A COMPARATIVE STUDY OF AGRICULTURAL LITERACY OF URBAN VS. RURAL THIRD AND FOURTH GRADERS: BEFORE AND AFTER AN AGRICULTURAL PROGRAM

By

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Abstract: Agricultural literacy is an important part of education in the United States. Public and policy maker understanding of agricultural and natural resources is a national research priority set forth by the American Association for Agricultural Education. The purpose of this study was to discover the level of agricultural literacy with third and fourth grade students in an urban area compared to students in a rural area before and after an agricultural program. Due to the ever increasing urban population students in today's world do not have the knowledge to be conversationally literate about agriculture. Agricultural programs have been put into place to help teach students about agriculture. This study employed a pretest and posttest, based upon the Food and Fiber Systems Literacy Framework, to determine if students were gaining agricultural knowledge through the Kids & Kows & More program. Data was compared to measure students' agricultural knowledge before and after the agricultural program. Overall, findings indicate that students do increase their knowledge from before to after an agricultural program. It was also found that urban students had a higher mean score on both the pretest and posttest. The study concluded that students involved in agricultural programs do increase their knowledge of agriculture through the teaching and experiential learning involved. Also, the study concluded that urban students have a higher level of agricultural literacy than rural students.

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CHAPTER I

INTRODUCTION

Background and Setting

Agriculture is an important aspect of America's quality of life (Ikerd, n.d.). America's agriculture systems determine the nation's general welfare and standard of living (Pense, Leising, Portillo & Igo, 2005; Leising & Zilbert, 1994). According to the National Research Council (NRC) (1988), the United States agriculture industry has fed, clothed, and provided building materials for millions of Americans and many residents of other countries. Although America has the lowest per capita food cost of any country in the world; much of the general public is unaware of where and how their food is produced (NRC, 1988). In 1994, nearly 90% of the population was two or three generations removed from direct contact with food and fiber production (Pense et al., 2005). Likewise the Environmental Protection Agency (EPA) (2009) reported that less than 1% of the population claims farming, fishing and forestry as their occupation. As a result, "most Americans, whether young or old, have limited knowledge about agriculture and food production" (Frick, Machtmes, & Birkenholz, 1995, p. 44). However, a basic understanding of agriculture and problems facing the industry would prove beneficial

for both consumers and producers (Frick, Birkenholz, Gardner & Machtmes, 1995). Therefore, it is important that agricultural educators make sure Americans are agriculturally literate.

According to the NRC (1988) all students, beginning in kindergarten and continuing through the twelfth grade, should receive agricultural literacy instruction and urban programs should be established. Agricultural education in secondary schools is a long standing tradition (Igo, 1998). Igo (1998) stated, "These programs are vitally important in preparing individuals for employment in the food and fiber system" (p.1). Although, not all of society is interested in employment in the food and fiber industry there is still a need for individuals to be educated about agriculture (Igo, 1998). Therefore, agricultural education is important to society no matter what the age. In addition, an agriculturally literate public could better understand the impact of agriculture on the nation's welfare and standard of living (Pense et al., 2005).

More recently, the American Association for Agricultural Education published a research agenda designed to address societal needs through research (Doerfert, 2011).

> The first priority of research was "Public and Policy Maker Understanding of Agriculture and Natural Resources" for which the key outcome is that "consumers and policy makers will have an accurate understanding of and informed opinion about agriculture and natural resources." As a result, "an understanding of agriculture's history and current economic, social, and environmental significance, both domestically and internationally, is important for all Americans" (p. 11).

Because people are becoming farther removed from agriculture, Americans are likely to be influenced by special interest groups involved in issues such as animal rights, pesticide usage, soil and water conservation, etc. (Doerfert, 2011).

The limited interaction between farmers and consumers result in a great deal of uncertainty for consumers. Consumers (parents and teachers) base their perceptions of agriculture on past experiences (Trexlar & Meischen, 2002). If a person has limited knowledge and experience with agriculture, he or she cannot perceive the industry accurately (Duncan & Broyles, 2006). They then rely on media and other opinions to form their own perceptions and assumptions about agriculture.

In the early days, agriculture was a way of life; people had to be agriculturally literate to survive (Terry, 1990). "Fathers taught their sons the practices and knowledge needed to support the family through the production of food and fiber" (Terry, 1990, p. 1). However, as the population has become more modernized and urbanized a disconnect between the population and agriculture has occurred (Powell & Agnew, 2011).

Agriculture has seen much advancement since its beginning. Today, the industry is much more progressive (Miller, 2013). In the early days, families grew their own food. Today, farmers grow food and feed the majority of the world (Farm Bureau, 2013). The increase of urbanization and technology continues to distance society from agriculture (Leising, Pense, & Igo, 2001). An understanding of the environment along with agriculture is important for society (Hubert, Frank, & Igo, 2000). The reason for this is, the practice of agriculture takes place in the environment (Farm Bureau, 2013).

Much of the United States population has become more aware of the environment throughout the last few decades. Hess and Trexler (2011) stated, "Past agricultural

practices, however, have not always been environmentally friendly, and in recent years, the general public has voiced greater concern about agri-food system impacts and sustainability" (p. 151). The National Geographic Society wrote (Union of Concerned Scientists, 2006):

> The fragile balance of plants and animals that share the Earth took millions of years to develop. Some life-forms have persisted in nearly their original state, surviving episodes of mass extinction. Some, like ourselves, are relative newcomers. The ones that have perished will not return. Neither will the thousands of species that are disappearing each year due in large part to such human influences as habitat destruction, introduction of invasive species, and overharvesting. If we continue reducing Earth's biodiversity at this rate, the consequences will be profound. The web of life connects the smallest bacterium to the giant redwood and the whale. When we put that web in peril, we become agents of calamity. (para. 5)

Today, there are numerous challenges concerning the environment and natural resources. There has been much damage done to the land; water quality and wildlife have also been affected (Berson, 2003). However, Americans and farmers have begun to make an effort to conserve these resources. The American Farm Bureau (2013) stated, "Careful stewardship by farmers has spurred a nearly 50 percent decline in erosion of cropland by wind and water since 1982" (para. 12). Americans have passed laws to help conserve resources and adopted strategies like recycling to ease the impact of the human footprint (Berson, 2003). Another new and important sector of agriculture is biotechnology (McIntosh, 2006).

Biotechnology provides farmers with tools that can make production of agriculture less expensive and more manageable (United States Department of Agriculture [USDA], 2005). For example, developing insect-resistant cotton has allowed for a significant reduction in certain pesticides that contaminate the groundwater (USDA, 2005). Research conducted by Trexler and Meischen (2002) studied prospective elementary teachers and their grasp of agriculture. Teachers in this study spoke more about the negative aspects of technologies because of what they heard about pesticides and pollution in the media (Trexler & Meischen, 2002). Therefore, it is important for American's to understand biotechnology and the science that increases the efficiency of agriculture (Trexler & Meischen, 2002).

The National Council of Agricultural Education (2000) has identified agricultural literacy goals, the third of which encourages all students to be conversationally literate. To be conversationally literate, students need to have a basic knowledge of agriculture, food, fiber and natural resources systems (NRC, 1988; Frick et al., 1991).

To provide students with the agriculture knowledge needed to become conversationally literate, agricultural education programs had to become a more viable component of education. In the early development of the United States, agriculture was the context for curriculum in many private schools in Maine, New York, and Georgia (Terry, 1990). In 1862, the federal government passed the Morrill Act. This act provided public land to each Senator and Representative to sell and the money was to be put into an endowment fund to provide a college to each of the states (Lightcap, n.d.). These colleges were known as land-grant institutions. Barrick (1989) stated, "With the realization that higher education could serve the common person interested in the

agricultural and mechanical arts became a system of public institutions of higher education called the land-grant college" (p. 24). With the implementation of the Morrill Act of 1862 and 1890 the purpose of education shifted from the classical studies to more applied studies, which prepared students for what they would face outside of the classroom (Lightcap, n.d.).

Following the Morrill Act's of 1862 and 1890 were the Smith-Lever Act of 1914, which implemented the Extension system, and the Smith-Hughes Act of 1917, which implemented vocational education. Terry (1990) reported, "All Americans should receive education that would increase their awareness of the impact of agriculture upon their lives – education about agriculture" (p. 3). In the late 1800s, researchers at public universities realized that adults were not adopting new farming techniques being developed, but found youth tended to adopt these new methods quickly (4-H History, n.d.). Youth became a conduit of information transfer from the university to the community. "The seed of the 4-H idea of practical and 'hands-on' learning came from the desire to make public school education more connected to country life" (4-H History, n.d., para. 3). From this idea, community clubs were created, The Tomato Club and the Corn Growing Club were some of the first of these clubs formed staring in 1902 (4-H History, n.d.).

4-H became a nationalized organization in 1914 with the passage of the Smith-Lever Act forming the Cooperative Extension Service (4-H History, n.d.). Today, 4-H is the largest youth development organization in the United States (4-H History, n.d.). According to 4-H History (n.d), "4-H serves youth in rural, urban, and suburban communities in every state across the nation" (para. 8). 4-H members are provided with

different opportunities for hands on learning to occur, such as clubs, camps, and programs with a "variety of science, engineering, technology and applied math education opportunities – from agricultural and animal science to rocketry, robotics, environmental protection and computer science" (4-H History, n.d., para. 10). 4-H is also a program that teaches youth about agriculture through livestock and small animal production.

Another nationally recognized program in agricultural education and youth development is the National FFA Organization. Following the passage of the Smith - Lever Act the Smith-Hughes Vocational Education Act was signed in 1917 and the Future Farmers of America was formed in 1928 (National FFA Organization, n.d.). "The Future Farmers of America brought together students, teachers and agribusiness to solidify support for agricultural education" (National FFA Organization, n.d, para. 1). The National FFA Organization is an organization available in junior high and high school (National FFA Organization, n.d). The National FFA Organization is committed to "premier leadership, personal growth and career success" through agricultural education (National FFA Organization, n.d., para. 2). Today, the National FFA Organization includes more than 7,490 FFA chapters and more than 557,000 members (National FFA Organization, n.d.).

Agriculture in the Classroom (AITC) is an agricultural program, funded by the USDA, which began in 1981 (Pense et al., 2005; National Agriculture in the Classroom, n.d.). AITC is a curriculum available in all 50 states (Traxler, 1990). Terry (1990) stated, "Agriculture in the Classroom is established in every state for the purpose of developing and distributing teaching materials about agriculture" (p. 4). Each states AITC program has its own goals and purpose. "The purpose of Oklahoma Ag in the

Classroom is to help familiarize Oklahoma school children with Oklahoma's food and fiber industry by providing resources for Oklahoma teachers" (Oklahoma Ag in the Classroom, n.d., para. 1). Teachers can obtain curriculum and teach agricultural lessons in their classrooms by contacting their state curriculum coordinator. AITC uses different teaching styles to educate youth about agriculture. There are activities to focus on and resources i.e., videos, posters, miniature farm machinery, etc. that are designed to capture students attention while teaching them about agriculture (Traxler, 1990). Likewise Traxler (1990) stated, "Field trips to farms; activities which enliven state fair visits such as treasure hunts among the agricultural exhibits; adopt-a-classroom where farm families write to students and visit the classroom" are added to compliment the classroom activities (p. 9 and 19).

This study focused on the program Kids & Kows & More funded by Texas Agri-Life Extension, Oklahoma Cooperative Extension and Southwest Dairy Farmers. This program targets third and fourth graders and brings agriculture to life through a series of hands on stations that provides an opportunity for students to interact with agricultural products. Presenters teach students about different aspects of the food and fiber industry. Third and fourth graders are the target for these programs because that is when students begin learning about their states history and geography, subjects that agriculture complements well (Traxler, 1990).

Statement of the Problem

Sorenson (1987) stated, "As we become an increasingly urban people, the typical American is less and less likely to have any direct contact with farms and farming" (p. 28). Also, as a result of more efficient agricultural practices, it became less important for

everyone to understand how to raise crops and livestock (Harris, 1993). Consequently, agricultural literacy is diminished (Turnball, 2002).

A large portion of research on agricultural literacy has focused on K-12 students and educator (Kovar & Ball, 2012). Much of this research has focused on student in agricultural education courses and teachers (Pense & Liesing, 2004; Balschwied, Thompson, & Cole, 1998; Trexler & Meischen, 2002; Frick et al., 1995).

Students in third and fourth grade begin learning about their states history and geography during these school years, which is complemented by learning about agriculture in the context of their state (Traxler, 1990). Therefore, this is the reason this program targets third and fourth graders. To that end, what is the agricultural literacy of third and fourth graders in urban schools as compared to their peers that go to a rural school?

Statement of Purpose

The purpose of the study was to discover the level of agricultural literacy with third and fourth grade students in an urban area compared to students in a rural area before and after an agricultural program.

Objectives

The following objectives were developed to accomplish the purpose:

1. Describe changes in students' agricultural knowledge, as measured before and after an agricultural education program.
2. Compare rural and urban students' agricultural knowledge, as measured before and after an agricultural education program.

Significance of Study

For youth and others to make decisions on a subject, they must have baseline knowledge about that subject. McIntosh (2006) reported, "Today, only 5% of students are enrolled in traditional agricultural education courses" (p. 12). Therefore, the majority of students are not receiving formal agricultural education instruction. Trexler and Meischen (2002) reported, "As the number of people directly involved in agriculture has decreased, the general public's basic understanding of the food and fiber industry has declined" (p. 68).

It is projected that the world population will grow to nine billion by 2050 (Hodges, 2005; Johnson & Jorgenson, 2006; Sayers, 2011). As people become further removed from agriculture, they begin to rely on information from media, their social circles, and activist groups (Doerfert, 2011). Doerfert (2011) reported, "The potential negative impact of a uniformed population on the United States and global agriculture and food system is great" (p. 8). The need for societal knowledge is based on the need for a basic understanding of food and fiber sources, marketing, distribution, and nutrition as consumers of agriculture and understanding the impact of agriculture on the society (Terry, Lacewell, Dunsford, & Gray, 1996). As people become further removed from agriculture, they begin to rely on information from media, their social circles, and activist groups (Doerfert, 2011; Turnbull, 2002). One of the research priority areas under priority one is delivery method preferences and effectiveness (Doerfert, 2011). Therefore, this study will report the effect of a one day agricultural education program on student's knowledge of the food and fiber industry.

Definitions

4-H is the youth education program of the Cooperative Extension Service. The program is research-based and utilizes a variety of delivery methods to reach youth who are 9 to 19 years of age. Membership is open regardless of race, sex, creed, national origin, or handicap. The four "H's" stand for the head, heart, hands, and health of each individual member (Wessel & Wessel, 1982).

Agricultural Education prepares students for successful careers and a lifetime of informed choices in the food and fiber industry, both domestically and internationally. Students are provided with the opportunity for leadership development, personal growth and career success (National FFA Organization, n.d.).

Agriculture in the Classroom (AITC) is formalized by the United States Department of Agriculture. This program is set up in every state and the program developed instructional materials to teach students about agriculture in their state (Pense et al., 2005).

Agricultural Literacy is the "Understanding and possession of knowledge needed to synthesize, analyze, and communicate basic information about agriculture" (Frick, Miller, & Kahler, 1991, p. 49).

Cooperative Extension System is a public-funded, non-formal, educational system that links the education and research resources and activities that links the education and research resources and activities of the United State Department of Agriculture, the land-grant university, and the county unit (Richert, 1991).

Kids & Kows & More is a program that targets third and fourth grade students. A series of age appropriate educational presentations is designed to focus on the production

of food, fiber and natural resources. This program is funded by Texas Agri-Life Cooperative Extension Service, Oklahoma Cooperative Extension Service, and Southwest Dairy Farmers (Southwest Dairy Farmers, 2012).

National FFA Organization is a youth organization that helps students discover their passion in life. It is an organization based on middle and high school classes to promote agricultural education. The National FFA Organization was formally known as Future Farmers of American. Today, the National FFA Organization is in all 50 states, Puerto Rico, and the Virgin Islands (National FFA Organization, n.d).

Rural Schools are located in communities that have a population that is (1) less than 10,000; or (2) less than 20,000 if not located in a Metropolitan Statistical Area (National Rural Housing Coalition, 2013)

United States Department of Agriculture is the United States federal executive department responsible for developing and executing U.S. federal government policy on farming, agriculture, and food (McIntosh, 2006).

Urban Schools are located in communities defined by the U.S. Census Bureau as core census block groups or blocks that have a population density of at least 1,000 people per square mile and surrounding census blocks that have an overall density of at least 500 people per square mile and a population of more than 50,000 (United States Census Bureau, 2010).

CHAPTER II

REVIEW OF LITERATURE

Introduction

The purpose of this chapter is to present and familiarize the reader with information pertinent to this research topic. Through the presentation of related research, the chapter examines agricultural literacy and how programs in schools impact students' knowledge of their agricultural industry. Literature reviewed included dissertations, papers from conference presentations, articles from professional magazines and journals, teaching materials, and other sources.

Agricultural Literacy

After the release of the NRC's report in 1988, many researchers have focused on agricultural literacy (Kovar & Ball, 2013). Wright (1992) noted, "If literacy is the condition or quality of being literate, and if the definition of knowledgeable or educated is used, then literacy is the condition or quality of being knowledgeable or educated" (p. 15). Someone who is agriculturally literate understands the food and fiber system, including its current economic, social, and environmental significance to citizens (NRC, 1988). Further, an agriculturally literate person has "some knowledge of food

and fiber production, processing, and domestic and international marketing" (NRC, 1988, p.1). This concept was built on the notion that an agriculturally literate person's knowledge should include "enough knowledge of nutrition to make informed personal choices about diet and health" (NRC, 1988, p. 2).

Numerous agricultural education scholars have taken on the charge of attempting to define agricultural literacy. Frick et al. (1991) reported one of the first conclusive agricultural literacy definitions:

> Agricultural literacy can be defined as possessing knowledge and understanding of our food and fiber system. An individual possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture. Basic information includes: the production of plant and animal products, the economic impact of agriculture, it societal significance, agriculture's important relationship with natural resources and the environment, the marketing of agricultural products, the processing of agricultural products, public agricultural policies, the global significance of agriculture, and the distribution of agricultural products. (p. 52)

Additionally, a panel consisting of 100 faculty members of agricultural education departments at land-grant universities identified 11 subject areas that encompassed agricultural literacy. The subject areas developed were 1) relationship with the environment, 2) agricultural products, 3) agriculture policies, 4) relationship with natural resources, 5) animal products, 6) societal significance, 7) plant products, 8) economic impact, 9) marketing, 10) distribution, and 11) global significance (Frick et al., 1991).

Pense et al. (2005) stated, "Goal three within the national strategic plan for Agricultural Education encourages all students to be conversationally literate in agriculture, food, fiber and natural resources systems" (p. 107). A definition of agricultural literacy should include understanding of the history, social significance, economics, science, and a awareness and understanding of food and fiber industry careers (Russell, McCraken, & Miller, 1990). Leising (1990) also included career awareness in his definition and noted that agricultural literacy is an opportunity to incorporate agriculture into the curriculum and motivate students to pursue agricultural careers.

Terry, Dunsford, and Lacewell (1996) explained that the average American needed to be knowledgeable about agriculture "…because of the role citizens play in policy decisions, people need to understand the impact of agriculture upon society, the economy, and the environment" (p. 215). Substantiating this point were Brown and Coffey (1992) who specified that people need a high level of agricultural literacy as it is "imperative that consumers and government policy-makers alike understand the role of science in agriculture so that they may utilize scientific facts rather than emotions in making decisions concerning food" (p. 169). All agricultural systems illustrate a variety of the sciences and show the interactions of how everything on Earth works together (Brown & Coffey, 1992).

Law and Pepple (1990) reported that people who are educated about agriculture not only have an increased knowledge in agriculture but also in personal development. The increased knowledge in both areas showed an understanding in the American economy, food supply, rural-urban interdependence, conservation ethic, agricultural issues, international agriculture, agricultural policy, vocational agriculture, consumer

education, appreciation of natural resources, environmental knowledge and awareness, and technological applications (Law & Pepple, 1990).

Importance of Agricultural Literacy

Terry and Lawver (1995) stated the American society is agriculturally ignorant. As special interest groups continue to get more involved in issues it becomes important for the general public to have some background knowledge and understanding of the agricultural industry (Law, 1990). Doerfert (2011) stated, "As such, it becomes increasingly imperative that the general public understands the history and current challenges and how it affects each person's life on a daily basis" (p. 11). Despite this lack of knowledge, people are becoming more involved in discussions regarding agricultural policy (Wachenheim & Rahtge, 2002). Therefore, a well-informed, literate society about agriculture is vital to the continued success of United States agriculture because they make better decisions on economic, political, social, and environmental issues (Igo & Frick, 1999; Kovar & Ball, 2013; Pense & Leising, 2004). By improving the agricultural literacy, of citizens they will become more aware of the issues facing agriculture (Frick et al., 1995).

Kovar and Ball (2013) conducted a synthesis of agricultural literacy throughout the last 20 years. They found that much of the research on agricultural literacy has been conducted on elementary students. However, throughout the years researchers have found that people are not agriculturally literate (Pense et al., 2005; Frick et al., 1995; Igo, 1998). It has been documented well that both adults and youth lack an understanding of the ways agriculture impacts their lives (Igo, 1998). Society tends to see agriculture as

farming, ranching and children have the idea that their food comes from the grocery store, not the farm (Blackburn, 1999).

What has caused this lack of agricultural literacy in the United States? Some researchers believe it is a result of our forefathers not continuing to teach about agriculture (Traxler, 1990; Terry, 1990). Traxler (1990) went on to say, "In the 1920's, 30's, and 40's, as the farm population shrank and agricultural emphasis decreased in schools, some books and educational materials reflected less agriculture and the focus for educators was on agriculture as an occupational specialty, rather than as an integral part of almost every student's life" (p. 9). In the early 1900's, many states required agricultural instruction (Hillison, 1998).

Agriculture is the world's oldest science (Ricketts, Duncan, & Peake, 2006). Science literature says education about science (agriculture) needs to begin in elementary school or by the 6th grade (Humphrey, Stewart, & Linhardt, 1994; Terry, Herring, & Larke, 1992). For years, educators have found that agriculture is an effective way for instruction of other subjects at the elementary level (Hillson, 1998). Consequently, agricultural literacy needs to begin at the elementary level.

With less than 2% of the population living on a farm, urban and suburban populations constitute the majority of the population (EPA, 2009). Even in rural areas there is a mix of nonfarm and farm residents, where nonfarm residents may be both aware and less familiar with production agriculture (Wachenheim & Rathage, 2002). Further, because American agriculture has become so successful, typical citizens simply have not needed to worry about a quality food supply (Terry, 1990). However, as fewer people are directly involved with agriculture, agricultural knowledge becomes more important

because of making informed decisions about agricultural related topics (Doerfert, 2011). Being agriculturally literate does not imply that a person must have a high scientific level of understanding; it should consist on a minimal knowledge level of basic agriculture methods (Doerfert, 2011).

Research conducted by Pense and Leising (2004) revealed that high school students involved in agricultural education courses were more knowledgeable than students who were not enrolled in agricultural education classes at the secondary level. Frick and Spontanski (1990) discussed the importance of secondary agricultural education programs. They reported three areas of emphasis, "1) An understating of the applied process or methods of agriculture, 2) the basic vocabulary of agricultural terms, and 3) the impact of agriculture on society" (p. 6). Therefore, it is important to continue to teach all ages about agriculture.

Jones (2013) conducted an assessment of incoming freshman's knowledge of agriculture at Oklahoma State University. Students from a city (urban area) scored lower than students from a rural area (Jones, 2013). Overall, it was found that incoming freshman did not possess a passing knowledge of agriculture (Jones, 2013). Likewise, Kovar and Ball (2013) recommend the study of older audiences, as well as younger audiences. Studies conducted since 1988 have reported that all ages need to be agriculturally literate (Kovar & Ball, 2013).

"Increasingly, society will be faced with issues at the social, economic and political interface of agriculture, which will require some basic literacy of the human designed agri-food system," (Hess & Trexler, 2011, p. 1). Issues and problems facing the agriculture industry are important to both the general public and those employed within

the industry (Doerfert, 2011). Future generations will face issues in the context of food, fiber and natural resources that will require an informed citizenry to address.

Rural-Urban Interdependence

Rural and urban America relies on one another for many different reasons. Tacoli (2000) stated, "Urban food and nutrition security depend on strong links between urban and rural areas" (para. 1). Okpala (2003) reported, "Rural-urban linkage generally refers to the growing flow of public and private capital, people and goods between urban and rural areas" (p. 1). However, most tend to ignore this relationship. Tacoli (2000) reported:

> It the next two decades, three main issues related to rural-urban interdependence are likely to emerge: 1) changes in land use around urban center, from farmland to residential or industrial use; 2) greater diversification of income sources in rural and urban areas, often involving people migrating or commuting between the countryside and urban centers; and 3) changes in the direction and composition of internal migration. (para. 1)

In the 1950s, rural and urban economies were seen as detached from their neighbors (Tandoh-Offin, 2010). However, in the 21st century, new technologies have changed this dynamic. Tandoh-Offin (2010) stated, "Communities are linked in a web of interrelated networks amidst a growing non-metro – to – metro commuting population, evidenced by increasing urban spillover that blur the distinction between rural and urban areas" (p. 339). Understanding the importance of rural linkages to urban livelihood is important for consumers and policymakers to understand to continue to improve lives (Tacoli, 2000).

Rural areas provide goods for metropolitan customers, such as food, energy, lower-cost land and labor, and unique experiences (Dabson, 2007). Metro areas constitute the end of the market for rural production; provide specialized services, and job opportunities, and generate resources important to rural America (Dabson, 2007). Dabson (2007) reported, "If metropolitan America is to drive national prosperity, metropolitan areas will need a healthy and sustainable rural economy and culture. Likewise, if rural America is to flourish, it will surely depend on vibrant well-functioning cities and suburbs" (p. 3).

Experiential Learning

To teach agriculture in the school secondary systems teachers have commonly relied on textbooks (McIntosh, 2006). McIntosh (2006) revealed that textbooks have a bias against agriculture. Most textbooks do not include a significant amount of agricultural education to teach youth about agriculture properly (McIntosh, 2006). Most textbooks do not utilize agriculture as a context when providing examples of principles that make up the natural world. Therefore, teachers need to find other ways to teach students about agriculture. Experiential learning has been found to be an effective way to teach students (Baker, Robinson, & Kolb, 2012).

Experiential learning has increased in importance as an educational approach since Kolb's study in 1984. Kolb (1984) built on the research of Dewey (1938) and Lewin (1951) to form his experiential learning theory. Kolb's (1984) theory highlighted a four-stage learning cycle, which showed how experience is translated through reflection to concepts. The first stage, concrete experience, allows the learner to actively experience an activity, such as a laboratory session. The second stage, reflective

observation, involves the learner reflecting back on the experience. The third stage, abstract conceptualization, focuses on the learner's attempt to conceptualize a theory or model of what is observed. The fourth stage, active experimentation, involves the learner trying to plan how to test a model or theory or plan for a forthcoming experience. These stages can be simplified into do, reflect, and apply (United States Department of Agriculture [USDA], 2011). Kolb's (1984) experiential learning theory asserted that, "Learning is the process whereby knowledge is created through the transformation of experience" (p. 38).

To teach youth about agriculture properly there must be experiential learning that occurs (Baker et al., 2012). Baker et al (2012) stated, "Agricultural education has been experiential in nature since its inception, as made evident by supervised agricultural experience programs (SAE), field trips, student teaching experiences, problem solving methods, and service-based learning" (p. 1). In order to teach about agriculture, hands-on learning is employed in agricultural education curriculum. People learn best when they are provided the opportunity to practice new skills (Mabie & Baker, 1996). Experiential learning occurs when someone is involved in an activity, looks back and reflects on the activity critically, decides what is important and useful, and uses this information to perform another activity (USDA, 2011). The learning that occurs in experiential learning comes from the thoughts and ideas created as a result of the experience (USDA, 2011). 4-H and FFA applies this in their principle; learn by doing. If a child is performing the activity actively he or she is more likely to understand and remember the activity and think back on what they learned.

Baker et al. (2012) explained, "Agricultural education is uniquely poised to help students through an effective model of instruction that is experiential by nature" (p. 12). It is important to have purposeful processing with the students after a learning experience so that the valuable meaning of the program is not lost (Baker et al., 2012).

Many programs place little emphasis on experiential activities when teaching agricultural literacy (Mabie & Baker, 1996). Hess and Trexler (2011) concluded, "Educators therefore should provide learners with opportunities to engage in agricultural experiences (e.g., school gardens, animal care, cooking, etc.) as a way to develop missing schemata" (p. 160). Students use these informal experiences, along with the content provided in the classroom, to increase their knowledge and build more complex understandings (Hess & Trexler, 2011). Baker et al. (2012) concluded, "Learning outside of the classroom can have value, but teachers must remain focused on the fact that a key tenant of experiential learning is that students are learning and not just enjoying an experience" (p. 12).

Leising et al. (2001) studied kindergarten through twelfth grade students in Montana, Oklahoma, and Nebraska to assess their knowledge of the food and fiber industry. Lesing et al., (2001) reported, "Students already had some knowledge about agriculture, but that by infusing instruction on food and fiber into the academic core curriculum knowledge about agriculture increased significantly" (p. 260). These statements support the idea of using experiential learning as the pedagogical method for teaching agricultural literacy.

Urban Schools

Men and women of all ages and ethnic groups have a vested interest in agriculture (Law & Pepple, 1990). For a program to be effective in an urban school setting the courses and information need to be aligned with the interests of the urban students (Brown, 2013). Also, for urban students, it is important that teachers stay true to the needs of the students for them to truly learn effectively (Baker, 2013).

Research conducted by Frick et al. (1995) assessed urban and rural high school students' knowledge of agriculture. They researchers assessed data from 1121 students and determined that rural high school students were significantly more knowledgeable than urban high school students. The researchers reported that rural high school students were most knowledgeable about natural resource concepts and least knowledgeable about plants in agriculture and urban students were most knowledgeable about natural resources but least knowledgeable of agriculture policy (Frick et al., 1995).

Hess and Trexler (2011) studied fourth through sixth graders from Long Beach, California to determine their knowledge of agriculture. Hess and Trexler (2011) reported, "Informants lacked background that supported the construction of agricultural knowledge and understanding" (p. 159). However, students did correlate farms to provide people with the basic necessity of food (Hess & Trexler, 2011). Making this connection of farms providing the basic necessities is the crucial step towards decreasing the agricultural literacy gap (Pratt, 2013).

A study conducted by Mabie and Baker (1996) investigated the agricultural knowledge of fifth and sixth graders in urban Los Angeles schools. They found that students had little agricultural knowledge before the program. In addition, "They were

unfamiliar with related careers, and common terminology, such as irrigation, pesticides, and drought" (Mabie & Baker, 1996, p. 3). After completing a ten-week series of experimental activities and using experiential learning, student's knowledge increased through participation in the activities (Mabie & Baker, 1996).

Further, Pense and Leising (2004) conducted a study focused on Oklahoma High School students' knowledge of the food and fiber system. Accordingly, they tested students in urban, suburban, and rural areas. The researchers found that urban and suburban students mean scores were higher than the mean score for rural students. Pense and Leising (2004) concluded, "Students enrolled in rural schools were less knowledgeable about agriculture than students attending urban or suburban schools" (p. 94). However, as a whole it was concluded that the students in the study did not demonstrate that they were agriculturally literate (Pense & Leising, 2004).

"Children need to be taught that agriculture is more than 'sows, cows and plows,' and even more importantly, that there are many viable career opportunities in the agriculture industry" (Miller, 2013, p. 14). Field trips to local farms and agri-business are an important piece to teaching urban students to learn about the different aspect of agriculture (Miller, 2013). Therefore, finding fun and interactive ways for urban youth to learn about agriculture is the key to teaching them about the industry (Miller, 2013).

Kids & Kows & More

The framework for this study was Kids & Kows & More. This program was developed over 20 years ago by Texas AgriLife Extension and Southwest Dairy Farmers (S. Pierce, personal communication, December 1, 2013). When this program was developed the main emphasis was cows. Peirce (2013) stated, "In order to get the

attention of the teachers and make the program title catchy, cows was spelled kows instead." This program name is now trademarked by Southwest Dairy Farmers (Pierce, 2013). There are 46 Kids & Kows & More programs offered in New Mexico, Texas, and Oklahoma (Peirce, 2013).

The program in this study was conducted in Tulsa County. Tulsa County has been conducting this program in the county for eight years (C. L. Richert, personal communication, May 10, 2013). Extension educators put this program together and determine the sessions that will be taught by the presenters. "Each year the educators get together and discuss relevant agricultural commodities and agricultural practices to Oklahoma to help decide what sessions to offer" (Richert, 2013). AITC curriculum is used to help determine the sessions, as well. One session that is a constant in the Kids & Kows & More program year after year is dairy because Southwest Dairy Farmers is a sponsor and cows are the emphasis of the program (Pierce, 2013). Each year educators change the other programs so that students that attend their third grade year will not have the same programs their fourth grade year (Richert, 2013).

This program is a one day program to help increase students knowledge about the food and fiber industry. This program helps students make the connection of how their food gets to their dinner table (Pratt, 2013). Likewise, Blackburn (1999) conducted research on agri-science fairs as a one-time learning event. The agri-science fair featured ten to twelve stations teaching students "how animals and plant are grown and processed for food and fiber" (Blackburn, 1999, p. 1). Experiential learning was employed in the agri-science fair with hands-on programs. Kids & Kows & More employs experiential

learning by offering hands-on programs to the participants and helps them to reflect on the program by writing an essay entitled "What I learned at Kids & Kows & More".

Conceptual Framework

Leising and Zilbert (1994) developed a systematic curriculum framework identifying five themes students should be able to comprehend, synthesize, and communicate about agriculture. The framework created was the Food and Fiber Systems Literacy Framework (FFSL) (see Figure 1). Igo (1998) stated:

> One of the justifications for developing such a framework was that through all the definitions of agricultural literacy, through the many agricultural literacy programs and agricultural literacy research, little emphasis had been placed on determining the actual knowledge a person needed to be agriculturally literate. (p. 21)

It was determined measurable standards and benchmarks were necessary to assess students' agricultural literacy (Igo, 1998). Testing a student's knowledge of the food and fiber system addresses both understanding of the industry and plays a role in every category of the cognitive domain (Pense et al., 2005). Five themes were identified as the foundation of the FFSL including: 1) Food and Fiber System: Understanding Agriculture, 2) Historical, Cultural, and Geographic Significance, 3) Science: Agricultural – Environmental Interdependence, 4) Business and Economics, 5) and Food, Nutrition, and Health (Leising & Zilbert, 1994). Today, educators have certain curriculum they must teach to their students and feel that adding one more program will make this difficult. However, additional courses are not necessary, but a more realistic approach would be to incorporate agricultural concepts into existing courses (Law, 1990). To that end, Igo

(1998) stated, “Instead of building a program upon instructional activities, the Framework was designed to make connections to agricultural concepts through the existing curriculum and academic standards that were mandated by local school districts and by states” (p. 27).

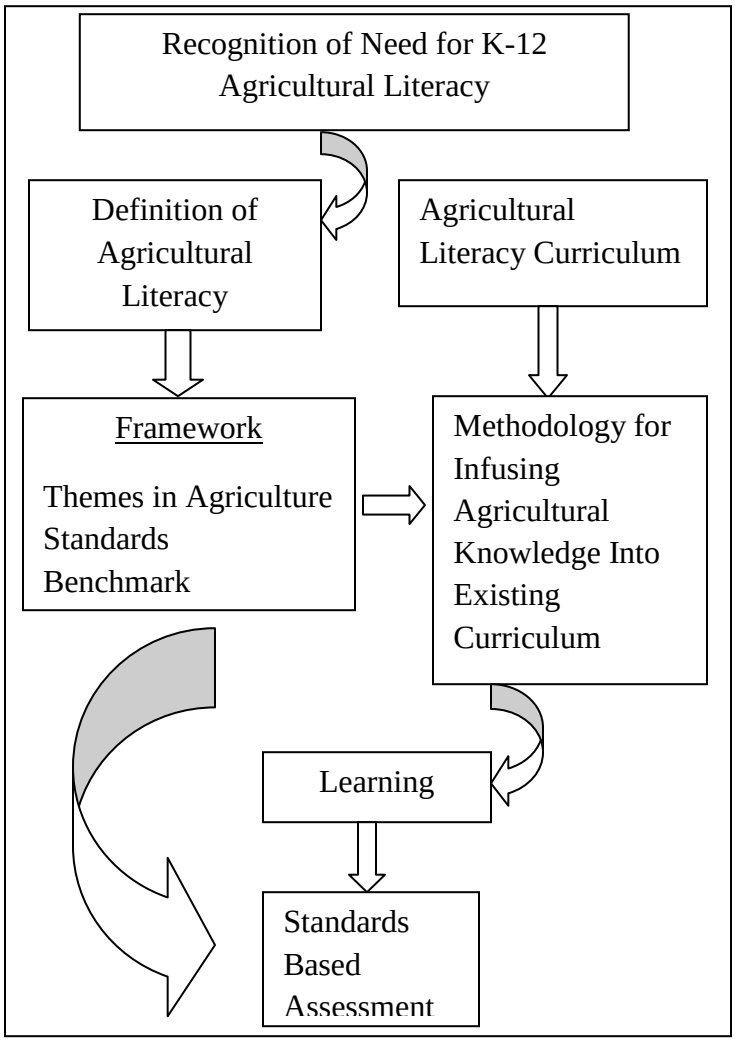

Figure 1. Conceptual Model of the Food & Fiber System Literacy Framework’s Role in Development of Agriculture Literacy (Pense et al., 2005, p. 109). Reprinted with permission.

Pense et al. (2005) conducted a quasi-experimental study with 1,734 students in grades K-12. They used Agriculture in the Classroom curriculum to teach agriculture knowledge and tested them with a pre and posttest. These tests assessed the five themes identified in the food and fiber systems literacy tests (Pense et al., 2005).

Igo (1998) studied three schools using the FFSL. Igo (1998) reported, "It was possible to increase student knowledge about agriculture by infusing instruction based upon the Food and Fiber Literacy Framework standards and benchmarks" (p. 71). It was concluded that the FFSL can be used to effectively guide instruction about agriculture (Igo, 1998).

Agricultural literacy programs must be comprehensive and systematic (Igo, 1998; Leising et al., 2001; Pense et al., 2005). Agricultural literacy programs must present the student with accurate information and teach the learner what they must know to make informed consumer decisions (Igo, 1998). This study utilized an instrument that was designed with the FFSL in mind.

Summary

It is evident that society lacks adequate knowledge about agriculture to make informed decisions (Doerfert, 2011; Frick et al., 1995; Kovar & Ball, 2013; Leising et al., 2001; Pense et al., 2005). However, citizens are called upon frequently to make important decisions about agriculture (Doerfert, 2011; Pense & Leising, 2004; Turnball, 2002). Therefore, it is important that we begin teaching students at a young age about agriculture (Hillison, 1998; Kovar & Ball, 2013; NRC, 1988). One venue to teach students about agriculture is one day agricultural programs.

In order to be agriculturally literate a person must be able to synthesize, analyze, and communicate basic knowledge about agriculture (Frick et al., 1991). One way to determine if a person is agriculturally literate it to test their knowledge with the Food and Fiber Systems Literacy Framework standards and benchmarks (FFSL) (Igo, 1998; Leising & Zilbert, 1994; Pense & Leising, 2004; Pense et al., 2005). It has been found that society is agriculturally ignorant (Doerfert, 2011; Terry & Lawver, 1995). Therefore, there is a need for agricultural knowledge among all age groups.

There is an imminent need to educate society about agriculture. Therefore, the purpose of this study was to examine the agricultural knowledge of third and fourth graders before and after a one day agricultural program.

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CHAPTER III

METHODOLOGY

This chapter introduces the methodology used to achieve the purpose of this study. This section includes the procedures that were followed, collection of data and the validity and reliability of the study. The purpose of this study was to discover the level of agricultural literacy with third and fourth grade students in an urban versus rural area before and after an agricultural program.

The following objectives were developed to accomplish the purpose:

1. Describe changes in students' agriculture knowledge, as measured before and after an agricultural education program.
2. Compare rural and urban student's agricultural knowledge, as measured before and after an agricultural education program.

Institutional Review Board

Oklahoma State University policy and federal regulations require approval of all research studies that involve human subjects before investigators can begin their research. The Oklahoma State University Office of University Research Services and the Institutional Review Board (IRB) conduct this review to protect the rights and welfare of

human subjects involved in biomedical and behavioral research. In compliance with this policy, this study was reviewed and permission to proceed was granted. The IRB assigned AG 1310 (Appendix A) to this study.

Research Design

In this study, third and fourth grade students from two urban-area schools and three rural-area schools were pre-tested (see Appendix B) before attending the program. The groups all attended Kids & Kows & More at the Tulsa State Fairgrounds to learn about the food and fiber industry. At the conclusion of the program, the same students were administered the posttest (see Appendix C). Students were pre-tested February 28 – March 4, 2013. Students attended the program on March 5, 2013 for three hours between 9:30 a.m. and 12:00 p.m. Students were then posttested between March 6 and March 12, 2013.

The pretests and posttests were administered to the students in the comfort of their own schools to help minimize anxiety. Students were identified with a unique number, which was randomly assigned to each student.

Population and Sample

The population for this study consisted of third and fourth grade students who attended the 2013 Tulsa County Kids & Kows & More program, which is a one day agricultural education program. Purposeful sampling was employed to identify the participants (Creswell, 2012). The researcher selected classrooms based on their location (Urban or Rural) and if the teacher was willing to participate in the study to learn and understand the knowledge difference between rural and urban students (Creswell, 2012). Students for the program were selected from the group of schools attending the Kids &

Kows & More program. All schools in Tulsa County and surrounding areas are invited to attend the program each year. The teachers who had chosen to participate in the program were asked if they would participate in the study and were then sent the appropriate paperwork to send home with their students. Teachers and principals were required to sign an approval form for their students to participate in the study (see Appendix D). Along with the approval from the teacher and principal, there was a parent approval form sent home for parents to sign and send back granting consent for their students to participate in the study (see Appendix E).

Before beginning the study, four urban schools and three rural schools were signed up to participate in the study. One urban school was unable to attend the program and another urban class did not have their parent consent forms. Therefore, two urban schools and three rural schools attended, with a final total for the urban group was 125 and the rural group consisted of 225 participants. After analyzing test scores in the urban group 119 (n = 119) were deemed usable and 210 (n = 210) scores of the rural group were deemed usable. Test scores were deemed unusable because several students took the pre-test and were absent for the posttest.

Instrument Design

This study was intended to describe the knowledge of third and fourth graders in urban and rural schools before and after an agricultural program. The instrument design for this study was the result of an adaptation of the work performed by Pense et al. (2005) that assessed students' knowledge of agriculture before and after AITC programs.

In addition, a systematic curriculum framework identifying five themes of what students should comprehend, synthesize and communicate about agriculture was referenced. This framework is also known as the Food and Fiber System Literacy Framework (FFSL). The five themes are; understanding the food & fiber systems; history, geography, and culture; science, technology, and environment; business & economics; and food, nutrition & health (Leising et al., 2001; Leising & Zilbert, 1994).

Considering the themes represented by the FFSL framework, a 20 - question test designed to measure the knowledge of the students, was developed. This test served as the pre and posttest and was administered before and after the agricultural program. The test was also developed with the help of experienced Extension personnel. Extension personnel helped to determine if the test was measuring information important to the five themes discussed by Leising et al. (2001).

Validity and Reliability of the Instrument

Validity is the score from an instrument that allows the researcher to develop good conclusions and how accurately the instrument measures the content it was intended to measure (Creswell, 2012). Likewise, reliability shows the consistency and stability of the instrument (Creswell, 2012).

Validity

Face and content validity were established by a panel of expert Extension personnel (Creswell, 2012). The Extension personnel selected to help with this were identified because of their close ties with the Kids & Kows & More program. They provided feedback and suggestions on the content and format of the pre-test and posttest and assessed the instrument to determine if the questions being asked were aligned with

the five themes of understanding. Extension educators reviewed the document to insure questions were representative of the subject, agricultural literacy. Pat Thompson, Oklahoma AITC curriculum writer, assessed the instrument *post hoc* to determine if questions were age appropriate.

Reliability

Given the nature of this study the researcher chose to conduct a pilot study. This study piloted the instrument being used. The pilot study was conducted in conjunction with the 2012 Kids & Kows & More program. A group of 25 participants who attended the 2012 Kids & Kows & More program were tested. Students involved in the pilot test indicated that some questions were difficult to understand and needed to be reworded or different questions needed to be asked. Consequently, new questions were added and the difficult questions were revised. Revisions were minor and dealt with modifying the language for clarity; the modifications did not affect the integrity of the test. The test asked 20 questions, which assessed each of the five thematic areas.

Data from the pilot study were used to calculate *Kuder/Richardson-20 (KR-20)* for the instrument. *KR-20* is used when items are scored right or wrong, there is not influence of speed, and the items measure a common factor (Creswell, 2012). The pilot test conducted with 25 students from 2012 Kids & Kows & More program yielded a reliability coefficient of 0.868, using the *KR-20* method.

The test developed was a criterion-referenced test. Weirsma and Jurs (1990) provide eight general factors to improve the reliability of an instrument. The eight factors included "homogenous items, discriminating items, enough items, high-quality items, high-quality copying and format, clear directions to the student, a controlled

setting, motivating introduction, and directions to the scorer" (Weirsma & Jurs, 1990, p. 200-201).

Data Collection

Data were collected by attending each school (n = 5) that chose to participate in the study starting one week before the program. The week following the program, each school was visited again by the research or an administrator to administer the posttest. Each child who had turned in a parent approval form took the test.

To ensure consistency in test administration, a training session was held with Extension personnel who might help with administering the tests. Administrators were instructed to read the script (see Appendix F) to inform the students as to who they were and how the tests would be used. They were also instructed to respond to any students questions, but were instructed not to provide the student any answers. They were only allowed to help pronounce the word or a definition of a word, unless it would provide them the answer to a question.

Students were taught about dairy, cotton, peanuts, sheep, farm animals and vegetables. The students visited these stations for 15 minutes each except for the dairy station, where the presentation was 30 minutes. The dairy presentation is longer because Southwest Dairy Farmers is one of the sponsors of the program and the presentation takes longer to teach. The students listened at each session and had a moment to ask the presenter questions. Students were also given a snack throughout the morning. To reinforce the vegetable station and the importance of eating vegetables, students were given carrots.

The dairy session was taught by an employee of Southwest Dairy Farmers with the mobile dairy classroom. The presenter taught about the process it takes to get the milk from the cow to their dinner table. Students were also able to observe the milking process. The cotton session was taught by a horticulture Extension employee. Students were taught about items that are made from cotton and how cotton is related to other items we eat on a daily basis. The peanut session was taught by a retired peanut farmer. Students learned how peanuts were grown and what type of equipment it takes to harvest peanuts. The sheep session was taught by a farmer who raises sheep for wool. The students were able to observe a sheep shearing and learned where wool comes from. Special attention was given to animal safety. Students were assured that shearing the wool in no way harmed the sheep. The farm animal session was taught by an agricultural Extension employee. The students were able to observe a baby calf, meat goats, dairy goats, pigs and chickens. The speaker described each animal, the by-products that come from each animal, and its nutritional value. Commodities grown in Oklahoma were discussed, also. The vegetable section was taught by Tulsa County - Oklahoma Home and Community Education members. They read the book, *"Who Grew My Soup?"* The book describes how vegetables found in soup are grown. The presenters who taught each session were considered knowledgeable in their respective areas.

Data Analysis

Data analysis for this study consisted of examining the change of knowledge in third and fourth graders to describe their increase in knowledge from before an agricultural program to after the program. At the completion of the program, tests were scored and coded into a Microsoft™ Excel spreadsheet for analysis. Microsoft™ Excel

was used because the researcher did not have immediate access to Statistical Package for Social Sciences (SPSS) Version 20. Two Extension personnel helped with the grading of the tests before inputting them into the spreadsheet. After inputting the information in the spreadsheet statistical procedures were performed using the SPSS Version 20 to analyze the data for both pretests and posttests in conjunction with the purpose and objectives of the study.

The rate of change was calculated for each student who participated in the test. This showed the amount of knowledge each student learned or did not learn during the program. A *t* test was also used to calculate the mean percentages based on the rural and urban groups. This also determined each group's knowledge before and after the program. These calculations were compared to determine which group was more knowledgeable of agriculture before the program and which group was more knowledgeable after the program.

CHAPTER IV

FINDINGS

Introduction

As society becomes further removed from the farm, it is apparent there is a need for a basic understanding of agriculture, the industry, and its importance to our country (Frick et al., 1995). Youth can be influenced and taught about agriculture by attending agricultural programs and being taught about agriculture in the classroom (Pense et al., 2005). The purpose of this study was to determine the level of agricultural literacy with third and fourth grade students in an urban area as compared to students in a rural area before and after an agricultural program.

The study employed a pre and posttest that was administered to third and fourth graders (n = 329), which was developed with the Food and Fiber System Literacy Framework (FFSL) in mind. This framework was used because of its success in measuring agricultural literacy in other studies. Igo (1998) stated, "It was possible to increase student knowledge about agriculture based upon the FFSL standards and benchmarks" (p. 70).

The test was administered before the program to determine their agricultural knowledge prior to the program and again after to determine their knowledge after the program. In total, 350 students completed the pretest and posttest, of these, 329 tests were usable. This was due to students taking the pretest and not being present to take the posttest. The purpose of the study was to discover the level of agricultural literacy with third and fourth grade students in an urban area compared to students in a rural area before and after an agricultural program.

In this chapter, findings of the study are discussed as they are related to the objectives.

The following objectives were developed to accomplish the purpose:

1. Describe changes in students' agriculture knowledge as measured before and after an agricultural program.
2. Compare rural and urban students' agricultural knowledge as measured before and after an agricultural education program.

Findings Related to Objective 1: Changes in student's knowledge

Objective one sought to describe the changes in students' agricultural knowledge before and after an agricultural program. Students (n = 329) were given both a pretest and posttest to help determine this objective. The 20-question test was developed by the researcher and was selected for its ability to measure the students' knowledge about basic agriculture. Demographic information was not collected on the individuals in the study. However, school information was used to determine selection (see Table 1).

Table 1

Demographic information for schools participating in the study

School (type)	Demographics	A-F Score	Free and reduced lunches
Zarrow[a] (Urban)	311 (71% white, 10% AA [b], 9% H[c], 8% NA[d], 2% A[e])	A	27% of students
Northeast Owasso (Urban)	449 (73% white, 3% AA, 4% H, 17% NA, 3% A)	A	28% of Students
Keystone (Rural)	456 (76% white, 1% AA, 2% H, 20% NA, 1% A)	C	73% of students
Catalayah[f] (Rural)	512 (58% white, 1% AA, 7% H, 32% NA, 2% A)	B-	70% of students
Intermediate Skiatook (Rural)	517 (63% white, 1% AA, 3% H, 34% NA)	B-	52% of students

Note. [a]Henry Zarrow International School in the Tulsa Public School System, [b] African American, [c] Hispanic, [d] Native American, [e] Asian, [f] Catalayah in the Claremore Public School system and serves a rural population (Office of Education Quality and Accountability, 2012; Oklahoma Department of Education, 2013)

A rate of change was calculated to determine the change of knowledge from before to after the program. After analyzing data using a rate of change calculation, it was determined that the students who participated in the program increased their knowledge of agriculture. Students involved in this study increased their knowledge by an average of four points.

Rural Students

Rural students (n = 210) were administered a pre-test before attending the Kids & Kows & More program. Descriptive statistics were used to determine the mean score and

standard deviation for the pretest and the posttest (Creswell, 2012). Rural students mean score on the pretest was 8.52. Rural students then were administered the posttest after attending the Kids & Kows & More program. The mean score of the rural students posttest was determined by utilizing descriptive statistics. Rural students mean score on the posttest was 13.23 (see Table 2).

Table 2

Comparison of Rural Students Mean Pretest and Posttest Scores

Town Type	Pre-test			Posttest			
	n	*M*	*SD*	*n*	*M*	*SD*	*ef*
Rural	210	8.52	2.05	210	13.23	2.68	.70

*Note.*Test is worth 20 points.; *$p < .05$

After analyzing the pre- and posttest mean scores it was determined that rural students agricultural literacy increased after participating in the program. After determining the mean score of each test, a mean rate of change was calculated by an independent samples *t*-test. The rate of change for rural students after participation in the program was 4.78.

To determine the practical significance, a Cohen's d effect size was calculated. This statistic demonstrates the practical significance the program had on participants' knowledge. To determine the effect size, the mean difference was divided by the average standard deviation (Creswell, 2012). According to Cohen (1992), 0.5 to 0.79 is a medium effect size. Therefore, the .70 effect size shows that the pretest and posttest scores of rural students have a medium relationship. Therefore, rural students increased their agricultural literacy through the one day Kids & Kows & More program.

Urban Students

Urban students (n = 119) were administered a pretest before attending the Kids & Kows & More program. Descriptive statistics were used to determine the mean score and standard deviation for the pretest and the posttest (Creswell, 2012). Urban students mean score on the pretest was 10.02. Urban students were then administered the posttest after attending the Kids & Kows & More program. Urban students mean score on the posttest was 14.56 (see Table 3).

Table 3

Comparison of Urban Students Mean Pretest and Posttest Scores

Town Type	Pretest			Posttest			
	n	*M*	*SD*	*n*	*M*	*SD*	*ef*
Urban	119	10.02	.43	119	14.56	2.08	.83

Note. Test was worth 20 points.

After calculating the pretest and posttest mean scores they were compared and it was determined that urban students agricultural literacy increased from before to after the program. After determining the mean score of each test a mean rate of change was calculated by an independent samples *t*-test. The rate of change for urban students on their test was 4.51.

To determine the practical significance, a Cohen's d effect size was calculated. According to Cohen (1992), 0.8 to infinity is a large effect size. Therefore, the .83 effect size shows that the pretest and posttest scores of urban students have a large relationship.

Therefore, urban students also increased their agricultural literacy through Kids & Kows & More program.

Findings Related to Objective 2: Comparing rural and urban student's knowledge

Objective two sought to compare urban and rural students' agricultural knowledge as measured before and after an agricultural education program. To determine the outcome of this objective, the students' agricultural knowledge was determined at the beginning and end of the program. An independent samples *t* test was run to determine the difference in the mean scores of the two groups. Urban students reported a mean score of 10.02 (n = 119), as compared to the rural students (n = 210) mean score of 8.52 (see Table 4). To determine the practical significance of the difference between urban students pretests and rural students pretests, a Cohen's d effect size was calculated. According to Cohen (1992), 0.8 to infinity is a large effect size. Therefore, the 1.0 effect size shows that the pretest and posttest scores of urban and rural students have a large and perfect relationship. Therefore, urban students also increased their agricultural literacy through Kids & Kows & More program.

Table 4

T-test Comparing Rural and Urban Pretest scores

Rural Pretest			Urban Pretest				
n	*M*	*SD*	*n*	*M*	*SD*	*p*	*ef*
210	8.52	2.05	119	10.02	.43	.000*	1.0

Note. Test was worth 20 points.; *$p < .05$

After analyzing the data in Table 4, it was determined that urban students were more knowledgeable before an agricultural program than rural students. After administering the posttest and analyzing the data the urban students (*n*=119) were more knowledgeable after the program as identified by their mean score of 14.56 as compared to the rural students (*n* = 210) mean score of 13.23 (see Table 5).

Table 5

T-test Comparing Rural and Urban Posttest scores

Rural Posttest			Urban Posttest				
n	*M*	*SD*	*n*	*M*	*SD*	*p*	*ef*
210	13.23	2.68	119	14.56	2.08	.002*	.55

Note. Test was worth 20 points.; * $p < .05$

After analyzing the data, it was determined that urban students were more knowledgeable than rural students after the program at a statistically significant level ($p < .05$). To determine the practical significance of the difference between urban students posttest and rural students pretests, a Cohen's d effect size was calculated. According to Cohen (1992), 0.5 to 0.79 is a medium effect size. Therefore, the 0.55 effect size shows that the pretest and posttest scores of urban and rural students have a medium relationship. Therefore, urban students also increased their agricultural literacy through Kids & Kows & More program.

The rate of change was also calculated for the urban and rural students. The urban students had a rate of change of 4.51 and the rural students had a rate of change of 4.78. This was determined significant with a significant value of .05 (see Table 6 and

figure 2). It was determined that both urban and rural student increased their agricultural literacy at the same rate.

Table 6

Rate of Change between test scores

	Rural			Urban			
	n	Mean	SD	*n*	Mean	SD	*p*
	210	4.77	± 2.63	119	4.51	± 2.09	.01*

Note. $p < .05$

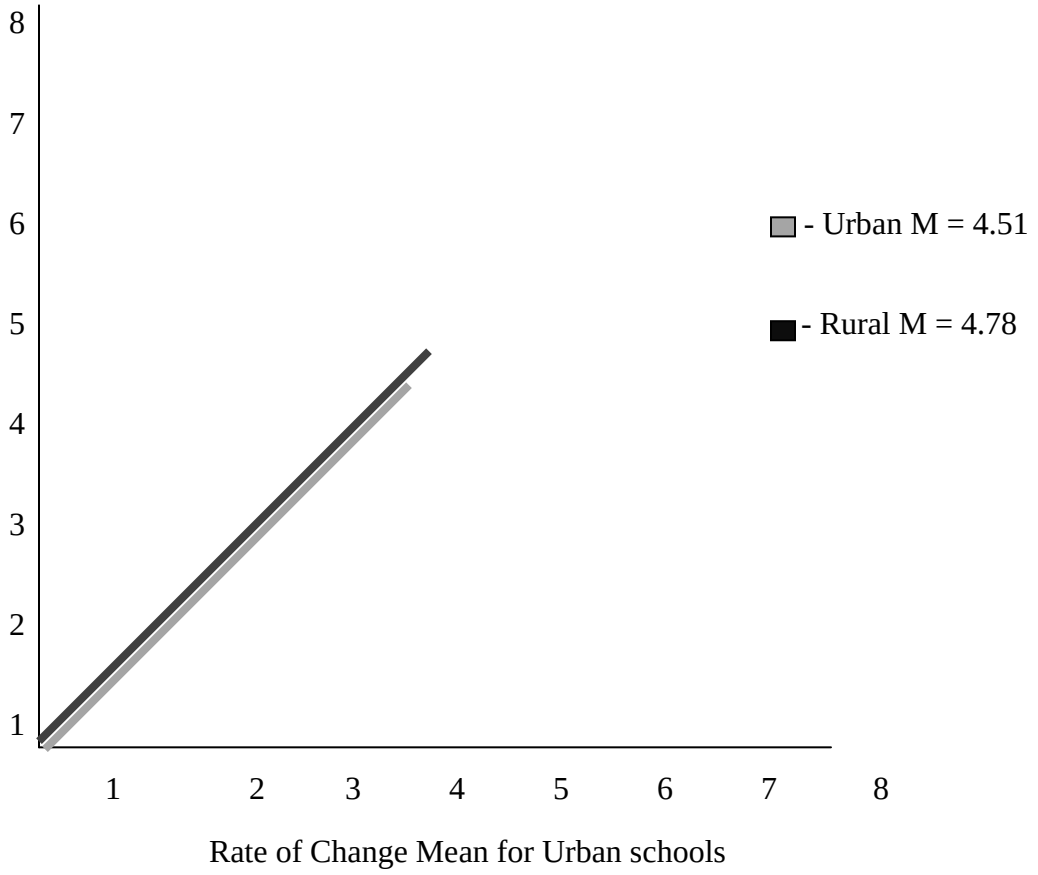

Figure 2. *T-test for Rate of Change between Test Score*

CHAPTER V

CONCLUSIONS

Introduction

This study of comparing urban versus rural students' knowledge of agriculture before and after an agricultural program was conducted during the spring of 2013. As society becomes farther removed from agriculture, interactions between farming and nonfarming communities become fewer (Holloway, 2004). Pre- and posttests were used with the population to determine their knowledge of agriculture before and after the program. The resulting data from these tests were compiled and analyzed by the researcher and are presented and discussed in Chapter IV.

The experiential learning theory postulates that when a youth participates in an activity, reflects back on it critically, determines what was useful or important to remember, and uses this information to perform another activity experiential learning has occurred (USDA, 2011). Agricultural education has been experiential since its beginnings (Baker et. al, 2012). Kolb's (1984) experiential learning theory asserted that, "Learning is the process whereby knowledge is created through the transformation of experience" (p. 38).

This study used the experiential learning theory to teach third and fourth graders of Tulsa County about the Food and Fiber industry combined with the five themes for understanding the food and fiber systems; history, geography, and culture; science, technology, and environment; business and economics; and food, nutrition, and health (Leising et al., 2001).

Statement of the Problem

Sorenson (1987) stated, "As we become an increasingly urban people, the typical American is less and less likely to have any direct contact with farms and farming" (p. 28). Also, as a result of more efficient agricultural practices, it became less important for everyone to understand how to raise crops and livestock (Harris, 1993). Consequently, agricultural literacy is diminished (Turnball, 2002).

A large portion of research on agricultural literacy has focused on K-12 students and educator (Kovar & Ball, 2012). Much of this research has focused on student in agricultural education courses and teachers (Pense & Liesing, 2004; Balschwied, Thompson, & Cole, 1998; Trexler & Meischen, 2002; Frick et al., 2005).

Students in third and fourth grade begin learning about their states history and geography during these school years, which is complemented by learning about agriculture in the context of their state (Traxler, 1990). Therefore, this is the reason this program targets third and fourth graders. To that end, what is the agricultural literacy of third and fourth graders in urban schools as compared to their peers that go to a rural school?

Statement of Purpose

The purpose of this study was to discover the level of agricultural literacy with third and fourth grade students in an urban area versus students in a rural area before and after an agricultural program.

Objectives

The following objectives were developed to accomplish the purpose:

1. Describe changes in students' agriculture knowledge, as measured before and after an agricultural education program.
2. Compare rural and urban students' agricultural knowledge, as measured before and after an agricultural education program.

Significance of the Study

For youth and others to make decisions on a subject, baseline knowledge about that subject must exist. McIntosh (2006) reported, "Today, only 5% of students are enrolled in traditional agricultural education courses (at the secondary level)" (p. 12). Therefore, the majority of students are not receiving formal education about agriculture. Trexler and Meischen (2002) reported, "As the number of people directly involved in agriculture has decreased, the general public's basic understanding of the food and fiber industry has declined" (p. 68).

It is projected that the world population will grow to nine billion by 2050 (Hodges, 2005; Johnson & Jorgenson, 2006; Sayers, 2011). As people become further removed from agriculture, they begin to rely on information from media, their social circles, and activist groups (Doerfert, 2011). Doerfert (2011) reported, "The potential negative impact of a uniformed population on the United States and global agriculture

and food system is great" (p. 8). The need for societal knowledge is based on the need for a basic understanding of food and fiber sources, marketing, distribution, and nutrition as consumers of agriculture and understanding the impact of agriculture on the society (Terry, Lacewell, Dunsford, & Gray, 1996). As people become further removed from agriculture, they begin to rely on information from media, their social circles, and activist groups (Doerfert, 2011; Turnbull, 2002). One of the research priority areas under priority one is delivery method preferences and effectiveness (Doerfert, 2011). Therefore, this study will report the effect of a one day agricultural education program on student's knowledge of the food and fiber industry.

Population and Sample

The population for this study consisted of third and fourth grade students who attended the 2013 Tulsa County Kids & Kows & More program, which is a one day agricultural education program. Purposeful sampling was employed to identify the participants (Creswell, 2012). The researcher selected classrooms based on their location and if the teacher was willing to participate to learn and understand the knowledge difference between rural and urban students (Creswell, 2012). Students for the program were selected from the group of schools attending the Kids & Kows & More program. All schools in Tulsa County and surrounding areas are invited to attend the program each year. The teachers who had chosen to participate in the program were asked if they would participate in the study and were then sent the appropriate IRB paperwork to disseminate to their students. Teachers and principals were required to sign an approval form for their students to participate in the study (see Appendix D). Along with the teacher and principal approval, there was a parent approval form sent home with the

students for the parents to sign and send back for their students to participate in the study (see Appendix E).

Before beginning the study, four urban area schools and three rural area schools were signed up to participate in the study. One urban class was not able to attend the program and another urban class did not have their parent approval forms. Therefore, two urban schools and three rural schools attended, with a final total for the urban group was 125 and the rural group consisted of 225 participants. After analyzing test scores in the urban group 119 (n = 119) were deemed usable and 210 (n = 210) scores of the rural group were deemed usable. Test scores were deemed unusable because several students took the pre-test and were absent for the posttest.

Research Design

In this study, third and fourth grade students from two urban area schools and three rural area schools were pre-tested (see Appendix B) before attending the program. The groups all attended Kids & Kows & More at the Tulsa State Fairgrounds to learn about the food and fiber industry. After attending the program the same students were given the posttest (see Appendix C), the same test given before the program. Students were pretested February 28 – March 4, 2013. Students attended the program on March 5, 2013 between 9:30 a.m. and 12:00 p.m. Students were then posttested between March 6 and March 12, 2013.

The tests were administered to the students in the comfort of their own schools to help minimize anxiety. Students were identified with a special number, which was randomly assigned to each student. This was done so that students could not be identified with their name after taking the test.

Results

Analysis of the pretests and posttests showed that rural students increased their knowledge of agriculture by an increase of 4.77. This is similar to the findings of Pense et al. (2005) when studying the Agriculture in the Classroom program. It was concluded that agriculture programs do make a positive difference in their knowledge (Pense et al., 2005). Likewise, the urban area students increased their knowledge of agriculture by 4.51. Mabie and Baker (1996) concluded that the influence of experiential learning on urban elementary students increases their agricultural knowledge. Mabie and Baker (1996) stated, "As a result (of this study), students went from knowing very little to becoming quite knowledgeable" (p. 3).

The pretests and posttests of urban and rural students were also compared to one another to determine which school type had more knowledge before the program and after the program. It was determined by the analysis of data, in this study, urban area students were more knowledgeable both before and after the program. This is similar to the findings in Pense's and Leising's (2004) study on Oklahoma High School students which found, "Students enrolled in rural schools were less knowledgeable about agriculture than students attending urban or suburban schools" (Pense & Leising, 2004, p. 94).

Conclusions

A total of 329 student's knowledge of the agricultural industry was evaluated in this study. The analysis of data, for this study, regarding each of the study's objectives formed the basis for the study's conclusions:

Objective #1

Describe changes in students' agricultural knowledge as measured before and after an agricultural program.

Concerning objective one, this study found that urban and rural students increased their knowledge of agriculture from before to after an agricultural program. These findings support Leising et al. (2001) who concluded that students' agricultural knowledge increase by incorporating agricultural instruction into the curriculum. Pense and Leising (2004) studied Oklahoma High School students in rural, urban, and suburban schools along with students involved in agricultural education and not in agricultural education. The findings of this study support Pense and Leising (2004) who found, "Both agricultural education students and general education students regardless of school type, possessed some agricultural knowledge" (p. 94). Therefore, both rural and urban students possess some knowledge of agriculture.

It was also concluded that urban and rural students increase their knowledge of agriculture through experiential learning. This finding is supported by Mabie and Baker (1996) who reported urban students learned best when they were provided with hands-on learning.

Urban and rural students increase their knowledge of agriculture through agricultural education. These findings were supported by Mabie and Baker (1996) and Pense et al. (2005) who reported that students increased their knowledge through participation in agricultural education programs.

It was shown that urban and rural students increase their knowledge of agriculture through the Kids & Kows & More program in all five theme areas of the FFSL. As the Kids & Kows & More program focuses on teaching youth an understanding of agriculture, how it effects the environment, how it affects the business and economics of the world, and food, nutrition and health. This finding is supported by Pense et al. (2005) who reported that students increased their knowledge in all five theme areas after being involved in Agriculture in the Classroom. They also stated, "Different themes appeared to have been successfully taught at different grade levels while developing and implementing agriculturally related lessons" (p. 116). The findings in this study were similar to the findings reported by Pense et al. Students acquired more knowledge in the food, nutrition, and health, and the science themes than the other three themes. Students did increase their knowledge of understanding that agriculture is a part of their life every day. However, this program is not tied directly to Agriculture in the Classroom programs it emphasizes the ideas that are taught in this program and is similar in teaching students about agriculture.

In Oklahoma, teachers are required to follow specific curriculum set by the state and must teach certain objectives. Teachers have little chance to teach outside of this curriculum to get their students ready for the Oklahoma Core Curriculum Test (OCCT); therefore, many students do not get any agricultural education unless it is touched on in geography or state history. Therefore, one day programs like Kids & Kows & More are important to teaching students about agriculture.

It was concluded, that students increased their knowledge of agriculture through the one day program. However, students were not agriculturally literate after the one day

program. Further, the one day program did lay a foundation of agricultural knowledge for the participants. Therefore, students need additional agricultural education to become agriculturally literate after participating in a one day program.

Objective #2

Compare rural and urban students' agricultural knowledge as measure before and after an agricultural education program.

Concerning objective two, an analysis of data determined that urban students were more knowledgeable both before and after an agricultural education program than rural students. Pense and Leising (2004) came to a similar conclusion when studying Oklahoma High School students. Pense and Leising (2004) found rural students were less knowledgeable about the food and fiber industry than urban students. This refutes the findings by Frick et al. (1995) that found rural students to be more knowledgeable about agriculture than urban students.

It was also concluded from the findings that urban and rural students increase their knowledge at the same rate. However, urban students still had more knowledge of the agricultural industry after the program than rural students.

Both urban and rural students need agricultural education in the classroom to continue their increased knowledge of agriculture. This is supported by Igo (1998) who concluded that a positive relationship existed between teachers making connections to agriculture and increasing knowledge of students. Likewise, the NRC (1988) told researchers that agricultural education should begin in kindergarten and continue through

the twelfth grade. However, studies have shown that agricultural education is important no matter the age (Frick et al., 1995; Jones, 2013; Kovar & Ball, 2013).

Formal education of agriculture seems to be the most reasonable way to help develop agricultural understanding (Hess & Trexler, 2011). Students are taught about agriculture through AITC curriculum; one day programs, such as Kids & Kows & More or agri-science fairs; and agriculture in the context of teaching other subjects. Therefore, rural and urban students need agricultural education in the classroom throughout their school years to continue to increase their agricultural literacy.

Recommendations for Practice

Elementary teachers should integrate some form of agricultural education in the classroom (i.e., Ag in the Classroom) to increase student knowledge of agriculture both in urban and rural schools. It has been reported that teaching agricultural programs in the classroom results in increased student knowledge about agriculture (Pense et al., 2005). Similarly, all teachers in grades K-12 should be teaching some form of agricultural education. Due to the rich context provided by food, fiber, and natural resources, incorporating agricultural education in classrooms through existing curriculum should become a priority for both urban and rural teachers.

In addition to teaching, professional development should be offered to teachers to learn how to teach agriculture in their classrooms and also to gain knowledge of the agricultural industry for themselves. Teachers have a negative perception of agriculture due to media outlets (Doerfert, 2011). Trexler and Meischen (2002) stated, "Generally informants spoke more elaborately about negative aspects of agri-food technologies than

they did benefits" (p. 79). Teachers should have a working understanding of the food and fiber industry in order to effectively teach students.

Similarly, in-services conducted by AITC should be available to teachers. This would help those teachers understand the AITC curriculum better and how to use the curriculum to teach agriculture to their students effectively. Teachers can contact ATIC to arrange for onsite training or other professional opportunities by visiting their website or contact Oklahoma AITC curriculum coordinators (Oklahoma Ag in the Classroom, n.d.). Externships for educators are another way of learning about agriculture and preparing them to teach agriculture in the classroom (Luft & Vidoni, 2000).

Likewise, teacher preparation programs should utilize AITC to help pre-service teachers going out into the field to supplement their knowledge of agriculture and how they apply it in their classroom settings. The study conducted by Trexler and Meischen (2002) concluded there was a need for an enhanced curriculum for prospective teachers because they often do not have an understanding of the agricultural industry to properly teach the subject.

Educators should be taught about the importance of experiential learning so that students are learning effectively. Knobloch (2003) stated, "the greatest challenge for today's teachers and students of agriculture is to move beyond the 'doing' and ensure that all learning is connected to thinking and knowledge that will be easily remembered and applied later in life" (p. 31).

Extension educators need to prepare programs for both rural and urban students. Educators gravitate toward teaching urban students about agriculture, but per the findings

of this study it is important that we educate both rural and urban students. Also, Extension educators should continue agricultural education after the one day program.

Recommendations for Future Research

There is a great need, as stated in the introduction and review of literature for people to be agriculturally literate. This study showed the increase in knowledge over a short-term period. A longitudinal study should be conducted to determine the students increased knowledge over a long period of time. As well as, increasing the time period between the end of the program and the posttest administration.

Future research should focus on students to see if they make the connection between the interaction of agriculture and the environment. It is important that consumers understand this interaction and that they make the connection between food and farms (Pratt, 2013).

Additional research should be conducted on students' perception of agriculture before and after the program. Students should be asked if their perception of the food and fiber industry has changed due to an agricultural program. Agriculture programs should help change negative perceptions that student's have on the food and fiber industry. Trexler and Meischen (2002) stated, "Teachers had constructed cognitive structures that were primarily based on a fear of pesticides and the pollution that they had heard these technologies cause" (p. 79). Likewise, students develop their own opinions by what teachers, adults, and media tell them.

More research should be conducted at the middle school, secondary and post-secondary levels to investigate student's agricultural literacy. It is important to continue

to increase the agricultural knowledge so that consumers are knowledgeable about agriculture. As Doerfert (2011) stated, "The potential negative impact of an uninformed population on the United State and global agriculture and food systems is great" (p. 8). Informed citizens will be able to make informed decisions on policy at all levels (Doerfert, 2011).

Implications and Discussion

The schools who participated in this study were representative of the demographics of Tulsa County, Oklahoma. All Tulsa County and surrounding area schools were invited to attend the program and schools who participated in the study were chosen from the group of schools who attended the program. Students had a base knowledge of agriculture before attending the program, but increased their knowledge of agriculture after attending the program. The findings of this study are limited to Tulsa County, Oklahoma and the schools who attended the program and should not be generalized to a larger population. Also, the increase of knowledge may have been due to the short time period between the end of the program and administration of the posttest.

Students' knowledge did change from before the program to after the program. Rural students' rate of change had a mean score of 4.77 and urban students had a mean score of 4.51. However, further investigation of the rate of change, revealed there were several students whose knowledge decreased from before to after the program. It is possible that some of these students were not able to attend the program, but were administered the test anyway.

A statistically significant difference was found between the urban students' knowledge and the rural students' knowledge. Urban students were found to be more knowledge both before and after the program than rural students. This could be explained by educators focusing on urban students and not rural students when focusing on agricultural education. However, overall mean scores of both urban and rural students were below average.

Agricultural programs, such as Kids & Kows & More, are vital to increasing the agricultural literacy of America. This study indicated that students have some agricultural knowledge before a program but with targeted, meaningful experiences their knowledge can increase as a result of an agricultural program.

With the world population reaching nine billion by 2050, the need exists for increased agriculture production (Blackburn, 1999; Hodges, 2005; Johnson & Jorgenson, 2006; Sayers, 2011). Therefore, an imminent need exists for all citizens to be educated about the food and fiber industry. One day agricultural programs, as found in this study, can be a way to lay the foundational knowledge citizens need in order to learn more about agriculture. However, it is not the responsibility of one entity to bear this burden, the industry, as a whole, should be taking steps towards educating primary, secondary, and post-secondary students about the source of their food and clothing.

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APPENDICES

APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL

Oklahoma State University Institutional Review Board

Date:	Thursday, February 28, 2013
IRB Application No:	AG1310
Proposal Title:	A Comparative Study of Urban and Rural 3rd and 4th Graders Agricultural Literacy: Before and After an Agricultural Program
Reviewed and Processed as:	Expedited

Status Recommended by Reviewer(s): **Protocol Expires: 2/27/2014**

Principal Investigator(s):

Leslie Lewis
PO Box 202
Preston, OK 74456

Jon Ramsey
455 Ag Hall
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study. As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval. Protocol modifications requiring approval may include changes to the title, PI, advisor, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research.
4. Notify the IRB Office in writing when your research project is complete; and
5. Your approval is contingent upon submission of approval documentation from each school system you will be interacting with as soon as possible after this interaction occurs.

Sincerely,

Shelia M. Kennison

Shelia Kennison, Chair
Institutional Review Board

APPENDIX B

PRETEST

KIDS & KOWS & MORE

PRE - TEST

Circle the correct answer for each question.

1. Milk is produced in what part of the cow's body?

   Stomach Brain Udder Foot

2. How many servings of milk per day, does a growing child need?

   1 to 2 servings 2 to 3 servings 3 to 4 servings 5 to 6 servings

3. To build strong muscles, you need _____ from beef.

   fat sugar cartilage protein

4. How many stomachs does a cow have?

   1 3 4 6

5. What products would be considered dairy products? (Circle all that apply)

   Eggs Yogurt Ice Cream Orange juice

6. True or False. Agriculture affects you if you eat or wear clothes.

   True False

7. Peanuts grow _____.

   Underground Above ground On a tree

8. Who invented the Cotton Gin?

   Eli Whitney Abraham Lincoln Benjamin Franklin Peter Cotton Tail

9 . Choose 3 of Oklahoma's top 5 agricultural commodities.

   Hogs Dairy Cattle Cotton Peanuts Goats Soybeans

10. Which food has more protein?

Eggs Peanuts Milk Carrots

11. Sheep produce an oil called _____ that is used in lotions and make up.

Lanolin Vegetable Sheep oil Olive

12. How often do sheep need to be sheared?

Whenever you feel like it Once a year Every 4 – 6 weeks

13. What is sheared from a sheep?

Hair Cotton Wool Linen

14. Where does bacon come from?

Hogs Cattle Chickens Sheep

15. Does it hurt the sheep to shear it?

Not too much No Yes, it is very painful

16. Carrots have something in them that help with your _____.

Eyesight Hearing Heart

17. The dollar bill contains cotton.

True False

18. Cotton and Okra are closely related.

True False

19. How many essential nutrients are in milk?

1 4 7 9

20. Cotton grows on _____.

A Tree A bush Underground

APPENDIX C

POSTTEST

KIDS & KOWS & MORE

POSTTEST

Circle the correct answer for each question.

1. Milk is produced in what part of the cow's body?

   Stomach Brain Udder Foot

2. How many servings of milk per day, does a growing child need?

   1 to 2 servings 2 to 3 servings 3 to 4 servings 5 to 6 servings

3. To build strong muscles, you need _____ from beef.

   fat sugar cartilage protein

4. How many stomachs does a cow have?

   1 3 4 6

5. What products would be considered dairy products? (Circle all that apply)

   Eggs Yogurt Ice Cream Orange juice

6. True or False. Agriculture affects you if you eat or wear clothes.

   True False

7. Peanuts grow _____.

   Underground Above ground On a tree

8. Who invented the Cotton Gin?

   Eli Whitney Abraham Lincoln Benjamin Franklin Peter Cotton Tail

9 . Choose 3 of Oklahoma's top 5 agricultural commodities.

   Hogs Dairy Cattle Cotton Peanuts Goats Soybeans

10. Which food has more protein?

Eggs Peanuts Milk Carrots

11. Sheep produce an oil called _____ that is used in lotions and make up.

Lanolin Vegetable Sheep oil Olive

12. How often do sheep need to be sheared?

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13. What is sheared from a sheep?

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14. Where does bacon come from?

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15. Does it hurt the sheep to shear it?

Not too much No Yes, it is very painful

16. Carrots have something in them that help with your _____.

Eyesight Hearing Heart

17. The dollar bill contains cotton.

True False

18. Cotton and Okra are closely related.

True False

19. How many essential nutrients are in milk?

1 4 7 9

20. Cotton grows on _____.

A Tree A bush Underground

APPENDIX D

TEACHER/PRINCIPAL APPROVAL

Principal/Teacher Approval

OKLAHOMA STATE UNIVERSITY

Dear Principal and Teacher,

I am interested in learning the agricultural knowledge of 3rd and 4th grade students before and after an agricultural program. In order to understand this, I would like your classes attending the Kids & Kows & More program through the Tulsa County Oklahoma Cooperative Extension service to participate in pre- and posttests.

Please understand that your classes do not have to participate in this study.

The children's names will not be on the forms they fill out, and they will be given a number that will be put on their tests so no one will know whose answers they are.

Sincerely,

Leslie Lewis

Graduate Student Oklahoma State University

Jon Ramsey, Ph.D.

Associate Professor Oklahoma State University

I have read this form and understand the nature of this study and agree to help with your project.

_____

(Principal Signature**)**

_____

(Teacher Signature)

_____

(date)

APPENDIX E

PARENT PERMISSION FORM

PARENT/GUARDIAN PERMISSION FORM

OKLAHOMA STATE UNIVERSITY

PROJECT TITLE: A Comparative Study of Urban and Rural 3rd and 4th graders agricultural literacy: Before and After an Agricultural Program.

INVESTIGATORS: Leslie Lewis, B. S. Oklahoma State University

PURPOSE:

This study will compare the agricultural knowledge of urban and rural 3rd and 4th grade students.

PROCEDURES:

Your child will complete two questionnaires. Both questionnaires will be the same. The first will be given before your child comes to the Kids & Kows & More program and the second will be given after the program. Either myself or a coworker will spend approximately 30 minutes on each visit with your child's classroom.

RISKS OF PARTICIPATION:

There are no known risks associated with this project which are greater than those ordinarily encountered in daily life.

BENEFITS OF PARTICIPATION:

The benefit of participation include student learning about agriculture, so informed decisions, concerning agriculture, can be made.

CONFIDENTIALITY:

The records of this study will be kept private. Any written results will discuss group findings and will not include information that will identify your child. Research records will be stored securely and only researchers and individuals responsible for research oversight will have access to the records. It is possible that the consent process and data collection will be observed by research oversight staff responsible for safeguarding the rights and wellbeing of people who participate in research

COMPENSATION:

Your child will receive a small gift when they come to the Kids & Kows & More, e.g., a bag from Southwest Dairy promoting Kids & Kows & More, a small cup that will tell how much milk is a serving, and other items from sessions throughout the day.

CONTACTS:

You may contact any of the researchers at the following addresses and phone numbers, should you desire to discuss your participation in the study and/or request information about the results of the study: Leslie German , B.S., Agricultural Hall, Department of Agricultural Communication, Education and Leadership, Oklahoma State University, Tulsa, OK 74112, 918-746-3719. If you have questions about your rights as a research volunteer, you may contact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-3377 or irb@okstate.edu

PARTICIPANT RIGHTS:

I understand that my child's participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my permission at any time, without penalty.

CONSENT DOCUMENTATION:

I have been fully informed about the procedures listed here. I am aware of what my child and I will be asked to do and of the benefits of my participation. I also understand the following statements:

I have read and fully understand this permission form. I sign it freely and voluntarily. A copy of this form will be given to me. I hereby give permission for my child _____.

_____ _____

Signature of Parent/Legal Guardian Date

I certify that I have personally explained this document before requesting that the participant sign it.

_____ _____

Signature of Researcher Date

APPENDIX F

SCRIPT

Good morning/afternoon. My name is Leslie Lewis* and I am currently working on my masters and am conducting research and also work for OSU Extension in Tulsa County. I am here today to administer a pre-test to your class and will be back again after the program to administer a posttest. This test is completely voluntary and will stay confidential. You will be assigned a random number for identification purposes so that we are able to track your pre and posttest scores. After the program is over and data has been collected the tests will be kept in a safe place at the Tulsa County OSU Extension Office. You all received a letter that you took home to your parents and had them sign. If your parent signed the letter your data will be used in the research. If your parents did not sign your letter you will still be allowed to take the test, however your data will not be entered into the research.

* Note: If a co-worker is administering the tests they will insert their name and let them know that I am doing the research.

VITA

Leslie Marie Lewis

Candidate for the Degree of

Master of Science

Thesis: A COMPARATIVE STUDY OF AGRICULTURAL LITERACY OF URBAN VS. RURAL 3RD AND 4TH GRADERS: BEFORE AND AFTER AN AGRICULTURAL PROGRAM

Major Field: Agricultural Education

Biographical:

Education:

Graduated from Cushing High School, Cushing, Oklahoma, May 2006.

Received Bachelor of Science in Animal Science and Agricultural Communications at Oklahoma State University, Stillwater, Oklahoma in May 2010.

Completed the requirements for the Master of Science in Agricultural Education at Oklahoma State University, Stillwater, Oklahoma in December 2013.

Experience:

December 2010 – Present **Oklahoma Cooperative Extension Service: Extension Educator.** Plan events and educational programs for 273 youth in the Tulsa County area. Train new volunteer leaders and club leaders. Present specialized workshops and training opportunities.

Professional Memberships:

- Oklahoma Association of Extension 4-H Agents
- National Association of Extension 4-H Agents
- Oklahoma Farm Bureau
- Gamma Sigma Delta