawn.				
I am confident in measuring and applying pesticides to my lawn.				
I confidently give advice on IPM to other homeowners.				
Too many pesticides will harm my lawn.				

- 24 Please rate your level of agreement/disagreement with the following statements using the scale:

SD=Strongly Disagree, D=Disagree, A=Agree, or SA=Strongly Agree

Statements	SD	D	A	SA
The information was easy to understand.				
The information will help in decisions about my own situation.				
The information will help me in giving advice to other homeowners.				
The presenter was knowledgeable about the subject.				
The examples used were relevant and meaningful.				
The length of the program was appropriate.				
The information presented was relevant to my geographic location.				
The information was presented in a logical, easy to follow manner.				

- 25 Would additional information in these subject areas be useful to you?
- a No, I have adequate information.
 - b Yes, I would like more information.
- 26 Do you plan to make any changes based on the information you received from this activity?
- a No
 - b Yes
 - c Not sure
- 27 How would you prefer to see Master Gardener trainings delivered?
- a Face-to-face workshop
 - b CD-based training materials
 - c Web-based
 - d Other _____
- 28 On a scale of 1-4 (1=Very Dissatisfied, 4=Very Satisfied), how satisfied are you with this activity? _____

APPENDIX G

CD-BASED MATERIALS POST-TEST (PAPER FORM)

**Turf for Texans Master Gardener Training Program
CD-Based Training Post-Test and Evaluation**

Use the following scenario to answer questions 1-3.

Rebecca's lot measures 100 ft. x 100 ft. Her home covers 2,000 square feet. It has been recommended that she apply 1 lb. of nitrogen per 1,000 square feet of lawn.

- 1 What is the square footage of Rebecca's lawn?
 - a 12,000 square feet
 - b 10,000 square feet
 - c 8,000 square feet
 - d 6,000 square feet
- 2 How much total nitrogen will Rebecca apply to her lawn using the 1 lb./1000 square foot rate?
 - a 0.8 lbs.
 - b 1.0 lb.
 - c 1.2 lbs.
 - d 8.0 lbs.
- 3 Using a 10-10-10 fertilizer, how much fertilizer should Rebecca purchase to cover her entire lawn?
 - a 40 lbs.
 - b 60 lbs.
 - c 80 lbs.
 - d 100 lbs.

Use the following scenario to answer questions 4-6.

John is at his local garden center looking for lawn fertilizer. His soil test results indicate his soil is high in phosphorous and low in potassium.

- 4 What other information does John need before buying his fertilizer?
 - a Credit card
 - b Square footage of his lawn
 - c Ph level
 - d Watering schedule

- 5 Which fertilizer would be best for John's lawn?
 - a 10-0-15
 - b 10-10-10
 - c 10-15-0
 - d 10-15-10
- 6 When applying his fertilizer, John accidentally applies a small amount onto his sidewalk. What should he do?
 - a Wash it into the street
 - b Sweep it up and place on the lawn
 - c Leave it blow away in the wind
 - d None of the above
- 7 With the exception of nitrogen, what is the most appropriate way to determine the amount of nutrients to be applied to your lawn?
 - a Ask a garden center employee
 - b Ask your neighbors
 - c Use the fertilizer bag recommendations
 - d Use your soil test results
- 8 To have the least negative potential impact on water quality, what type of nitrogen should be applied?
 - a Any nitrogen type will work
 - b Readily available nitrogen
 - c Slowly available nitrogen
 - d A mixture of nitrogen types
- 9 What is integrated pest management (IPM)?
 - a Organic pest control
 - b Chemically dependent approach to pest management
 - c Systematic, information intensive approach to pest management
 - d Finding the fastest way to get rid of pests
- 10 Janet has a problem with her St. Augustine lawn. It is later summer/early fall and she has circular patches of light brown turf. The leaf blades easily pull away from the runners. What would you suspect is Janet's turfgrass problem?
 - a St. Augustine decline
 - b Brown patch
 - c Water stress
 - d Chinch Bugs

- 11 Using IPM methods, what can Janet do to control this problem?
 - a Water more frequently
 - b Improve drainage and irrigation practices
 - c Apply any fungicide
 - d None of the above
- 12 It is mid-August and the Jones family notices small but expanding patches of yellow grass that later turn brown in their St. Augustine lawn. What foliar feeding insect would you suspect is damaging their lawn?
 - a Chinch bugs
 - b Fire ants
 - c Grasshoppers
 - d White grubs
- 13 How can the Jones family use IPM to minimize insect problems?
 - a Control thatch
 - b Plant resistant varieties
 - c Irrigate properly
 - d All of the above
- 14 In winter, you notice small green patches in your dormant Bermuda grass lawn. What can be causing these green spots?
 - a Summer annual broadleaf weeds
 - b Summer annual grassy weeds
 - c Winter annual weeds
 - d Leprechauns
- 15 What management technique could reduce the pest you selected in question 14?
 - a Maintaining a dense turf
 - b Using adapted grasses
 - c Using herbicides labeled for control of the weed and labeled as safe for the grass type
 - d All of the above
- 16 What is potential evapotranspiration (PET)?
 - a Production of food for the plant
 - b Loss of water from the soil
 - c Loss of water from the plant
 - d Loss of water from the soil and plant

- 17 Applying 1 acre inch of water actually supplies _____ gallons per square foot of lawn.
- a 0.31
 - b 0.62
 - c 0.93
 - d 1.00

Use the following scenario to aid in answering questions 18-21.

Bob called his local county extension office to find out how much water he should apply to his lawn. The county agent found that the annual potential evapotranspiration (PET) rate in Bob's area is 75 inches and the annual rainfall is only 20 inches. From the Texas ET network, Bob calculated his weekly PET rate at 1.4 inches. He also found from the ET network that his warm season grass only needs 60% of its PET rate to persist.

- 18 What is the annual water deficit for Bob's lawn?
- a 18"
 - b 20"
 - c 55"
 - d 75"
- 19 If Bob waters weekly, how much water should he apply when watering his lawn?
- a 0.42"
 - b 0.84"
 - c 1.00"
 - d 1.50"
- 20 All things considered, when should Bob water his lawn?
- a Early morning (before 8 a.m.)
 - b Midday
 - c Late afternoon
 - d Evening (8 p.m. – 12 a.m.)
- 21 What technique should Bob use to apply the proper amount of water?
- a Sprinkle the lawn daily
 - b Water continuously until the soil is saturated
 - c Water as deeply and as infrequently as the soil will allow
 - d Set the irrigation timer once and let it alone

22 What is a sign of water stress?

- a Uniform color
- b Dense turf
- c Smooth texture
- d Leaf rolling

23 Please indicate your level of agreement, by checking the appropriate column, for each of the following statements using the scale:

SD=Strongly Disagree, D=Disagree, A=Agree, or SA=Strongly Agree

Statements	SD	D	A	SA
Turf plays an important role in the landscape.				
I appreciate turf in the landscape.				
Lawn management confuses me.				
I am comfortable taking care of my lawn.				
I am confident in measuring and applying fertilizer to my lawn.				
I confidently give advice on nutrient management to other homeowners.				
Too much fertilizer will harm my lawn.				
I am confident in measuring and applying water to my lawn.				
I confidently give advice on irrigation matters to other homeowners.				
Too much water will harm my lawn.				
I am confident in measuring and applying pesticides to my lawn.				
I confidently give advice on IPM to other homeowners.				
Too many pesticides will harm by lawn.				

- 24 Thinking about the workshop portion of the training that you completed, please indicate your level of agreement, by checking the appropriate column, for each of the following statements using the scale:

SD=Strongly Disagree, D=Disagree, A=Agree, or SA=Strongly Agree

Statements	SD	D	A	SA
The information was easy to understand.				
The information will help in decisions about my own situation.				
The information will help me in giving advice to other homeowners.				
The presenter was knowledgeable about the subject.				
The examples used were relevant and meaningful.				
The length of the program was appropriate.				
The information presented was relevant to my geographic location.				
The information was presented in a logical, easy to follow manner.				

- 25 Please rate the usefulness of the following components of the CD-based training materials using the scale:

NU=Not Useful, SU = Somewhat Useful, U=Useful, VU=Very Useful

Technology Used	NU	SU	U	VU
Video clips				
Text on screen				
Static graphics				
Handouts (ie. Adobe Acrobat files)				
Audio clips				
Links to outside sources of information				

- 26 Thinking about the CD-based training materials, please indicate your level of agreement, by checking the appropriate column, for each of the following statements using the scale:

SD=Strongly Disagree, D=Disagree, A=Agree, or SA=Strongly Agree

Statements	SD	D	A	SA
The information was easy to understand.				
The information will help in decisions about my own situation.				
The information will help me in giving advice to other homeowners.				
The examples used were relevant and meaningful.				
The pace of the program was appropriate.				
The information presented was relevant to my geographic location.				
The information was presented in a logical, easy to follow manner.				
The course materials were easy to navigate.				

- 27 Where did you complete the majority of the CD-based training materials?
- a Home
 - b Office
 - c Other _____
- 28 How would you prefer to see Master Gardener programs delivered?
- a Face-to-face workshop
 - b CD-based materials
 - c Web-based
 - d Other _____
- 29 Would additional information in these subject areas be useful to you?
- a No, I have adequate information.
 - b Yes, I would like more information.
- 30 Do you plan to make any changes based on the information you received from this activity?
- a No
 - b Yes
 - c Not sure
- 31 On a scale of 1-4 (1=Very Dissatisfied, 4=Very Satisfied), how satisfied are you with this activity? _____

APPENDIX H
INFORMED CONSENT

CONSENT FORM

I have been asked to participate in a research study being conducted that will determine if Texas Master Gardener program participants' learning levels differ when taught nutrient, water, and pest management using CD-based materials versus traditional workshop methods. A secondary purpose of the study is to determine if the Texas Master Gardener program contributes to community development.

If I agree to be in this study, I will be asked to take a pre-test and two post-tests that will measure my knowledge of nutrient, water, and pest management issues. I will also be asked to provide information on my present and future community involvement along with some basic demographic information. This study will take approximately 20 minutes to complete for each pre-test and post-test. There are no risks or benefits to participating in this study. This is no monetary compensation included with this study.

This study is anonymous. Only those participants choosing to use the CD-based materials will be asked to provide an email address that will be provided to the individual maintaining the secure database. The researcher will not have access to this information. The records of this study will be kept private. No identifiers linking me to the study will be included in any sort of report that might be published. Research records will be stored securely and only the researcher and her committee members will have access to the records.

My decision whether or not to participate will not affect my current or future relations with Texas A&M University or the Texas Master Gardener program. If I decide to participate, I am free to refuse to answer any of the questions that may make me uncomfortable. I can withdraw at any time without my relations with the university, job, benefits, etc. being affected. I can contact Chyrel A. Mayfield (cmayfield@aged.tamu.edu) at (979) 458-1049 or Gary J. Wingenbach (gwingenbach@tamu.edu) at (979) 862-1507 with any questions about this study.

This research study has been reviewed by the Institutional Review Board – Human Subjects in Research, Texas A&M University. For research-related problems or questions regarding subjects' rights, I can contact the Institutional Review Board through Dr. Michael W. Buckley, Director of Research Compliance, Office of Vice President for Research at (979) 845-8585 (mwbuckley@tamu.edu).

APPENDIX I**ELECTRONIC MAIL NOTICE SENT TO PARTICIPANTS USING THE CD-
BASED MATERIALS REGARDING POST-TEST COMPLETION**

Everyone:

This is to serve as a reminder that you have until May 14 to complete your Master Gardener turfgrass training using the *Turf for Texans* CD. Once you have completed the CD, please follow the steps below. This is a necessary step in completion of your turfgrass training. If you have already completed the online post-test, thank you so much. There is no need for you to complete another post-test at this time.

Logon to the Ag-Communicators <<http://www.ag-communicators.org/surveys/T4Tposttest.asp>> Web site.

Use the drop-down menu to choose your home county.

Fill in your email address in the appropriate blank.

Answer all the questions in post-test.

Submit your answers online (your answers will be recorded in a secure database).

In approximately 6 weeks, you will receive an email asking you to complete another short post-test. This test will measure your long-term knowledge gain and help us to evaluate your community involvement after being involved in the Master Gardener program.

If you have any questions, problems, or comments, please feel free to contact me at 979-458-1049 or via email at cmayfield@aged.tamu.edu.

Again, thanks for your participation in my research study.

Sincerely,
 Chyrel Mayfield
 Graduate Student
 Dept. of Agricultural Education/Soil & Crop Sciences
 MS 2116
 Texas A&M University
 College Station, TX 77843
 979-458-1049
 979-845-6296 - fax
cmayfield@aged.tamu.edu

APPENDIX J

**FINAL ELECTRONIC MAIL NOTICE SENT TO PARTICIPANTS USING THE
CD-BASED MATERIALS REGARDING POST-TEST COMPLETION**

My study results are indicating that you have not yet completed the required online post-test for the *Turf for Texans* research study. This is a necessary step in the study process. Please connect to the following site and follow the directions to complete your required post-test as soon as possible.

Logon to the Ag-Communicators <<http://www.ag-communicators.org/surveys/T4Tposttest.asp>> Web site.

Use the drop-down menu to choose your home county.

Fill in your email address in the appropriate blank.

Answer all the questions in post-test.

Submit your answers online (your answers will be recorded in a secure database).

You will have until Thursday, May 20, 2004. Remember that completion of the test was a requirement for leaving the Turf training early and using the CD materials. If you have any questions, comments, or problems please feel free to contact me at 979-458-1049 or via email at cmayfield@aged.tamu.edu.

Again, thanks for your participation in my research study.

Sincerely,
Chyrel Mayfield
Graduate Student
Dept. of Agricultural Education/Soil & Crop Sciences
MS 2116
Texas A&M University
College Station, TX 77843
979-458-1049
979-845-6296 - fax
cmayfield@aged.tamu.edu

VITA

Chyrel A. Mayfield
203 Meadowbrook Lane
Brenham, TX 77833
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Education	B.S. Agricultural Communications Texas Tech University, May 1997
Professional	Department of Soil and Crop Sciences, Texas A&M University Experience System, College Station, Texas Graduate Research Assistant, November 2002-present Texas Seed Trade Association, Brenham, Texas Assistant Executive Vice President, January 2000 – present Asgrow Seed Company, Plainview, Texas Customer Service Manager, August 1997 – September 1999
Professional Organizations	American Society of Agronomy Southern Rural Sociological Association
Publications	Mayfield, C. A., & Theodori, G. L. (under review). Attendance at religious meetings and community involvement: A research note. (<i>Southern Rural Sociology</i>). Mayfield, C. A., Wingenbach, G. J., & Chalmers, D. R. (under review). Assessing stakeholder needs: Delphi meets the Internet. (<i>Journal of Extension</i>).
Presentations	Mayfield, C. A. (February 2004). “ <i>Church Attendance and Community Participation</i> .” Paper presented at the annual meeting of the Southern Rural Sociological Association in Tulsa, OK. Mayfield, C. A., Wingenbach, G. J., & Chalmers, D. R. (February 2004). “ <i>Turf for Texans: Basic to Advanced Turfgrass Instructional Modules for the Texas Master Gardener Program</i> .” Paper presented at the Southern Association of Agricultural Scientists – Ag Communications Section, Tulsa, OK. http://agnews.tamu.edu/saas/saasproceedings.html