

Determining to What Extent Agricultural Content Diffuses from a Primary  
School through a Rural African Village: A Phenomenological Study

by

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## **Abstract**

Life Academy of Kimuli Uganda is a primary school for students between the ages of three and seventeen. The purpose of this school is to educate students in basic subjects, including science. The researcher identified that the science curriculum contained agriculture integrated into the content. This qualitative study utilized the phenomenological methodology to understand the attitudes and perceptions of all stakeholders who are impacted by the science curriculum. Additionally, this study sought to determine to what extent the content being taught in the primary school was diffusing through this small African village of Kimuli, Uganda. The results of this study indicated that while teachers perceived they were teaching improved agricultural practices and that this content could enhance existing agricultural practices of Kimuli, parents and community members identified in this study were not adopters of such improved practices. Barriers were identified that hindered diffusion and adoption of agricultural content facilitated at the primary school.

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## **Chapter 1**

### **Introduction**

Leadership development of students of agricultural education programs in the United States has long been a desired goal (Brannon, Holley, & Key, 1989). However, the same leadership characteristics as learned via school based agricultural education may be utilized for community development and family survival in third world countries such as Uganda (Kibwika & Semana, 2001). Additionally, Kibwika and Semana (2001) asserted that youth of Uganda are not being prepared for real life challenges. Potential hindrances of youth development via agricultural education may be due to student perceptions (Kibwika & Semana, 2001; Kipkurgat, Lawver, Baker, Kessell, & Bullock, 2006).

Dailey, Conroy, and Shelley-Tolbert (2001) asserted that agricultural education is a an effective vehicle for leading to transfer of workplace skills. While workplace skills are necessary for students in the United States to become contributors to society, it may be said that these same skills are a necessity for food-security and family survival in Uganda (Kibwika & Semana, 2001; Okiror, Matsiko, & Oonyu, 2011). Dailey, et. al. (2001) further discussed that experiential learning provides opportunity for students to apply theory in real world problem-solving settings. These authors also posited that understanding of agricultural concepts is important as decision-



makers dealing with agricultural issues and agricultural education helps prepare future leaders employed in agricultural careers.

Walker stated that the youth subjects of Uganda “supported monogamous marriage, smaller families, family planning, and child spacing methods” (Walker, 1998, p. 89). Walker (1998) also found subjects had high aspirations, goals, optimistic outlook of the future, and youthful zeal to obtain these possibilities. Walker (1998) continued by asserting that agricultural and extension educators are in a unique position to facilitate the integration of youth and young adults into sustainable development” (Walker, 1998, p. 89). Walker (1998) called for the education of youth regarding agricultural/vocational training, environmental education, credit, and access to land; all items that may be addressed via school-based agricultural education curriculum.

### **Background and Setting**

Life Academy Primary School is an extension of the Church of Kimuli, Uganda. This academy is a primary school for students age three through seventeen. Students earn basic education while enrolled in the school’s program. The researcher identified that agricultural content is embedded in the science curriculum and taught to students at the primary grade level. While many agricultural education studies have been conducted in Uganda, there is little known from the literature reflecting the way agricultural knowledge diffuses (Rogers, 2003) from a taught curriculum that affects

stakeholder groups such as students, teachers, parents, and community members with regard to this level of agricultural education.

### **Agricultural Education in Uganda**

District Agricultural Training and Information Centres (DATICS) have provided training to students aged 15-25 who have dropped out of school in the following districts of Uganda: Kabarole, Rakai, Masaka, Pallisa, and Tororo. According to Mugisha and Owens (2008), DATIC's philosophy is to offer knowledge and education regarding improved agricultural education and to move the agricultural sector away from subsistence farming to market orientation. While this program is in place for adult aged people between 15 and 25, students of primary school age are not addressed in this initiative. Perhaps agricultural content taught during primary school may have a positive impact upon the agricultural sector.

Results of the DATICS study revealed that young farmers benefit from the knowledge and training received (Mugisha & Owens, 2008). Could a similar agricultural focus offered in a primary school provide similar benefit? Mugisha and Owens (2008) continued by asserting that agricultural curriculum realignment might improve young farmers' income levels. Educating students in agricultural knowledge may address this perceived need.

Kipkurgat et. al. (2006) also asserted that a large proportion of Uganda's population is challenged by inadequate diet and per capita caloric

intake. Additionally, the authors posited that offering education and programming from a university level, to farmers might promote improved agricultural practices that may intern reduce poverty. While this case may be true for adult aged men and women, the question may be presented regarding the impact that agricultural education at the primary level may present with respect to reducing the poverty level.

According to Breazeale, Mangheni, Erbaugh, and Mbowa (2004), the agribusiness curriculum of Uganda's Makerere University needed to change in order to prepare students with the skills and qualities necessary to work in the private sector. Perhaps another lens through which to view this challenge is the type of students who typically enroll in Makerere's agribusiness program. Do students who have been exposed to agricultural content typically choose to pursue degree programs prepare them for a career in Uganda's agribusiness sector? Investigation of attitudes and perceptions of students in a primary school of a rural village in Uganda may provide such insight.

### **Statement of the Problem**

The literature reveals research regarding agricultural education in Uganda (Breazeale, Mangheni, Erbaugh, & Mbowa, 2004; Kibwika & Semana, 2001; Kipkurgat, Lawver, Baker, Kessell, & Bullock, 2006; Mugisha & Owens, 2008; Okiror, Matsiko, & Oonyu, 2011; Walker, 1998). However, little information is available regarding the experiences that a small rural

village may share regarding agricultural content embedded in the science curriculum of a local primary school. Therefore, the problem is to what extent does agricultural content diffuse from students to stakeholder groups of a rural African village?

### **Purpose**

Many studies identify the need for agricultural education in Uganda (Breazeale, Mangheni, Erbaugh, & Mbowe, 2004; Kipkurgat et. al., 2006; Mugisha & Owens, 2008; Walker, 1998; Kibwika & Semana, 2008); however, few studies measure the perceived impact that students enrolled in courses that teach agricultural content have on their families and communities in rural Africa. The purpose of this phenomenological study was to describe the influence of agricultural content upon students of a primary school in Kimuli, Uganda.

### **Guiding Research Questions**

Using the Diffusion of Innovations model (Rogers, 2003) as a frame to describe the level of impact that primary aged school children enrolled in agricultural curriculum may have on a community, the following research questions were investigated:

- 1.) To what extent do school teachers believe the taught agricultural content embedded in science curriculum is an improvement upon existing agricultural practices in the Kimuli Village?

- 2.) What are teachers' attitudes and perceptions of the agricultural content students share with their families practiced at home?
- 3.) What are students' attitudes and perceptions of the agricultural curriculum taught in science class?
- 4.) To what extent do students act as the communication channels from learned content at school to their parents?
- 5.) To what extent do parents adopt agricultural practices based upon information their children share with them?
- 6.) To what extent do parents share new agricultural knowledge with other family members, friends, and members of the community?
- 7.) What are community members' attitudes and perceptions of primary aged students sharing agricultural content they learned from school?

### **Operational Definitions**

- 1.) Class Monitors – Each grade in school at Union Grove Life Academy, Kimuli, Uganda has chosen leaders that serve as class monitors. This is a student leadership program for this school (V. Victours, personal communication, June 4, 2012).
- 2.) Union Grove Life Academy – This is a primary school in Kimuli, Uganda. Children in this school are from the age of three through 17 (V. Victours, personal communication, June 4, 2012).

- 3.) Community Leaders – For this study, community leaders will include anyone that plays a role in making decisions regarding land ownership and agricultural production.
- 4.) Communication Channels – A communication channel, according to Rogers (2003) is a means whereby a message, in this study the innovation of agricultural content, is communicated from individual to another.
- 5.) Homophily—According to Rogers (2003) this is where individuals who interact with one another possess similar certain attributes. For this study, similar attributes are determined to be predicated upon being both residents of the Kimuli village and Uganda in general.
- 6.) Heterophily -- Rogers (2003) asserted this to be the difference of certain attributes that individuals possess who interact with another. For this study, this was identified in those determined to be change agents who were also termed “foreigners” by the residents of Kimuli, Uganda.
- 7.)Relative Advantage -- Rogers (2003) asserted this to be “the degree to which an innovation is perceived as better than the idea it supersedes” (p. 15).
- 8.)Compatibility – Rogers stated this to be “the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters” (p. 15).

- 9.)Complexity – Rogers (2003) stated this to be “the degree to which an innovation is perceived as difficult to understand and use” (p. 16).
- 10.) Triability – Rogers (2003) stated this to be “the degree to which an innovation may be experimented with on a limited basis” (p. 16).
- 11.) Observability – Rogers (2003) stated this to be “the degree to which the results of an innovation are visible to others” (p. 16).
- 12.)Change Agent – Rogers (2003) stated that “a change agent is an individual who influences clients’ innovation-decisions in a direction deemed desirable by a change agency” (p. 27).
- 13.)Diffusion – Rogers (2003) stated that this “is the process in which an innovation is communicated through certain channels over time among the members of a social system” (p. 5).
- 14.) Innovation – Rogers (2003) stated that “an innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption” (p. 12).
- 15.)Opinion Leadership – Rogers (2003) stated this to be “the degree to which an individual is able to influence other individuals’ attitudes or overt behavior informally in a desired way with relative frequency” (p. 27).

### **Scope of the Study**

This study included subjects from Life Academy in Kimuli, Uganda. Each of subjects interviewed were enrolled in the academy and identified as

class monitors. For grades five through seven, each class monitor ( $n = 4$ ) was interviewed. Additionally, parents of each child were interviewed ( $n = 3$ ). Finally, the teachers ( $n = 4$ ) and community leaders ( $n = 4$ ) were interviewed.

### **Delimitations**

The scope of this study was governed by the following guidelines:

- 1.) Participation in this study was delimited to those instructors of Life Academy in Kimuli, Uganda.
- 2.) Student participants were delimited to those students who are enrolled in courses of Life Academy in Kimuli, Uganda. Additionally, these students were identified as class monitors.

### **Limitations**

The research was restricted by the following limitations:

- 1.) Data obtained from these programs were limited to the time in which the research was performed. Thus, care should be taken not to generalize the results of this study to similar primary schools in Uganda. Additionally, due to the small number of participants from which data was collected, readers shall take care not to generalize to other populations.
- 2.) Data collection was only from students identified to be class monitors of Life Academy in Kimuli, Uganda.
- 3.) Students identified in this study were in primary grades five through eight.



4.) Teachers of these courses were considered credentialed teachers based upon the governmental requirements of Uganda.

### **Assumptions**

The following assumptions were made concerning this study:

1. Teachers of science and English content performed normal daily teaching protocol while courses were observed.
2. Students, teachers, school administrators, parents, and community leaders were honest when interviews were being administered.

### **Statement of Significance**

A study of the experiences for all stakeholders involved with the agricultural content of Life Academy is important for several reasons. An understanding of teachers' perceptions regarding ways students are utilizing the content being taught will enable them to know how to teach more effectively. An understanding of the parents' perceptions of the knowledge that students diffuse or not diffuse will provide an insight as to whether or not the taught agricultural content is being adopted or not being adopted. Also, experiences of students will provide understanding regarding perceptions of agricultural content and if they are diffusing this knowledge in their homes to their parents.

Additionally, agricultural education and training was highlighted by the Republic of Uganda's national agricultural education strategy (2003) for the years between 2004 and 2015. Due to the government of Uganda's

documented initiated strategy, agricultural education was targeted as a vehicle to help reduce poverty in Uganda. The report stated that agriculture was the most important sector for the economy at the time this policy was produced. Therefore, the strategy sought to identify specific measures to enhance agricultural education. Results from this study may be of value when viewed in accordance of the sought after objectives of this policy.

## **Chapter 2**

### **Review of the Literature**

#### **Introduction**

Agricultural science integration has been examined in the United States for many years (Bjoraker & McClay, 1960; Camp & Crunkilton, 1985; Hillison, 1996). The integration of both science and agriculture with regard to school curriculums, have been implemented and examined in foreign educational programs as well (Frempong, Zinnah, & Adam, 2003; Hulela & Miller, 2003). Central to describing the phenomenon for this research is to understand how previous studies document the implementation, examination, and perhaps adoption of science and agriculture curriculum in both the United States and foreign countries. This literature review will include the integration of science and agriculture both in the United States and abroad. Also, this literature review will review studies both in this country and internationally that have utilized Rogers' (2003) Diffusion of Innovations theory as a frame for their work.

Also to be included in this literature review is a review of research conducted that examined the influence of women in agriculture in Uganda. Studies have indicated that women are engaged in agricultural production activities and their impact may be significant (Kipkurgat et. al., 2006; Erbaugh et. al., 2003).

## **Integration of Science and Agriculture**

The inception of vocational education in the United States ushered in the existence of agricultural education. This began with the Smith-Hughes Act of 1917 (Camp & Crunkilton, 1985). This act initiated the structure for school-based vocational agricultural education nationwide. Additionally, this act provided monies federally for agricultural education to be implemented and maintained. Several years after its origination, the concept of embedding agricultural content into science curriculum evolved. Bjoraker and McClay (1960) stated that, crucial for the progress of agricultural education, preparation of students for careers would require knowledge of scientific farming. Additionally, they posited that agricultural education needed to provide basic preparation in agricultural sciences. Hillison (1996) stated, prior to the Smith-Hughes Act of 1917, the USDA oversaw science integration as the experimental stations that were created in the Hatch Act of 1887 would share scientific research based instructional information with agricultural teachers of secondary schools (Hillison, 1996). Bjoraker and McClay (1960) also posited that secondary students who possessed a desire early in their high school careers would need to experience an agricultural education comprised of scientific agricultural knowledge.

Hillison (1998) documented the existence of agriculture in the classroom whereby elementary students were taught subject content material, i.e. mathematics, English, and science, while integrating

agricultural concepts. He utilized historical methods of research to document instruction of agriculture at the elementary grade levels in the early 1900s. Investigated were primary and secondary sources to include books, journals, and bulletins. Secondary sources utilized were magazines. Hillison found that teachers of elementary aged students identified with the value that agriculture was as effective delivery tool for instruction of other subjects. Identified in this research was the use of the project method, and elements of instruction reminiscent of the scientific method (Hillison, 1998). Hillison asserted this historical research served as groundwork for proponents, including the U.S.D.A., enthused about the use of agriculture in the classroom programs.

Wilson and Curry (2011) reviewed research related to integration of science and agricultural education to identify gaps in the existing body of literature and to make conclusions with regard to integration of agriculture and science content. Data was secured from library and Internet searches from 20 years prior to the time of the study. The research presented and discussed was not exhaustive. Conclusions included that, as a result of the National Research Agenda: 2007-2010 (National Research Agenda, 2007), curriculum development and trends were made a high priority. Many perception-based descriptive studies were present in the literature. However, a lack of empirical research regarding the integration of science into agricultural education curriculum was identified. Also, the researchers

identified that students who experienced science integrated within agricultural education expressed a more positive attitude about this process. Additionally, the authors found the literature was lacking with regard to longitudinal studies examining effects of science integration into agricultural education curriculum on student retention, college placement, careers in the agriscience sector, and knowledge transfer (Wilson & Curry, 2011).

Thompson (1998) sought to determine perceptions of agriculture teachers with regard to the integration of science into the agricultural education program. The population he studied consisted of all state, regional, and national winners of the National FFA AgriScience Teacher of the Year Award Program from 1988 until 1995, which yielded a population of 253 individuals. One hundred and thirty-one responses were received from the purposive sample of 187 existing award-winning teachers at the time of the study. This yielded a 71.98 percent response rate. Thompson (1998) found that based upon his findings, agriscience teachers did believe that students were better able to understand science concepts as a result of the agriculture and science integration. Additionally, results showed that agriscience teachers felt more equipped to teach biological concepts integrated into agriculture, rather than physical science concepts. Results also showed that the perception was that undergraduate students and in-service teachers alike, needed to receive instruction with regard to integration of science into agriculture. It was also perceived by respondents that credibility and

perceived benefits of agricultural programs would climb, thus providing potential to recruit high ability students as a result of the integration of science into the agriculture curriculum.

Thompson and Warnick (2007) investigated a similar problem as the previously referenced study, but with a different population. The study determined perceptions and attitudes of secondary science and agriculture teachers with regard to integrating science into the agricultural education curriculum. Populations for science and agriculture teachers were 360 and 121, respectively. An adapted instrument was utilized in two forms to gather responses from both science and agriculture teachers. Two hundred twenty-two science teachers responded for a 61.7% response rate and 106 agriculture teachers for a response of 87.6 percent. Science and agriculture teachers believed integration of science into agricultural curriculum would help align with standards across disciplines. The researchers found that each group expressed positive attitudes with regard to the integration of science into the agricultural education curriculum. In light of favorable perceptions held by science teachers, the authors suggested there was potential for more integration of science into agricultural education curriculum. In light of this potential for more integration, the authors posited that more science literate students could have a greater understanding of agriculture and its connection to science, as a result of this type of integration.

Warnick, Thompson, and Gummer (2004) conducted a similar study to investigate perceptions and attitudes of Oregon high school science teachers with regard to agriculture programs and their integration of science into the curriculum. Three hundred sixty science teachers were surveyed during the 2001-2002 academic year. Two hundred fourteen science teachers responded, which yielded a response rate of 59.4%. These teachers agreed agriculture is an applied science and agriculturists must have an updated understanding of science. They also believed that students would benefit from the integration of science into agricultural education curriculum. Science teachers did, however, identify barriers science integration. Based upon findings of this study, science teachers lacked an agricultural background, funding and equipment, an integrated science curriculum, and agriscience workshops. Oregon science teachers perceived that science integration into agricultural education programs would help agriculture content align more with required state standards.

### **Elementary Students' Agriculture and Science Literacy Examined**

Hess and Trexler (2011) examined elementary students' understanding of agricultural literacy. Students' schema for science and agriculture concepts consisting of common foods, food origins, and process of production travels of raw product to food were investigated utilizing qualitative methods to glean insight from elementary aged students. The population consisted of 18 urban southern California students, grades four through six. Selected



students were perceived as having developed language skills. The researchers selected population based upon gender, ethnicity, location, and type of residence. Partnering to identify informants with the researchers were the Boys and Girls Club of Long Beach, California. The program director recruited respondents, sent home proper consent forms to the parents, and acted as messenger to deliver stipends from the University of California, Davis, amounting to \$300 for participation. Forty-five minute semi-structured interviews were utilized to assess elementary students' schema with regard to literacy of the agri-food system. Protocol was based upon Trexler's (2000) synthesis of the *Project 2061 Benchmarks for Science Literacy* as well as *A Guide to Food and Fiber Systems Literacy Framework* (Leising, 1998). Students were asked to dissect a cheeseburger, identify components of the cheeseburger, and explain their understanding of each component. The authors found that experiences held by elementary students interviewed that were of an agricultural nature did not influence their schema with regard to the process of the agricultural product as it is raw, and processed, then readily consumable. Additionally, schema were lacking in informants to enter into discourse regarding agricultural crops and their postproduction processes. Informants were aware that food came from plants and animals, yet lacked basic understanding of food processing, manufacturing, and marketing. The authors posited that investigation was warranted to identify where the breakdown exists from accurate

understanding of food production and inaccurate understanding post-production processes to bring raw agricultural products to a form readily consumable.

Hess and Trexler (2011) utilized concomitant research methods to explore elementary students' understanding of agriculture. Utilizing the same sample and methods as mentioned in Hess and Trexler (2011a), researchers found informants lacked sub-concepts essential to elementary students' ability to construct agricultural knowledge and understanding. As a result, the authors posited that educators could create curriculum aimed at further developing schemata of elementary aged students with regard to their understanding of agricultural science. This was deemed necessary as informants from this study lacked agricultural experiences to schema development for understanding agriculture more deeply.

Balschweid and Huerta (2008) utilized a phenomenological approach to perceive the comfort level of agricultural science teachers adopting an advanced life science course based upon state standards. Additionally, the study sought to identify the teachers' perceptions of the benefits to students. Teachers interviewed in this study felt confident in their ability to teach the life science curriculum embedded in an animal science course. Additionally, teachers felt that students would benefit from the application of scientific principles to a real world context (Balschweid & Huerta, 2008). Further research conclusions indicated skills would be transferrable from this course

to the life science workforce or higher learning settings. Balschweid and Huerta (2008) exemplified benefits to secondary education students enrolled in a science course with a focus on agricultural animals. This may have implications regarding the transferability of agricultural concepts being integrated in a science curriculum for students of Life Academy Primary School in Kimuli, Uganda.

Trexler and Meischen (2003) utilized clinical interviewing to determine in-depth understanding of subjects in this study. Seven fifth grade students were interviewed to determine their knowledge of agricultural literacy based upon Trexler's (1999) synthesis of the Benchmarks for Science Literacy (AAAS, 1993) and Leising's (1998) Food and Fiber System Literacy Framework. Bidimensional coding was used to assess participants' responses for each benchmark (Meischen & Trexler, 2003). Three students lived on farms while four other students lived in rural towns. Two of these students raised steers for 4-H projects, while one student raised a 4-H lamb. Most parents of the students worked in a nearby city. None of these parents were primarily agricultural producers. Findings revealed students knew that food products originated from plants and animals. Students did not understand cattle by-products and that they may be utilized in many everyday products. The researchers asserted that this area needs further attention as elementary-aged students may have a deeper understanding of how agriculture impacts their everyday lives. Participants of the study also

believed that farms are diversified (Meischen & Trexler, 2003). These rural students understood the processing procedure of plants and animals.

Meischen and Trexler (2003) asserted this may be a result of a society with fast food restaurants. Respondents, however, did not utilize proper terminology. While this study does showed the importance of elementary aged students increasing in their literacy of the culture of agriculture, further research is needed internationally to determine the extent to which similar aged students of third world countries understand about agriculture.

Trexler (2000) found that out of school experiences are strong determinants for fifth graders' ability to discuss agricultural literacy similar to experts' understanding. Trexler (2000) also found urban student informants to lack knowledge of pests and their control. Trexler (2000) also stated that the clinical interview process was helpful in identifying elementary students' understanding of agricultural literacy.

Mabie and Baker (1996) issued a call for elementary school teachers to introduce experiential activities into their science curriculum. This was in response to a study, which consisted of three types of instructional methods performed upon three different groups of students. The first group received a series of experienced based learning activities, the second group worked with a school garden, while the third group was considered to be the control group. Agricultural content and instruction was utilized to enhance students' ability in scientific procedures such as observing, communicating, comparing,

ordering, relating, and inferring. The findings indicated that students had increased in observational, communication, and comparison science process skills if they received the agriculturally embedded treatment instructional activities (Mabie & Baker, 1996). Researchers also asserted that informants reported the treatment activities to promote fun and learning in science education while the control group reported the course to be boring. Findings identified students' ability to order, relate, and infer is closely linked to the students' attitudes pertaining to the topic being learned. Experiential, agriculturally-based activities increased motivation of students; whereas, the absence of these activities yielded a decrease of student motivation.

Trexler and Meischen (2002) identified that pre-service science teachers with little science background are not equipped to address content standards that promote agricultural literacy. Respondents from suburbs and cities were more focused upon pollution and danger regarding biotechnology than counterparts of rural background. Background experience played the largest role in pre-service elementary teachers being able to discourse in a quality fashion regarding agricultural literacy. While this study investigated perceptions of elementary junior and senior pre-service teachers in college with regard to biotechnological innovations in agriculture, few studies of this nature, if any, have been conducted in third world Africa. Ugandan teachers of science curriculum who currently embed agricultural practices may have perceptions worthy of investigation.

## **Science Integration into Agricultural Education Internationally**

Frempong, Zinnah, and Adam (2003) assessed constraints to effective teaching of agriculture at the primary and secondary level in Ghana. They posited that the need for this type of study was to develop indigenous people with necessary skills and knowledge in agriculture for the development of the nation of Ghana. This descriptive survey collected data from 54 randomly selected teachers of agriculture of the Cape Coast district of Central Region, Ghana. Results of the survey sought to describe teachers of agricultural science characteristics. The authors stated, “the teacher is the pivot of classroom instructional activity” (Frempong, Zinnah, & Adam, 2003, p. 60). Constraints to teaching agriculture were identified by teachers via their responses on the survey. Regarding teaching methods, most used one of the following: question and answer technique (62.5%), reading of a textbook with students (47.5%), and writing notes on the blackboard for students to copy (77.5%). Only 17.5% utilized school gardens to supervise students in a sanctioned learning experience. Constraints were identified as follows: teachers indicated the difficulty they experienced in teaching agricultural science lessons, such as farm record keeping, growing field crops, composting, and animal and poultry husbandry, the syllabus was comprised of items not only difficult to address in the time allotted, but perceived by teachers as not relevant to the communities, and the lack of motivation. No bonuses other than predetermined salary and no professional development opportunities

were in existence. Negative attitudes of parents and students also posed issues constraining teachers' effectiveness in delivering agricultural science content in Ghana. Pre-service and in-service preparation of teachers was determined to be a constraint, as well as supervision by governmental officers. Teaching facilities and environment were perceived as constraints as the compounds where schools were located did not present a viable location to conduct supervised student learning projects germane to agricultural science. Conclusions made by the authors suggested that the traditional methods used to teach agricultural science are outdated. Change can exist in the form of increased focus on pre-service teacher preparation and stronger relationships between schools and ministry of education. Additionally, the authors posited that parents and community members may play a role in enhancing the environment and teaching and learning supplies in order to provide better teaching and learning opportunities for pupils.

Hulela and Miller (2003) utilized historical methods of research to provide information regarding the development of agricultural education from pre-independence Botswana until the time of the study. Additionally, the researchers documented challenges and accomplishments of the existing agricultural education program of Botswana. Conclusions reported that agricultural education had “developed from gardening and livestock rearing skills to a complex modern agricultural education program capable of providing student with pre-vocational skills” (Hulela & Miller, 2003, p. 313).

Included in curriculum were agricultural economics, animal husbandry, farm engineering, field crops, and fruit and vegetable production, environmental education, and developmental issues affecting agriculture. Career opportunities evolved for graduates of secondary schools and opportunities for post-secondary training. The country has seen a change in attitudes toward agriculture. Agriculture is viewed as an applied science and as essential for human life. The authors asserted that policies were for continued progress agricultural development and to provide food security in Botswana.

Eck and Torres (1996) sought to determine attitudes of administrators in Belize Ministry of Education with regard to agricultural education. This descriptive-correlational study utilized a census approach to survey identified administrators ( $N=40$ ). The administrators were deemed to have a “moderately favorable” (Eck & Torres, 1996, p. 30) attitude with regard to agricultural education at the primary school level. The authors suggested in-service education programs for administrators to understand the necessity of agriculture to the economy, agricultural literacy, and long-term benefits as students who are completers of this type of education contribute to society as citizens.

### **Women in Uganda Practicing Agriculture**

According to some studies in Uganda, women have many responsibilities in the home that may prevent them from pursuing



agriculturally-related degrees (Kipkurgat, Lawver, Baker, Kessell, and Bullock, 2006). Kipkurgat et. al. (2006) also asserted that women were left behind in their access to education due to illiteracy, gender roles, and language barriers.

Erbaugh, Donnermeyer, Amujal, and Kyamanywa (2003) asserted that, essential to effective program delivery by agricultural research and extension programs of Uganda, gender based knowledge and perceptions needed to be assessed. Additionally, the knowledge differences between men and women needed to be built into extension programs. Erbaugh, et. al. (2003) also found that it was not necessary to advocate a primary focus upon education of women based upon the respondents of their study. While women played an important role in agricultural production and pest management, there was not a significant difference in the knowledge base. Women shared in the decision-making processes in homes, where both spouses were living; however, women made all decisions related to agricultural production in homes where there was no husband. In fact, because women were oftentimes heads of households (Erbaugh, et. al., 2003) perhaps their perception of an agricultural content embedded science curriculum offered in primary school may prove beneficial. Because women may be the heads of households, investigation of the relationship of agricultural practices taught in school to children and then shared with women who are heads of the household as a result of a familial relationship is warranted.

## **Theoretical Framework Diffusion of Innovations**

The theoretical framework for this study comes from Diffusion of Innovations theory by Rogers (2003). Rogers' Diffusion of Innovation theory was selected to determine to what extent agricultural knowledge diffuses from teachers to students, students to parents, and then parents to community members. Rogers' theory (2003) provides a framework from which to advance existing understanding about an innovation of agricultural content, and its diffusion through the Kimuli village of Uganda, Africa, via students who are taught agricultural content.

Rogers stated "an innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (2003, p. 12). "Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p. 11). Further, Rogers stated that influencers are typically those individuals who are in places of leadership (Rogers, 2003).

Rogers (2003) discussed five attributes that impact the rate of adoption: 1) relative advantage, 2) compatibility, 3) complexity, 4) triability, and 5) observability. "Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes" (Rogers, 2003, p. 15). The second attribute, compatibility, "is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003, p. 15). The third

attribute, complexity, “is the degree to which an innovation is perceived as relatively difficult to understand use” (Rogers, 2003, p. 15). The fourth attribute, triability “is the degree to which an innovation may be experimented with on a limited basis” (Rogers, 2003, p. 15). The last attribute, observability, “is the degree to which the results of an innovation are visible to others” (Rogers, 2003, p. 15).

Because influencers tend to be individuals who are in places of leadership (Rogers, 2003), students identified as communication channels for this study will be the class monitors. Questions were asked with regard to the agricultural content embedded in the science curriculum and taught to the students. Stakeholders were identified as teachers, students, parents/guardians, and community members who were also agricultural producers. Stakeholders were interviewed to determine their attitudes and perceptions of Rogers’ five attributes that impact the rate of adoption (2003).

### **Use of Diffusion of Innovations Theory in Agricultural Education**

Rollins (1993) sought to investigate which generalizations of the 15 that were developed in a previous study by Rogers and Shoemaker in 1971 (Rogers & Shoemaker, 1971) related to farm operators of Pennsylvania and their perceptions of their own innovativeness. Descriptive correlational methods were utilized to examine relationships of these generalizations to farm operators of Pennsylvania personalities. Total population included all farm operators in Pennsylvania ( $N=24,546$ ). Sample size was determined to

be 197. Phone interviews were conducted and results indicated that 52% of farm operators were classified as early adopters and early majority adopters, while 48% were classified as late majority adopters and laggards, which did correlate with Rogers and Shoemaker's 1971 study (Rollins, 1993) basic characteristics of a normal distribution. Implications shared by researchers included that if educational programming be sought to communicate new methods of practice to Pennsylvania farm operators, then innovators and early adopters should be enlisted to assist in communicating the message to other operators. Additionally, Rollins asserted that not all potential adopters would use only one source of information. This is important for extension to understand, in that there are many other forms of information available to farm operators. King and Rollins (1995) investigated technical and economic aspects of a pre-side dress nitrogen test (PSNT) in order to design and develop educational material for potential adopters of this product. This product was designed with the purpose of mitigating issues regarding manure management, nutrient management, and public concern of pollution of the environment. Two hundred and twenty farmers were sampled from 515 central Pennsylvania counties. This descriptive survey provided insight as to whether or not farmers would adopt the PSNT product. Those who agreed to future usage were categorized as adopters while those who were skeptical were categorized as nonadopters. Conclusions from this study exhibited that farmers assessed the PSNT by the economic value the product

would add to or take away from the current bottom line of the farm operation. Interestingly enough the purpose of the product is for environmental management practices and not monetary benefit. Barriers to adoption were identified in the study with regard to technical practices. This study also revealed that change agents held both mixed and negative attitudes about the PSNT. Where change agents held this negativity, farmers were less likely to adopt. King and Rollins (1995) explained the importance of education when implementing new farming practices. Farmers related better to innovations when they were properly educated about the process. This has relevance to this study as proper education of children is necessary so that they are equipped to be communication channels through which content information is shared with parents and the community.

Murphrey and Dooley (2000) examined strengths, weaknesses, opportunities, and threats regarding distance education technologies within a college of agriculture. Perceptions of faculty, administrators, and professional support staff investigated using the naturalistic approach. Authors used a snowball technique to select individuals to be interviewed with probing questions via semi-structured interviews, gathering descriptive information, about their perceptions of distance education. From 42 interviews conducted, 16 were administrators, 15 faculty members, and 11 support staff comprised the sample. Conclusions indicated that, in order for distance education to be adopted, attributes in the form of incentives needed

to be available. Compatibility also needed to be present in the form of student usage of same procedures for financial aid, technical support, and other practices. Complexity was determined as a challenge to mitigate as technology was constantly changing at the time of this study as it is now. Triability was prescribed in the form of converting hard copy documents into electronic copies to share via the communication medium. Observability may be achieved through rewards, grants, workshops, demonstrations, and presentations.

Roberts, Hall, Briers, Gill, Shinn, Larke, Jr., and Jaure, (2009) utilized Rogers' diffusion of innovation theory of 2003, to identify Hispanic students who would be adopters of agricultural education and the FFA by enrolling and paying dues, or those who would be nonadopters by not enrolling or paying dues. Specifically investigated was the potential for use of interventions to increase student involvement in the FFA and agricultural education. This descriptive quantitative study sought to collect data from face-to-face visits of three schools and via electronic communication. Six interventions were utilized to increase participation of the Hispanic population. The project team targeted opinion leaders to ensure more adoption. Concluded from this study was that all three schools saw increased enrollment and participation in the agricultural education and FFA programs from the Hispanic population. Therefore, the authors asserted that the interventions employed utilizing Rogers' theory of diffusion of innovations in

2003 (Roberts, et al., 2009) might have impact on FFA and agricultural education involvement.

### **Diffusion of Innovations Theory in International Research**

Navarro (2007) sought to help change agents when implementing innovations abroad by better addressing needs and realities of environments in which people live and to cooperate with Indigenous Knowledge Systems so as to better understand the change process necessary for the innovation to be adopted. Indigenous Knowledge Systems, as defined in this study was “local knowledge, beliefs, and values unique to a group of people, culture, or society” according to Warren and Rajasekaran (Warren & Rajasekaran, 1993, p. 8). Her approach was identified by the following themes: moving from a transfer of knowledge framework to a co-creation of knowledge framework, building interdisciplinary teams that include social scientists, addressing the pro-innovation bias, overcoming the technology push, including more flexibility in the diffusion process, preventing negative and unexpected consequences of development, further analyzing the characteristics of an innovation, understanding development, engaging in sound program development, understanding struggles between naturalistic and quantitative paradigms, using participatory methods, asking the right questions of the right people, interpreting well, and building trust. In conclusion Navarro (2007) asserted efforts of innovation are complex with regard to development in agriculture. Cooperation between farmers and extension workers are urged to work

toward an “interactive and integrative model of co-creation of knowledge” (Narvarro, 2007, p. 254).

### **Diffusion of Innovations in Extension Literature**

Moriba, Kandeh, and Edwards (2011) utilized Rogers’ diffusion of innovations theory (2003) to investigate the impact of Tikonko Agricultural Extension Centre’s (TAEC) impact on farmers and communities in the area of Tikonko Chiefdom in Sierra Leone. Specifically, the researchers utilized the theory to focus on the concept that innovations are adopted in light of their perceived value over what it is currently utilized or practiced (Moriba, Kandeh, & Edwards, 2011; Rogers, 2003). Descriptive methods were used to survey a population of 318 farmers, yielding a sample size of 74 randomly sampled participants. Data were analyzed descriptively measuring frequencies and percentages based upon participants’ responses. Most of the participants interviewed were identified as adopters due to their perceptions warranting that technological improvements were compatible and relative advantage was perceived as evident (Moriba, Kandeh, & Edwards, 2011; Rogers, 2003). Farmers also perceived that the technologies increased agricultural production and raised their capacity to secure food sustainably. Farmers identified barriers to adoption, such as lack of access to loans, lesser networking of farmers, lack of maintenance facilities, incompetence of Tikonko Agricultural Extension Centre agents, existing low access to technology, and farmers’ existing poor financial status. Offered as a



discussion point by the researchers was that “technological advances can have a dramatic effect on food production in a society, which, in turn, may lead to accelerated economic development more generally” (Moriba, Kande, & Edwards, 2011, p. 57). Rogers’ theory of diffusion of innovations can provide the frame to measure this impact of technology use in the developing third world.

Strong (2012) sought to understand “Mexican lending institutions’ awareness and usage of the Ministry of Agriculture’s statistics in determining and disseminating loans to farmers” (p. 2). Rogers’ theory of diffusion of innovations provided the frame to determine relative speed. Rogers’ (2003) five-stage model illustrates decision-making processes to adopt an innovation, and relative advantage that a technology presents. Strong posited (2012) this is one of the most “robust” (p. 3) predictors of relative speed of the adoption of a new technology. This descriptive qualitative study investigated 14 administrators, purposively selected, of loan implementation in Mexican lending institutions. Semi-structured interviews were conducted via SkypeTM. Conclusions identified that most institutions perceived the Ministry of agriculture’s statistics to present relative advantage when compared to other sources for information. Complexity was determined to be a barrier, in the form of timing of information available, and less than desirable communication.

Elliott and Claves (2002) conducted a descriptive study in the form of an oral questionnaire to survey private and governmental extension services to determine usage of computers and Internet in Messinia Prefecture, Greece. In this study the computer and the Internet were the innovations with which extension service, private sector, and government adopted utilizing Rogers' diffusion of innovations theory (2003). Forty-one subjects were surveyed. A strong, positive relationship occurred between computer ownership and year the agent graduated, age, and years of experience in the profession. Positive moderate relationship was evident between ownership of a computer and university attended, as well as a negative moderate relationship between computer ownership and children in the house. Positive low association was identified between computer ownership, additional education, and major studied in university, as well as a negative low association with regard to the size of the extension operation. Positive negligible relationship was evident between computer ownership and gender. A follow up study was recommended to obtain information pertaining to personal computer use and Internet adoption.

Sofranko, Swanson, and Samy (2004) utilized diffusion of innovations theory (Rogers, 2003) as a frame to investigate "neglected aspect of adoption behavior, i.e., the sub-set of producers who try and then stop using an innovation" (Sofranko, Swanson, & Samy, 2004, p. 695). Additionally, the researchers sought to provide interventions that would prevent the decreased

use of an innovation after its adoption. Seven hundred eighty-five farmers from five counties in Illinois were surveyed to determine if producer involvement and interest in value-enhanced grain increased, earnings were higher from value-enhanced grain, and if farmers had altered their views regarding value-enhanced grain. Results showed that farmers discontinued use of value-enhanced grain due to lower levels of income experienced as a result of value-enhanced grain usage.

Leite and Baggett (2003) utilized qualitative methods to study perceptions of Brazilian supported agricultural school teachers regarding innovations in the wake of reform from the professional educational system. Innovations included separation between academic and professional education, as well as modular competency curriculum being put into use. Framework for this study was diffusion of innovations theory by Rogers (2003). Cluster sampling technique identified 65 federally supported agricultural schools. From these schools, four teachers were randomly selected to be interviewed via one-to-one in-depth interviews. Grounded theory approach was utilized to collect and analyze data. Per the researchers, “compatibility and relative advantage appear to be the leading attributes driving their perceptions about the adoption of the innovations” (Leite & Baggett, 2003, p. 375). Additionally, Brazilian teachers favored modular curriculum delivery due to flexibility, which is perceived to be advantageous. Separation of academic and professional tracks were not

supported by teachers interviewed due to the perceived “restriction of opportunities for educational attainment, reinforces social differences, promotes academic heterogeneity in the student body, and brings an excessive amount of work for teachers and students (Leite & Baggett, 2003, p. 375.)

Li and Lindner (2005) examined China Agricultural University’s faculty perceptions regarding barriers to diffusion of web-based distance education. Random and stratified sampling yielded a response from ( $n=273$ ) from 1170 faculty from the entire university. All barriers investigated, were perceived as moderate by faculty. Credibility of the program was the largest concern. Of least concern were incentives, infrastructure, conflict with traditional education, and fear of technology from the 10 barriers investigated. These barriers were identified which might inhibit the adoption of web-based distance education.

Duvel (2006) presented a poster explaining the necessity in rethinking opinion leadership in international cultures. He stated that sociometric leadership identification had been utilized as context for studies previously conducted in Uganda, Lesotho, and South Africa. Findings from this study implied that opinion leadership differs among small farmers regarding whether they come from black or white cultures. Black cultures exhibited distance as a barrier to being identified as opinion leaders, while white cultures expressed psychological accessibility to be a significant indicator.

The black culture also exhibited that females don't typically present themselves as opinion leaders. Challenges with regard to measuring opinion leadership arise when examining credibility and accessibility aspects of research (Duvel, 2006).

Manganyi, Place, and Letsoalo (2007) highlighted adoption of institutional arrangements by farmers when farm redistribution took place in South Africa. Thirteen farms were identified as participants for this qualitative study, utilizing focus group interviews. Also reviewed were documents in the form of constitutions and business plans in order to affirm data that were collected from focus group interviews. Errors and imperfections were detected as a result of findings that indicated the diffusion processes of the program to redistribute, were traced back to communication channels (Rogers, 2003). Target audiences were not as widely reached, thus farmers did not receive the message regarding adoption of institutional arrangements. Thus communication channels were identified to be worthy of further investigation to determine communication breakdown.

Miller and Mariola (2008; 2009) utilized diffusion of innovations theory by Rogers (2003) to identify "hassles" (Miller & Mariola, 2008, p. 341) present when farmers of Costa Rica sought to adopt environmental innovations. Small farmers identified "hassles" as the cause for cessation of use. This study utilized qualitative methods employing snowball sample procedure to identify both small part-time and full-time farmers of rural Costa Rica.

Sixty-nine individuals were interviewed to determine why they had ceased usage of at least one or more of the four technologies provided by EARTH university of Costa Rica. The technologies were biodigesters, worm compost systems, bokashi, or efficient microorganisms. Two broad classes were identified as reasons that the farmers dropped technologies. They were either the “hassle” (Miller & Mariola, 2008, p. 347) or larger socioeconomic factors such as farm growth, loss of labor, and or growing for different markets. Suggestions made by the researchers included holding workshops to teach maintenance and improved practice with the use of the technologies, creating social networks whereby users of technology could collaborate under the leadership of University extension education.

Moriba, Kandeh, and Edwards (2010) presented a poster highlighting the need for research to take place with regard to empowering post conflict farmers of Sierra Leone to prevent future conflict, as well as promote increased agricultural productivity and secure more food production. Objectives included technology identification and training provided to farmers as well as technology and farmer training description. Questionnaires were used to gather data from 318 farmers. Technologies were provided, and subsequently adopted by farmers. Training was also provided in order to promote self-reliance.

Oleas, Dooley, Shinn, and Giusti (2010) utilized qualitative methods to analyze the diffusion process of innovations (Rogers, 2003) among farmers of

Chimaltenango, Guatemala. Interviews, observations, and journal entries were sources of data collected, to understand perceptions of whom were the opinion leaders, and their effect on “adoption or non-adoption of agricultural innovations” (Oleas, Dooley, Shinn, & Giusti, 2010, p. 37). Snowball sampling methods were first employed to identify network sampling. Once the network had been discovered, purposive sampling led to interviewing 15 individuals. Participants did recognize importance of opinion leaders regarding the diffusion and adoption of innovations. Such importance existed in the form of evaluation of new innovations, communicating among networks, opportunities for training and agricultural projects, and outside contact maintenance. Honest, loyal, and proactive people diffused innovations, though the study presents that they were heterophilous as well. Thus, as asserted by the researchers, agricultural innovations may be diffused as opinion leaders communicate amongst their channels.

Harder and Lindner (2008) utilized descriptive methods to determine agents’ perceptions of barriers to adoption of eXtension. Of 533 agents, a sample of extension agents ( $N=237$ ) were randomly selected to participate. Agents participating expressed most concerns regarding time as a barrier. They didn’t have time or opportunity to learn about eXtension and incorporate into routine practice. Additionally, agents somewhat agreed that lack of incentives played a role in barriers to adopt eXtension. Also, agents were concerned regarding the loss of face time with clientele as a result of the

online platform. As well education was seen as a determining factor of whether or not agents would adopt the use of eXtension.

Witt, Pemsil, and Waibel (2008) examined two phenomena regarding use of farmer field schools in Senegal. Objectives included analyzing relative importance of training intensity that might influence diffusion of information, as well as estimating to what extent said factors affect attitude of untrained farmers regarding integrated production and pest management. Demographic and social conditions as well as data regarding farm and integrated production and pest management issues were collected in Senegal in 2004. Conclusions showed that increasing farmer field school participants led to better diffusion of integrated production and pest management to non-participants. The researchers suggested that high rates of diffusion and adoption of integrated production and pest management of Western Senegal could be enhanced as a result of careful targeting of farmer field schools.

### **Summary of the Literature Review**

Studies have been conducted regarding the integration of science into agricultural content (Balschweid & Huerta, 2008; Mabie & Baker, 1996; Trexler, 2000; Trexler & Meinschein, 2002; Trexler & Meinschein, 2003). Balschweid and Huerta (2008) found that agricultural based instruction attributed to students' transferrable skills from the school to workplace. Mabie and Baker (1996) found that scientific based activities that were linked to agricultural context increased student knowledge of scientific



practices, increased motivation to engage in activities, and students reported that activities were fun when agriculturally based practices were present. Trexler (2000) found that the clinical interview process was helpful in identifying what agricultural literacy students possessed. Additionally, Trexler and Meinschein (2002) found that pre-service teachers seeking certification to teach both science and agriculture lacked proficiency in knowledge and ability to correctly teach agricultural content to students. Trexler and Meinschein (2003) found elementary aged students may lack agricultural literacy. According to (Trexler & Meinschein, 2003), this may be due to the fast food society exhibited in the culture of the United States. Kipkurgat, Lawver, Baker, Kessell, and Bullock, 2006 found that women of Uganda may be primary decision makers of their household. However, though women may be in the place to make decisions, they may lack education and the ability to read. As a result, this may prevent them from pursuing agricultural degrees if the opportunity was made available to them (Kipkurgat, et. al., 2006). Erbaugh, et. al. (2003) found that women may be the heads of households where the husband is either gone or deceased. Additionally, in many cases, women make primary decisions regarding agricultural production.

### **Chapter 3**

#### **Research Methods**

Campbell and Martin (1992) asserted that donor nations such as the United States, in seeking to provide aid in international settings, ask the wrong questions. There is a need to expand the research methodology to better serve the international people groups who would call upon the services of the United States. They also asserted there is much literature that discusses the failure of adopting practices to serve the world's poor and hungry. The authors also posited that the problems are not with United States technology, but with research methodology. Qualitative research methods may be a potential solution (Campbell & Martin, 1992). Qualitative research methods may provide flexibility needed to assess opinions and attitudes of native people. This is necessary as agricultural and extension educators. However, the naturalist point of view may be better utilized to serve the poor and hungry of the third world (Campbell & Martin, 1992).

#### **Design**

This qualitative study incorporated phenomenological methodology (Balschweid & Huerta, 2008; Crotty, 2003). This allowed the researcher to make sense of lived experiences in the lives of individuals interviewed. For the purpose of this study, the lived experience investigated was the essence of the impact of agricultural content embedded in the science curriculum of Life Academy Primary School in Kimuli, Uganda. Patton (2002) stated that essences are at the core of a phenomenon commonly experienced. Erlandson,

Harris, Skipper, and Allen (1993) asserted that within qualitative traditions, multiple realities are assumed to be present. Each reality exists in the perception of each respondent, whereby the researcher may observe what common meaning might be provided (Erlandson et. al., 1993). Additionally, Marshall and Rossman (2006) posited that qualitative research is justifiable when the research is exploratory and as such seeks cultural description as well as when the research being conducted is based upon a little known phenomenon. This research is exploratory in that the researcher sought to describe attitudes and perceptions of stakeholders who were impacted by agriculture embedded science curriculum of which is a phenomenon that has not been previously investigated in this particular African community. Of particular interest was to describe the relationship of school children enrolled in a science and or English course where agricultural content was taught, and the concepts shared with parents regarding the course. Specifically, this study viewed the school-aged children enrolled in the course as channels of communication as identified in Rogers (2003). Rogers (2003) stated that initiators of communication channels were typically influencers. Further, because influencers are typically in places of leadership (Rogers, 2003); students interviewed for this study were identified as class monitors. A semi-structured interview format was used to organize the process, which allowed for more freedom and exploration during the interview session (Hatch, 2002). Specifically, the researcher developed interview schedules for each

stakeholder group (Appendices D - G) based upon the five attributes Rogers (2003) listed that foster a society's adoption of an innovation. Due to the nature of this study, respondents lived in the bush territory of Africa with no access to electricity, which limited the opportunity for communication prior to arrival and during the researcher's visit. Therefore, contact with respondents had to be initiated while in the field. The researcher gained informed consent, as was approved and recommended by the IRB of Auburn University, from all respondents before engaging in the interview process. Additionally, the researcher relied upon interpreters in the event that respondents did not speak English. For this study, minors were interviewed, thus informed consent included compliance from parent, guardian, or adult overseer. For individuals who did not speak English, a translator was utilized to communicate the concept of implied consent and facilitated the process of gaining the required signatures.

Rogers (2003, p. 11) stated diffusion as defined by an innovation is communicated through certain channels over time among the members of a social system. For this study, the innovation was agricultural content embedded in science curriculum. The communication channel investigated was that of agricultural content and the path traveled from teacher to student. The researcher observed and interviewed students to determine influences regarding the innovation of agricultural education and to determine students' perceptions of the agricultural knowledge they shared

with their parents. Additionally, investigated was the extent to which the innovation traveled to the home via the school children as they acted as communication channels (Rogers, 2003). Okirir, Matsiko, and Oonyu (2011) determined that parents of students who had a home garden supervised agricultural experience did gain awareness of new agricultural methods. However, their perceptions of new agricultural practices were not particularly favorable. The researcher also interviewed parents to determine whether or not students shared agricultural education content at home. Also investigated was the path the innovation traveled outside of the home via the student as the channel of communication, or via parents (Rogers, 2003). In cases identified as such, to what extent did the inhabitants of Kimuli adopt the innovation?

### **Population**

A purposive sample of 13 individuals was recruited to represent each criterion deemed necessary to examine this phenomenon. Creswell (2007) stated that for qualitative studies, smaller subject numbers between one and 20 were needed to provide understanding into the phenomenon being investigated. Respondents from each criterion were recruited in order to represent students, teachers, parents, and agricultural producers of the village of Kimuli. Because this study utilized Rogers' Diffusion of Innovations Theory (2003) as a frame, the researcher recruited students identified as class monitors enrolled in a science and or English course

whereby agriculture was embedded in the curriculum. Rogers (2003) stated that influencers are typically leaders in their own communities. As such, children who were selected by teachers to become class monitors for their respective grades were seen as leaders (R. Mugisha, personal communication, February 14, 2013). The researcher sought to examine to what extent if any, student leaders called class monitors may be inclined to influence their parents' approach to agriculture as a result of their learning of agricultural science content in Life Academy Primary School. Therefore class monitors ( $n=4$ ) of primary grades four through seven were recruited and interviewed for this study. Because class monitors were receiving agricultural content from science and English teachers, teachers were recruited and interviewed as well ( $n=4$ ). Communication channels (Rogers, 2003) between children and their parents were examined, therefore, parents of the children ( $n=3$ ) were interviewed as well. Additionally, the researcher interviewed agricultural producers ( $n=4$ ) in close proximity of this primary school, however, with no direct relationship to the school, to determine if agricultural content taught to students had been diffused to practitioners of the sector from which the content was derived. Respondents interviewed from each category were determined to provide the researcher with their experiences which would enhance understanding regarding the phenomenon of agricultural content embedded in the science curriculum and its diffusion throughout this rural African village of Kimuli.

## **Researcher Subjectivity**

I have been interested in international agricultural education for years. I remember sensing this desire as a sophomore in college as a result of my perceived benefit from agricultural education, FFA, and Supervised Agricultural Experience during high school. I saw how his path greatly influenced me for the better. For instance, because I was enrolled for two years in agricultural classes in high school, my life's profession became devoted to the industry that produces food and fiber for the world. Additionally, I recalled as a junior in college reading from the Bible, Genesis 3:19, "by the sweat of your face, you shall eat bread . . ." (ESV). In this moment, I felt a strong desire to focus my energy and resources on helping humanity cope with the reality of the "sweat." I perceived that, when the burden of bringing food to the table becomes so oppressive, the impact on people can indeed be so negative that poverty and suffering stifle an individual from truly discovering his or her purpose in life. For this researcher, it became apparent that my love for FFA and agricultural education in high school equipped me with leadership skills, knowledge of agricultural content, and workplace skills, however, this was not an issue of life and death. For young men and young women of the third world, an understanding of agricultural education, or lack thereof, may lead to life or death. This train of thought led me to voice a passion for international agricultural education to help ease the oppressive burden of bringing food to

people in the third world so that these individuals would be free to grow as leaders and contributors to the societies of which they are a part.

Nine years later, I was given the opportunity to work alongside the chair of my doctoral committee in Kimuli, Uganda. The reason for involvement in Kimuli was to plant a church, which would also sponsor a school. This school would be a primary school to educate students ages three through seventeen. While this school did not teach a specific agricultural pathway or even formal sequence of courses, the agricultural content is embedded in the science curriculum even for the youngest students. According to the teachers of the school, each child is in some way directly connected to agriculture, therefore it is mandatory that agricultural content be taught embedded in the science curriculum to educate students about proper and new agricultural practices. At the onset of this study, I wanted to know the impact of this agricultural content being taught in the science curriculum on the lives of the students that attended this school

My desire to investigate these questions qualitatively was due to population size and also the hope that, from this study, much good would come to the people of Kimuli, Uganda. Additionally, I have a desire to have a long lasting relationship with this community, specifically via the continuous improvement of this school—from facilities to practice.

Due to these small populations and my subjectivity, qualitative methods were determined to best fit this study. Additionally, the rich



description provided might be utilized for enhancement of the school in a manner that may provide great benefit and positive impact on the students of Kimuli, Uganda.

### **Data Collection Procedures**

Data were collected via direct observation, semi-structured one on one interviews, and focus group interviews. Hatch (2002) stated that semi-structured interviews are necessary so as not to restrict data from evolving in a conversational manner. Glesne (2011) stated that small focus groups of three or four are necessary for children to answer questions honestly and freely.

Teachers, students, parents, and community members were interviewed to determine their lived experiences with regard to the agricultural content that is taught at Life Academy Primary School, Kimuli, Uganda. The researcher identified how agricultural content was communicated from the teacher to students. The researcher then sought to determine what, if anything, the students were sharing with their parents regarding agricultural content learned from school. Finally, the researcher sought to identify if parents were sharing what students learned with other community members.

### **Data Analysis Procedures**

Focus group interviews, as well as one on one semi-structured interviews were recorded with an audio recorder. Recorded interviews were

transcribed by the use of a transcription company. Additionally, direct observation was utilized to make sense of meaning. Once data were collected, the researcher utilized thematic analysis to identify emerging themes from respondents' interviews (Dooley, 2007; Glesne, 2011). In this type of analysis, the researcher focused on analytical techniques to search for emergent themes or patterns (Dooley, 2007; Glesne, 2011). The researcher engaged in early data analysis that included the simultaneous analysis of data that allowed the focus of the study to be shaped as data collection continued (Dooley, 2007; Glesne, 2011). The researcher also utilized memo writing (Dooley, 2007; Glesne, 2011) as a form of reflective thinking regarding the analysis process. In later data analysis, the researcher began classifying and categorizing data (Dooley, 2007; Glesne, 2011). The researcher read data, line-by-line, and recorded notes while reading (Glesne, 2011). Once notes were taken, the researcher arranged those into categories and subcategories (Glesne, 2011). The researcher utilized the categories and subcategories as a framework (Glesne, 2011) from which to identify relationships between data and phenomena.

### **Credibility and Confirmability**

Regarding qualitative research, Patton (2002) explained that validity and reliability are issues of concern while designing a good research study, as the researcher is the instrument. Therefore, credibility of qualitative research depends upon the researcher (Golafshani, 2003). Central to

determining the validity of data collected for this qualitative study, the researcher sought to triangulate (Dooley, 2007; Glesne, 2011; Golafshani, 2003) information via the use of several methods. Additionally, each research question was analyzed for credibility, confirmability, dependability, and transferability (Dooley, 2007; Lincoln & Guba, 1985). The researcher utilized direct observation to observe teachers of science grades primary five through eight of Life Academy Primary School, Kimuli, Uganda, to determine to what extent agricultural content was facilitated during the science course. Additionally, the researcher interviewed multiple parties (Creswell, 2007) to include teachers of science, English, and agricultural content; students; parents; and community leaders who practiced agricultural production. To ensure reliability, or the extent to which these methods are replicable, the researcher utilized peer review and debriefing (Creswell, 2007) in order to reflect upon the data collected, and provide input regarding the analysis the researcher practiced. The researcher also clarified researcher bias (Creswell, 2007) as subjectivity arose; modifications were made in the research process as a measure to ensure trustworthiness of the methods employed. Also included by the researcher is rich, thick description to capture the context from the data that were collected (Creswell, 2007). Finally, once all audio recordings were transcribed, and field notes were collected, the researcher utilized an external audit (Creswell, 2007; Dooley, 2007) from a member of the researcher's doctoral committee.

## **Chapter 4**

### **Research Findings**

Life Academy Primary School of Kimuli, Uganda, is located fourteen miles from the closest city which is Mityana, Uganda. Kimuli is a rural village with no paved roads, and only one or two dirt roads that are maintained only as necessary for passage by four wheeled vehicles after the rainy seasons, and foot trails. There is one local area for commerce. There are roughly eight to ten shops that offer products to the residents of Kimuli. These shops resemble cargo trailers pulled by semi-trucks Americans see on interstates and highways all across the United States. Kimuli is fraught with poverty. Due to its remote location, and very little commerce, which might provide jobs of sustainable incomes for families, the people rely upon living off of the land based upon observations of the researcher. Many of the individuals of Kimuli are what the locals refer to as “gardeners”. This means that farming is their primary source of income. The researcher did interview seven producers and the size of farms was determined to be between three and six acres.

The Life Academy Primary School is very new. The school began its operation in April 2012. At that time, there were roughly 30 – 40 students attending. At the time of this research, there were more than 400 students in attendance. The school has grown significantly. When asked, most individuals cited the excellence of the school’s reputation as a reason many parents either transferred their students, or started sending their students to

school there. The school was created under the leadership of one man, Bishop Vincent Victours in 2012. He raised funding and support from at least one Alabama Church, Union Grove Baptist Church. In conjunction with the creation of the school, the Bishop also led the creation of a church, which oversees the administration of the school in terms of funding and governmental compliance. One head master and eight teachers lead the school itself. The school is situated on a hillside overlooking Lake Wamalla. There are gardens surrounding the school property planted in maize (corn), beans, cassava, coffee trees, and matokee (banana) trees. The main edifice for the school is an unfinished brick building with seven rooms. There is also one administration building where textbooks and other forms of documentation clutter the space covered by roof. This is also the building where teachers meet to have faculty meetings, grade papers, have parent meetings, and eat their lunch and break time meals. There are also two unfinished buildings that function as school buildings. One is an open-air structure with a tin roof nailed to some sapling trees that have been placed in the ground for stability. This is where children from ages three to five receive instruction. The other building functions as a cafeteria. This building has the appearance of a barn. The walls are not sealed and are constructed of unfinished lumber with a tin roof to keep the rain out. There is one large pot for cooking the corn meal each day that will feed the school children. Also, this is where dishes are washed. The researcher observed one

man and one child washing all dishes with murky water in a wheelbarrow. The man was employed by the church and served in the role as associate pastor. The child was a student enrolled in the school. The week this research was conducted was the week that she was appointed to wash dishes.

Children in the school ranged in age from three to 15 (Vincent Victours, Personal Communication, June 4, 2012). Interviewed in this research were class monitors in grades primary four, primary five, primary six, and primary seven. According to the head master teacher, primary four students' ages were between 10 and 11 years old. Primary five students' age ranged from 11 to 12 years old. Students enrolled in primary six were the age of 12 and 13 years old, while the students in primary grades seven and eight could be between the ages of 12 to 15. The school children were dressed in a variety of clothing. Many of them had uniforms, albeit of different colors and no patterns identifiable by the researcher. There were also many students not dressed in uniforms. This was due to their lack of income to afford them. Many children had old and worn out shoes, and some did not even have shoes. The children arrived to school at 7:00 a.m. If they were late, they received lashes from a switch administered by one of the teachers. The lashes were placed on the calves of the children. On two of the mornings that the researcher was present, there were morning assemblies consisting of children singing songs, doing exercises together, and practicing drills. Once students went to class, the researcher observed that much instructional time

was spent by the teacher writing content from the textbook onto the chalkboard, for the children to quietly copy the information onto their notebook papers. There would be some discussion that would ensue once the students had completed the copying of their notes. On one occasion the researcher observed students in an English class reciting a poem about the cassava plant.

Students received a small bowl of corn meal during break time, which occurred at 10:00 a.m. They then received a lunchtime meal of either beans or more corn meal at 12:00 p.m. The researcher observed that these identified times were not strictly observed. At times, the meals might take place 30 minutes later than the schedule indicated. On these occasions, lunch and break were both extended to offer the full amount of time typically allotted. Teachers then would keep the students longer in the afternoons. On one occasion the researcher observed students leaving school at approximately 6:00 p.m.

Teachers interviewed varied in age. The head master teacher was much older as he had been teaching for 23 years and had served as a head master for 13 years. He was from the city of Kampala; however, he had come to work in this school at the request of Bishop, Vincent Victours. Additionally, he shared that he was there “by the call of God.” He had left his wife and children to come to do this work. They were not left in the city; rather, they went back to the rural village where the head master teacher

grew up. The other three gentlemen interviewed for the purpose of this study were younger. They all moved from Kampala as well at the request of the same Bishop. Two gentlemen shared they were saving money to go back to the University to receive more education so that they could become head master teachers in the future.

Farmers interviewed for the study were age 21, 39, 59, 63, and 66. Farmers, called “gardeners” by the local residents, practiced a type of agriculture that appeared to be chaotic and devoid of order to the researcher upon arrival. However, after spending time visiting farms, and interviewing farmers, the researcher learned that there was a system farmers tried to follow in order to be productive. One such example was that of crop rotation. Crop rotation was one of the concepts taught to science students. The teachers perceived that this idea of rotating crops each season might be an innovative practice, which would be beneficial to farmers in the village. However, after interviewing seven farmers, three of which were parents of the school children interviewed, while four were not parents, the researcher found that all farmers interviewed actually implemented crop rotation. Other examples included the use of a backpack sprayer. All but two farmers reported the use of such a sprayer to apply chemicals in the form of some variety of Glyphosate and liquid fertilizer.

Parents interviewed were the ages of 34, 45, and 43. One parent was the father to two of the children interviewed. They were the class monitors in



primary grades six and seven. One parent was the parent of a young girl who was in primary grade five. She was the only female interviewed; the remaining parents of pupils who fit the description of the model from whom the researcher planned to collect data were all males.

Children interviewed were class monitors in primary grades four through seven. Duties of the class monitors were to assist the teacher in preparing the classroom before instruction began, as well as keeping things tidy. The researcher observed that when a teacher entered the room, class monitors would stand and begin a chant to welcome teachers into the classroom. Additionally, class monitors were instructed by the teachers to run errands outside of the classroom.

In order to perform interviews with respondents of each stakeholder group, the researcher relied upon interpreters to address language barriers. The native language for Kimuli, Uganda is Luganda. However, many respondents also spoke English. The researcher did prepare interview schedules based upon Rogers' (2003) Theory of Diffusion of Innovations. However, early in the interview process the researcher recognized that specific language as identified in Rogers (2003) was not be readily understood by respondents. For instance, the researcher determined that terms like triability and observability (Rogers, 2003) were difficult to explain to the interpreter and thus, likewise difficult for the interpreter to explain to respondents. The researcher therefore, relied upon semi-structured

interviews so that data might be accessed through a more conversational manner.

### **Theme 1: Contextualized Teaching**

The researcher found, after curriculum reviewing within the Life Academy Primary School of Kimuli, Uganda, the science course taught to students in grades primary five through primary seven had agricultural content embedded. Of 12 chapters in the observed science text, approximately half of the content was agriculturally based. This concept of contextualizing agriculture content within science content is one that may be attributed to compatibility, as stated in Rogers Diffusion of Innovations theory (Rogers, 2003). Because each student is required to pass an examination (Head Master Teacher, Personal Communication, February 13, 2013) at the end of each course, as required by the government, the agricultural content can be seen as meeting the needs of students to pass final examinations.

The head master teacher not only administered the operations of the school, but he also taught English. The researcher observed this teacher instructing his students to recite a poem about cassava, a native agricultural plant cultivated in Kimuli and other locations in Uganda. Additionally, this teacher explained that agriculture is embedded into the science curriculum.

*“Agriculture to teach English, we use agriculture because English is the subject whereby it is the [sic] it is the way of communication. So agriculture, the words in agriculture can be used in English. Yes” [Head Master Teacher]*

Compatibility is expressed in the concept of embedding the agricultural content into the science content. The science teachers were also interviewed to garner perceptions about contextualizing agricultural content as embedded into science curriculum.

Another science teacher (ID 102) expressed that the science curriculum is very specific with regard to agricultural content.

*“Then how to maintain soil facilities . . . And, uh, uhm, how to manage weeding and so many others. . . Uhm. And transferring the seeds from the bu – the, the bed . . . And soil fertility . . . Plant life, flowering plants, and non-living things.”* [Teacher 102]

The innovation of agricultural content being taught in this village is compatible with the science curriculum, as indicated through the words of the science (ID 102) teacher.

*“By – yeah for example, when our – when we are teaching we read it, we read it. Science – OK, it is science agriculture. That is what we teach, practical science, and theory.”* [Teacher 102]

*“Yeah, it is just a simple practical. We do not involve chemistry. We just get like show them how to grow some crops, uh rearing of poultry and uh – and pig yeah and cow yeah. And how to treat skins, how we treat our milk, yeah, that is what is involved.”* [Teacher 102]

As this teacher (ID 102) indicated, agricultural content is embedded into science content such as practical aspects regarding crop and livestock cultivation.

Another teacher (ID 104) expressed that teaching contextualized agriculture was compatible (Rogers, 2003) with the science content as well.

*“Animal and the crop husbandry . . . Yeah, we do teach about – about methods of farming on-on [sic] the part of husbandry . . . And uh, farming you make like this, and then we explain to them the methods of farming. Uh, what*

*would be the problems of the – eh, of the methods of farming? The advantages and disadvantages, yeah, that is grow husbandry.” [Teacher 104]*

Each teacher expressed they were teaching agricultural content embedded into the science curriculum. This approach is a part of the text that prepares students for the practical living exam (Head Master Teacher, Personal Communication, February 11). Therefore the practice of the contextualization of agriculture via science curriculum was assessed when school children completed exams at the end of each school year.

### **Theme 2: Improved Agricultural Practice**

Teachers explained that they all, for the most part, taught improved agricultural practices. However, after interviewing farmers in the community, the researcher found similarities in what the teachers were teaching and what producers were already practicing.

*“Yes we teach children how to help their parents . . . In fact improved agriculture. At the moment we don’t tell them about improved agriculture . . . We help them to help their parents local in the, the way their parents have been knowing.” [Head Master Teacher]*

As the Head Master Teacher explained, due to the newness of the school, they are not yet teaching improved agricultural methods, based upon his perception. Therefore, the Head Master Teacher did not perceive the relative advantage (Rogers, 2003, pg. 15) to be more advantageous to the parents, even if their students were telling them about the methods.

Another teacher (ID 102) shared a perception that the agricultural content taught was better than agricultural methods parents were teaching children.

*“I think that this is better run [sic] . . . Yeah, than the, the parents teach their children . . . Because we have another experience . . . Yeah, I have another experience . . . About the experience. Uh, growing tomatoes, beans, maize, uhm, just, uhm...I’m missing some – nuts, about agriculture . . . And an, ideas... About agriculture.”* [Teacher 102]

He had experience and ideas that he perceived would be a better base of knowledge from which students may learn agricultural content. Rogers addressed this in the concept of relative advantage of adoption of an innovation (Rogers, 2003, pg. 15). Because of the attributes that the teacher perceived, the knowledge he possessed would be more innovative and therefore more adoptable, and thus a perceived improvement on current agricultural practice.

Another teacher (ID 103) explained that, by using herbicides, parents may see an improvement in the practice of agriculture.

*“Like they can weed by using chemicals like herbicides . . . That helps them improve on their methods and to make the work easier.”* [Teacher 103]

Rogers (2003) explained that the relative advantage of an innovation expressed that more gains could be discovered from use of the innovation (p. 15). In this case the teacher teaching students how to utilize herbicides in crop production may be used as a means to increase crop yields. The relative advantage would be evidenced in that increased crop yields would be indicative of improved agricultural practice.

Another teacher (ID 104) explained that he did not perceive these methods to be any better than the parents were teaching their children. However, he did share that children do not practice what they are taught due to the barrier of lack of time and the barrier of chores.

*“They are no different . . . Uh, that one is in the way that children learn, but they don’t practice. Uh, because uh, mostly Africa it is a – it’s a general problem, enough if our children learn it that way, they don’t put into practice. So, they end up learning here. When they go back home, they do not put into practice.” [Teacher 104]*

This teacher [ID 104] expressed his concern that children do not practice what they are taught in their science class regarding agriculture. Therefore while teacher #4 may perceive that content being taught to students is an improvement upon agricultural practices currently in existence, the reality that the content is not passed along to the students’ parents stifled any chance for the improvements to be adopted by parents.

*“Yeah. It’s very difficult to teach them. They do it uh, theoretical, then in practical they don’t, because you teach them everything here. When they go back home, they just do – their do work. Like fetching water is their own – is their only work that they do. But what if we do – if they did what we taught to them. Then it would be good, but they don’t put it to – put it into practice, yeah.” [Teacher 104]*

According to Rogers (2003), this teacher does not perceive this agricultural content as an innovation. As he stated, children do not communicate the different practices they’ve learned from science content in primary school either via words or observable practice, thus parents do not adopt. There must be enough different content present to improve upon practices children learn from their teachers (Rogers, 2003).

### **Theme 3: Barriers to Students as Communication Channels**

Though the researcher found that all students interviewed reportedly liked the science class that taught agricultural content, there were barriers to their ability to diffuse agricultural content to their parents. Each student expressed that they liked to learn about growing crops or livestock husbandry. As well, students reported that what they were learning with regard to agricultural practice, they already saw their parents utilizing at home. Nonetheless, as the researcher interviewed multiple groups to identify diffusion and adoption (Rogers, 2003) of agricultural content embedded in science curriculum, several barriers emerged which prohibited this cycle from coming to fruition.

Barriers were identified that inhibited the diffusion of agricultural content from interviewed students to their parents. Additionally, producers of the community interviewed had not heard of or observed agricultural practices that had diffused via students either. Barriers included the lack of time management, lack of resources, and student chores. This resulted in what Rogers identified as a failure among the respondents to adopt based upon their innovation-decision process (Rogers, 2003, pg. 14). Rogers defined this innovation-decision process as “information seeking and information-processing activity in which an individual is motivated to reduce uncertainty about the advantages and disadvantages of the innovation” (Rogers, 2003, pg. 14). Based upon the responses given, the motivation for children to share the

innovation of agricultural content learned in their science course was not greater than the uncertainty of the advantages of adopting and communicating themselves.

### **Time Management**

As indicated by the head master teacher, many students and village residents did not understand the practice of telling time or time management because many of them do not own a clock.

*“Yeah. When we gong the bell they run . . . I have told them that time is the worst enemy of man on Earth . . . People in the village don’t understand time management but the children, because when we tell children that we want you to be at school by this time, they come . . . So now the people in the village are also trying to learn time through their children.”* [Head Master Teacher]

This barrier of poor time management is apparent in that students only know that they are to arrive to school based upon hearing the sound of the gong of a bell. This gong is also to be communicated to students that might walk a self-reported distance of two or three kilometers to school. For these students to hear that bell, which is not anything more than a hand held manually activated device, would be impossible. Additionally, the head master teacher says that the adults in the village have no understanding of time and thus they are trying to learn through their children.

Another teacher (ID 102) expressed that parents would be reluctant to adopt new methods of practicing agriculture that their students are learning because they have no time. He went on to share that parents are busy with activities such as doing laundry, cooking meals, and other chores. For



example, when asked if parents currently space their crops, this teacher (ID 102) expressed the following.

*“They don’t currently do that . . . Because of the time . . . And they are very, so busy. They have to cook for their children and to wash for them. So, they . . . Didn’t get enough to that – to do that. So, it’s just and no time for weeding them . . . Uh, there is a way they don’t manage to do that because they don’t know what to do . . . But if they’ve got an idea from us. . . Then that will be wonderful.”* [Teacher 102]

Observed in this passage is that the barrier of time management, as perceived by this teacher, precluded parents from recognizing the relative advantage (Rogers, 2003) and compatibility (Rogers, 2003) of agricultural practices that their children are being taught in science class. Thus, the potential to adopt an innovation from their children is removed because of the lifestyle that requires much time from the parents to keep up with day to day chores.

Another teacher (ID 102) also indicated that teachers have a difficult time teaching effectively because students show up late to school. When students arrive late, they also miss content that was taught on that day.

*“Some students comes from very far. . . They don’t reach in time. . . They come when they – the morning lessons already gone. . . Gone, yeah. And it’s affect us. Because we don’t want to see anyone who is backsliding in the studies.”* [Teacher 102]

Additionally, students arriving to school on time is a concern of teacher (ID 102).

*“Uh, at 8:00, we want all them to be here. But some come late. That’s the . . . Problem we face. Yeah. That’s why we decided to have the dormitory . . . And those one who will come from very far.”* [Teacher 102]

The barrier expressed here is that students are walking long distances. However, the researcher observed that many students did arrive to class on time. Therefore, there are those who may be late because they walked quite some distance; however, as many students arrived on time, the researcher questioned if this is likely due to poor time management on the part of the students or parents and guardians. As was expressed previously, many of the village residents do not own a clock. This lack of precision presented a problem with regard to traveling long distances by foot for children. Time management is a barrier addressed in Rogers' Diffusion of Innovation theory concept of relative advantage with regard to convenience (Rogers, 2003, pg. 15). Though the content taught regarding agricultural practice might be beneficial, the location of the school and the societal issue of students lacking transport other than by foot, have been observed to be less than a convenient opportunity for adoption of this innovation.

Interview data from this teacher (ID 104) expressed that students have no time to implement agricultural practices learned in school. When asked by the researcher if teachers perceive that students are responsible for fetching the water and that this prevents students from communicating learned agricultural content from science class, this teacher (ID 104) reported the following:

*"Yeah, there – there is they are [sic] – they don't always have time to do it."*  
[Teacher 104]

While this teacher (ID 104) perceived chores to be an issue preventing students from devoting time to practice new methods, the barrier of time management suggested that students do not prioritize time for this practice of agricultural knowledge they have gained from school. From the focus group interview, the researcher learned that all children helped their parents while working in the garden or farm operation. According to Rogers' Diffusion of Innovation theory, this would be an issue of relative advantage. Rogers stated that if a potential communicator values the innovation, then he or she would communicate the value of the innovation to others (Rogers, 2003). Therefore, students have not communicated this innovation to their parents in part due to the barrier of time management and prioritizing the communication of the value of the innovation to their parents.

Students enrolled in a science course that taught the agricultural content shared that they walked to fetch water distances as long as four kilometers. While they did not perceive this distance to be particularly long, the issue of travel time does present a barrier of time management that might impede upon the learning process of agricultural content. When asked if the students must fetch the water, the researcher was answered with a "Yes". One student, Tommy, reported walking a distance of *"two meters?"* Another student, Randy, reported walking as far as *"Four kilometers from here."*

When asked if fetching water presented obstacles in students completing their homework, they all reported that this was not a problem. However, the researcher believed that this is due to their perceptions, when in actuality, the reality of walking four miles to fetch water will interfere with students' completion of agriculturally embedded science homework and thus impede upon their ability to transfer understanding into proficiency the content learned.

As indicated, the travel time of students completing their chores was not perceived as a barrier to completing their homework; however the researcher observed that time spent securing water limited the amount of time that could have been spent practicing their knowledge of the agricultural content taught. Rogers explains triability (Rogers, 2003, pg. 15) of the innovation on a small scale might induce adoption more rapidly. However, as seen here, the barrier of time management and chores of fetching water prohibited the potential for triability.

One Parent (ID 201) also indicated that his daughter traveled to fetch water. This gives credence to the barrier of chores and time management with regard to triability (Rogers, 2003, pg. 15). As indicated below, when asked if a female student was responsible for fetching water, parent #1 responded, "*She, she does?*" [Parent 201]

As evidenced from the focus group with students, triability can be affected by the travel distance which limits the amount of time that could be spent practicing agricultural content learned at school.

#### **Theme 4: Prompted Adoption**

The researcher observed several instances of adoption that resulted when someone in a position of prominence offered suggestion, teaching, or mandates. As such, the researcher identified the emergent theme of prompted adoption. For example, the head master teacher explained that coffee was introduced and adopted because “*foreigners*” brought the crop to the village.

*“I have not seen that because, okay, the crops they are growing here were first introduced by the foreigners like coffee . . . And they adopted it . . . The only crop which I think they had is, is Matoke . . . So the community is always interested with learning new things.”* [Head Master Teacher]

The head master teacher explained that because “foreigners” brought the coffee to the village, the community was willing to adopt. According to Rogers (2003), this would indicate that the foreigners who introduced coffee were actually the change agents (Rogers, 2003, p. 27).

One teacher (ID 103) provided indication of prompted adoption as a result of community members perceiving the school was teaching farming practices common in America.

*“Because uh children, when they go back to their homes, they teach their parents new methods of farming like Americanization and using of chemicals, not using just hand method.”* [Teacher 103]

This teacher (ID 103) described the farming methods as “*Americanized*” and likened this term to the use of chemicals, indicating that this method is better than their current methods of producing crops. One parent (ID 201) explained that because the school was teaching his child about agriculture, he could provide his female child gardening space at his home garden to practice what she had been learning. What was unique about this statement is that the interview process prompted this parent to share with the researcher, further lending the researcher to consider these occurrences appropriately labeled prompted adoption.

*“Yeah, for the daughter . . . He’s saying that, uh, he... According to the way that he sees his daughter... practicing, he gets to know that he, she’s learning something . . . and because he’s pleased he’s a farmer . . . he’s, he... At least he gets something from the time also practice and you be a good farmer . . .”*  
[Parent 201]

The parent shared that what his daughter was learning in school could be of value if she had the opportunity to practice what she was being taught in her science class about agriculture. This realization came to the parent as a result of the conversation that he had with the researcher. This parent viewed the researcher as a change agent (Rogers, 2003, pg. 27).

The same parent (ID 201) also asked the researcher for help and training that would be able to help him in his agricultural practice. He expressed eagerness to learn of what knowledge the researcher possessed as he indicated agricultural education could help him.

*“Is he saying that he... basically, the question is, uh, uh, around that he... those problems he has told to you. Then, then maybe the question he has is*

*would you organize or you organize a for them, at least a training... or any agricultural education... that we can, uh, learn how, we can improve?"*  
[Teacher 201]

This parent expressed a desire to improve and he perceived that could be achieved if he received training from American farmers and educators. Again the observation may be made that American farmers can be seen as change agents, in this instance (Rogers, 2003, pg. 27).

Another parent (ID 202) also expressed desires to receive education from the researcher. His perspective was that any knowledge that could be given to him from the researcher could provide him direction that would be beneficial for his farm.

*"So he is asking, he says that the problem with him right now is umm, he is not educated . . . And, and you asked him a question if he can, if he like maybe it would give him the knowledge of how to do agriculture and he says he feels he would have loved to learn. And then he would have land and he would speak in English. But then I told him, speaking English is other problem because right now like we're speaking right now, he is speaking in English but he is getting it. . . Okay. Yeah. So his, his problem would be like a lack of education. . . He says he's ready if anybody is to come and teach him and he can get the language. He's ready for that."* [Parent 202]

As evidenced in the interview the researcher is again being perceived as the change agent (Rogers, 2003, p. 27) who would be the individual bringing the necessary knowledge to him.

In a unique case, the third parent [ID 203] interviewed expressed that, as a result of the focus group conducted for this research, of which his son was a part he was prompted to adopt what his son was learning in the agriculturally based science class at his school.

*“Yes. He never had . . . The removal of weeds . . . So now he is saying that if there is some manure which he can use then that crop will grow well. . .”*  
[Parent 203]

This parent viewed the researcher as the change agent (Rogers, 2003, pg. 27), which influenced his son to come home and share with his father what he had learned at school. This evidence would indicate that this agricultural producer would listen to what his son is learning from school when shared at home, as long as prompting from the appropriate change agent was in place. This is also reflected in Rogers’ Diffusion of Innovations theory (2003).

More evidence of this idea that change agents from another country may prompt adoption was present in the interview with the village chairman who is also a farmer.

*“He learned about banana plantation and coffee. . . The government send the white leaders to teach them.”* [Village Chairman]

In this interview, the researcher learned the government sent the “white leaders” to teach the process of producing bananas and coffee. Again, this is indicative of prompted adoption via change agents (Rogers, 2003, pg. 27).

The researcher found that, across all interviews, not one farmer in the community had learned of improved agricultural practices as a result of students learning new concepts in Life Academy Primary School. However, as was observed in the case of the child interviewed prompting diffusion and adoption to his father, the researcher asserted that prompted adoption would



cause more community members to take an interest in what students were learning as a result of the contextualization of agriculture into science class.

### **Theme 5: Standard Agricultural Practice**

There were several crops that all farmers communicated that they cultivated. Among these were maize (corn), Irish potatoes, sweet potatoes, cassava, beans, tomatoes, and coffee.

After the researcher interviewed students' parents, three agricultural producers, and one village chairman, the researcher identified some standard agricultural practices almost all interviewees mentioned. For instance, all but two interviewees mentioned the use of a backpack sprayer. Almost everyone mentioned the use of crop spacing as an agricultural practice, even if they lacked precision. The researcher observed what first appeared to be chaos in agricultural practice. For example, the maize was planted under the shade of coffee trees and cassava plants. Matokee trees also hovered over the bean plots. Larger trees were in place to shade the coffee trees. Chickens free ranged, and yet not many producers could give an exact number of chickens owned. Each farmer owned only a few head of livestock, usually cattle or pigs. Most producers expressed use of weedmaster, liquid fertilizer, 2-4D, and all of this was administered from a backpack sprayer. Therefore, upon learning of methods of cultivating and growing food crops, the researcher came to realize that what first appeared to be chaos was in

actuality a standard system that worked based upon the size, scope, and limited resources each farmer had at his disposal.

There were several practices that one farmer (ID 301) indicated as intensive labor cultivation of agricultural crops. Specifically, the spreading of manure for fertilizer is one such example.

*“Manure. You just take it to the garden and put it in there. . . We just uh, spread.”* [Farmer 301]

As can be seen here, the farmer doesn’t measure according to any precise amounts, and instead just administers the manure as fertilizer. This farmer also indicated that he utilized liquid fertilizer, as well as other chemicals.

*“Roundup, Weed Masters, and the others too, to make this gust to grow. . . We buy just, because we just buy some bottle. We can buy like two bottle – five bottles . . . Yeah, we fertilize. Sometimes we use um, fertilizer which we buy, but sometimes we use fertilizer which we get from the, oh uh, animals”* [Farmer 301]

The same farmer (ID 301) shared that the method of purchasing is on a small scale, in that he purchases maybe two or five bottles at one time. He then explained that he mixed the chemical in his backpack sprayer and applied to the crop. When the researcher toured the farm after the interview, it was discovered that there appeared to be no precise method of applying a specific amount of spray fertilizer.

**Crop Spacing.** Another farmer (ID 302) shared how he spaced his crop was simply by taking two steps, and then seeding according to parallel lines.

*“I space them . . . Mmm, it’s like, uh, I put one, one and the other one.”*  
[Farmer 302]

When asked how many steps this was, his reply was two steps.

*“Yeah, two steps.”* [Farmer 302]

While some spacing of maize plants is necessary there appears to be no precise distance that is repeated among the farmers interviewed. Another farmer (ID 301) also shared a similar story.

*“Yes. Yes. Like um, uh, two foot. Yeah . . . Yeah, we just use our eyes.”* [Farmer 301]

The farmer shared, he visually estimates spacing rather than relying on a piece of precision equipment, such as a stick with which to measure. Additionally, a similar response may be observed from one parent’s (ID 202) agricultural practice of crop spacing in the maize crop.

*“If it is maize just use 2 meters . . . he just use the brain.”* [Parent 202]

Again, this farmer does not rely upon the use of a stick for measuring, but rather his method was to use, in the words of the translator, *“the brain”*.

This approach to crop spacing was also demonstrated by the village chairman. This is the elected official who leads the residents of the village. He is also a farmer for his main source of income. He also spaced his maize for improved production, and while his measurement was more precise than others interviewed, he still did not rely upon a measuring tool to ensure precision.

*“Sixty centimeter . . . Just use head.”* [Village Chairman]

He too only used what may be termed as “common sense.” Perhaps even a measuring stick might be viewed as a piece of technology, which might enhance yield of maize production in this village.

### **Theme 6: Barriers to Agricultural Production**

The researcher observed, while interviewing both parents and producers, all shared a perception of barriers that prohibited successful cultivation of agricultural products. These barriers were identified by the researcher as the market and lack of safety education.

#### **Barrier of The Market**

After visiting with seven local producers, the researcher discovered that the market was perceived to be one of the major problems. One farmer (ID 301) explained this case as may be observed below.

*“Um, the biggest problem we have is the market . . . The market is a real problem. . . Because when you plant maize, when you get it from the shop to, when you have that uh, maize, the market is not, the marketer, you can sell like one kilogram 500UGX or 400UGX, one kilogram . . . And, sometimes, you can find uh, when there is a market one kilogram of maize they buy it like 1,000UGX.” [Farmer 301]*

As described above, the farmer sold his crop for a much cheaper price than the crop was sold in town. Therefore, this farmer perceives that this was a large barrier to his success.

One parent 201 also explained that he perceived that the market was a problem for him to deal with also.

*“The local markets, they are for, for the produce . . . Uh, he’s saying that they sell it for 10,000 UGX only.” [Parent 201]*

The parent perceives that the market is a problem with regard to his ability to earn well on his production.

### **Barrier of Safety Education**

Seven farmers were interviewed. Of the seven farmers, only one followed safety precautions as recommended by the safety label. All producers shared they used a backpack sprayer. Thus, the use of the sprayer, and chemicals that contained glyphosate indicated that these farmers were at a risk of health hazards because of this practice.

One farmer (ID 301) indicated that there were no safety precautions taken with regard to the use of proper personal protective equipment.

*“Well, actually, we do not have some.”* [Farmer 301]

Another farmer (ID 302) indicated some usage of protective clothing; however, did not utilize safety glasses or a mask.

*“Now I put on the overall . . . After then, I wear the boots . . . I have no glasses.”* [Farmer 302]

When asked if he used gloves, he shared that he didn’t, and he also responded when asked if he used a mask, that he just covered his mouth with a handkerchief type of cloth. When asked, farmer #3 showed by shaking his head no, that they did not utilize any safety equipment while spraying chemicals.

During the course of the interview with a parent (201) who was also a farmer, he expressed that he did not make use of safety precautions while spraying with the backpack sprayer. However, interestingly, he indicated

that when he was sick, he would wear overalls to try and prevent more sickness.

*“He’s saying that when he use them, well, for example, when you are not okay . . . Example of when I got some malaria fever.”* [ID 201]

Another parent also indicated that he did not use safety equipment by just saying, “no”. While another parent (ID 203) responded via the translator by sharing that he too didn’t practice safety precautions when utilizing the backpack sprayer to spray chemical.

*“He doesn’t. He just spray.”* [Parent 203]

One farmer (ID 304) expressed that he utilized safety precautions as a result of reading the label on the sprayer. He also indicated that most of the other farmers did not utilize safety precautions because they lacked income.

*“Yeah, he got it from the instructions from sprayer.”* [Farmer 304]

As the translator conveyed, this farmer (ID 304) learned from the instructions on the sprayer that proper handling and use of chemicals as applied by the sprayer would necessitate safety apparel. This farmer was also the village chairman. The elected official to lead the rural village of Kimuli recognized the importance of reading the instructions and following safety protocol.

### **Summary**

This chapter reported data generated by the research questions of this study. Guiding research questions of this study were:

- 1.) To what extent do schoolteachers believe the taught agricultural content embedded in science curriculum is an improvement upon existing agricultural practices in the Kimuli Village?
- 2.) What are teachers' attitudes and perceptions of students' ability to enhance the agricultural practices utilized by their parents as a result of receiving agricultural instruction?
- 3.) What are students' attitudes and perceptions of the agricultural curriculum taught in science class?
- 4.) To what extent do students act as the communication channels from learned content at school to their parents?
- 5.) To what extent do parents adopt these agricultural practices based upon what their children share with them?
- 6.) To what extent do parents share new agricultural knowledge with other family members, friends, and members of the community?
- 7.) What are community members' attitudes and perceptions of primary aged students sharing agricultural content that they have learned from school?

Upon utilizing thematic analysis to make sense of data collected, the researcher identified six themes that emerged. The first theme was contextualized teaching. Teachers of science and English integrated agricultural content in their lessons. The Head Master Teacher perceived that the agricultural content was not an improvement upon existing

agricultural practice in the Kimuli village, however, the younger teachers believed the content was improved.

The researcher identified the second theme to emerge as improved agricultural practice. Each teacher, parent, and farmer interviewed grasped the concept of improvement upon their current agricultural practices. While the Head Master Teacher did not perceive the taught agricultural content to be an improvement upon existing practices, the other teachers interviewed did perceive improvement. Parents and farmers were eager for an opportunity to be educated about improved agricultural practices.

The third theme identified to emerge from data was that of barriers to students as communication channels. Barriers such as time management and household chores like fetching water each evening were perceived by parents and teachers to inhibit the diffusion of agricultural content taught at Life Academy Primary School.

The fourth theme that emerged from the data was prompted adoption. Respondents reported that advancements in agricultural practice had occurred in the Kimuli village as a result of *“foreigners”* and *“white leaders”*. Additionally, the researcher learned that as a result of a focus group interview, one student, Jimmy, told his father what he was learning in science class at school. The father then reported he had adopted what Jimmy had shared with him in his agricultural practice at home.



The fifth theme that emerged was that of standard agricultural practice. Farmers of Kimuli, Uganda, do utilize certain systems to produce their crops. They also utilize techniques like crop spacing and crop rotation to enhance production. Additionally, farmers reported using backpack sprayers for the application of chemicals and liquid fertilizers.

The sixth theme identified by the researcher was barriers to agricultural production. Farmers reported that the markets were their biggest problem. Concerns shared included the dishonesty of brokers and low commodity prices at local markets. Additionally, farmers reported that while they applied chemicals and liquid fertilizers to their crops, all with the exception of one, did not utilize proper safety equipment.

Further findings reported in chapter four will be discussed in chapter five. Along with further discussion of findings, the researcher will explain conclusions and recommendations for both research and future educators and philanthropy organizations traveling to rural Uganda.

## **Chapter 5**

### **Summary, Conclusions, and Recommendations**

The purpose of this study was to determine the extent to which agricultural content taught in a primary school diffuses and is adopted in the rural African village of Kimuli, Uganda.

#### **Guiding Research Questions**

- 1.) To what extent do schoolteachers believe the taught agricultural content embedded in science curriculum is an improvement upon existing agricultural practices in the Kimuli Village?
- 2.) What are teachers' attitudes and perceptions of students' ability to enhance the agricultural practices utilized by their parents as a result of receiving agricultural instruction?
- 3.) What are students' attitudes and perceptions of the agricultural curriculum taught in science class?
- 4.) To what extent do students act as the communication channels from learned content at school to their parents?
- 5.) To what extent do parents adopt these agricultural practices based upon what their children share with them?
- 6.) To what extent do parents share new agricultural knowledge with other family members, friends, and members of the community?
- 7.) What are community members' attitudes and perceptions of primary aged students sharing agricultural content that they have learned from school

## **Conclusions**

### **Research Question One**

Necessary to answer research question one, the researcher interviewed four teachers of Life Academy Primary School in Kimuli, Uganda. Three teachers taught science, while one teacher, the head master teacher, taught English. All four teachers explained that they integrated agricultural content into their courses. This is not unlike schools in the United States that have been integrating agriculture and science (Bjoraker & McClay, 1960; Hillison, 1996) for many years. The head master teacher shared that, from his perspective, the agricultural content integrated into the science and English curriculum was not an improvement upon current agricultural practices. This is in contrast with the assertion made by Kipkurgat et al. (2006) who stated that farmers might benefit from agricultural training and education from a university type institution. While Kipkurgat et al. (2006) found this to be true in their study, it is of interest to note that this head master teacher was a graduate of Mekere University (Head Master Teacher, Personal Communication, February 13, 2013) and did not feel as though the agricultural content being taught to the primary students would be considered improved agricultural practice. While the head master teacher shared his attitudes and perceptions with regard to the lack of improvement upon agricultural practice taught in the curriculum, his younger colleagues did not express such an opinion. Younger teachers expressed attitudes and

perceptions that found the agricultural content they taught to be quite an improvement upon existing agricultural practices by farmers living in Kimuli. Additionally, the head master teacher shared that farmers were currently practicing things such as crop rotation and crop spacing. Based upon the head master teacher's perspective, the taught agricultural content was compatible (Rogers, 2003) with existing practices; therefore, enhancing the potential of stakeholders viewing the taught content favorably. In contrast, the younger teachers shared that they perceived the agricultural content to be advancement upon current practices in Kimuli. They felt that their experiences and their education had given them a greater understanding of agricultural practices and were thus superior, which is in keeping with Rogers' definition of relative advantage (2003) in that the innovation is actually better for the adopter than the technology it supersedes. This is in keeping with Trexler and Meinschein's research (2002), which stated that pre-service teachers who lacked agricultural background struggle to develop proper understanding of agricultural content. Teachers from Uganda interviewed for this study all shared that they grew up with a farming background, meaning that their families raised crops for their families' sustenance. There is, however, a difference in perception between the three younger teachers who are in their twenties, as compared to the head master teacher who is in his fifties. This may be due to several factors. For instance, age and inexperience may contribute to the younger

teachers' perceptions, as Trexler and Meinschein (2002) found to be the case among pre-service teachers in the United States. Also, the head master teacher taught English, while the other three taught science. Perhaps there is a lack of understanding on the part of the head master teacher as to what is truly taught in the classroom of the younger teachers. The researcher did observe both in the taught curriculum as well as via direct observation of several science courses being taught that much of the content was already being practiced by local farmers, according to interviews held with farmers who were not connected to the school.

### **Research Question Two**

To address research question number two, the same teachers were interviewed as for question one. However, necessary to ascertain teachers' attitudes and perceptions regarding students' ability to enhance the agricultural practices of their parents, the researcher utilized a semi-structured interview questionnaire in a focus group format so as to allow for probing in order to make better sense of meaning. Glesne (2011) stated that small children might feel more comfortable in an environment surrounded by peers which may enhance the flow of the focus group discussion.

The head master teacher did not perceive that students were being taught improved agricultural practices; therefore, the students would not be able to enhance their parents' practices. However, he did share that students were encouraged to help their parents with the agricultural production work

of their parents via the taught curriculum at school. The three younger teachers expressed that they perceived that students would teach their parents advanced agricultural practices that they had learned in school. The three younger teacher perceptions are not unlike the assertions made by Kibwika and Semana (2001) who stated that leadership skills gained by students in Uganda may assist their families in what the authors termed rural family survival. The younger teachers believed students would teach their parents what they were learning in school, which they believed to be advanced agricultural practice; the head master teacher shared that he did not believe students were learning advanced agricultural procedures, however both attitudes and perceptions agree with Kibwika and Semana (2001) that students will aid in their families' survival as a result of their attendance in a science course.

### **Research Question Three**

Students shared that they enjoyed the taught agricultural curriculum integrated into the science curriculum. This contrasted with Kibwika and Semana (2001) who stated that students might associate agriculture with a lesser desired lifestyle and jobs. Specific examples shared with the researcher included animal husbandry, as well as understanding of proteins and carbohydrates, not unlike content that may be taught in a food science course. Though students interviewed in the focus group activity (Glesne, 2011) shared little to explain their level of satisfaction with the agricultural

content, their responses depicted an understanding of agricultural knowledge that served as a background from which to respond with specific examples. This coincides with Trexler and Meinschein (2003) who found that students that have out of school experiences interacting with agriculture are able to identify basic agricultural concepts. This research is somewhat different from the finding in Hess and Trexler (2011a) however, who explained that elementary-aged students lacked background knowledge of agricultural information, thus preventing them from developing deeper understanding of agricultural concepts. This research also agrees with Trexler (2000) in that out of school agricultural experiences for elementary aged students are instrumental in providing students the ability to understand deeper agricultural knowledge. As previously stated, the focus group interview proved to yield little description from the students regarding their attitudes and perceptions of the agriculture embedded science curriculum. This contrasts with Walker (1998) who found that students were quite descriptive when sharing their attitudes and perceptions regarding their future quality of lives. This may be due to the difference in method used in this research. While Walker (1998) collected data via student journals, the focus group interview facilitated by this researcher was necessary to address objectives of this research, however, yielded less data than that of the case of Walker (1998).

#### **Research Question Four**

Students were perceived by the teachers to be communication channels of agricultural content from the taught curriculum at school to their parents at home. However, when parents were asked if students had shared content regarding agriculture they had learned from school, they all replied “no” with one exception. One parent explained that his son came home and shared with him about weeding crops and crop spacing just two days before the interview. The researcher had conducted the focus group interview with the children at that time, and they shared they did not share information with their parents. As a result of this question from the interview schedule, the child went home and told his father about the agricultural content learned from school. His reasoning for telling his father was because the researcher had asked him, and he, therefore, made the assumption that he should be sharing with his parents the agricultural knowledge he was learning in school. This phenomenon is explained by the theme “prompted adoption”. Additionally, Rogers (2003) stated that some members of a third world society adopted an innovation in an attempt to gain favor of the individual acting as the change agent, who in this instance was from a foreign country. This occurrence reflected that which Rogers (2003) found to be true was also the case in Kimuli, Uganda.

Two other parents interviewed expressed their children had not yet shared with them anything regarding agriculture they learned from school.



According to Rogers (2003), this would stifle the observability of the innovation. Due to the lack of communication among family members, there is no observation taking place. This may be the result of barriers as discussed in chapter four. Children are required to fetch water, which might include walks up to three miles in distance. Additionally, children are required to do other chores necessary in taking care of siblings and the home. Kibwika and Semana (2001) asserted that youth of rural Uganda are involved with aiding their families in survival via their involvement with household chores such as fetching water.

The majority of school children identified in this study are not currently acting as communication channels of agricultural content from the primary school to their parents. However, when prompted by the appropriate personnel, in this case the researcher, the children do respond by acting as a communication channel.

### **Research Question Five**

In all cases observed, there was only one parent who adopted an agricultural practice as shared by the student from what they had learned at school. This case is the example previously shared with regard to research question four. Parents may show a desire to adopt an innovation from their children if they perceive the relative advantage (Rogers, 2003), in this case the favor of the researcher, to bring value to their farming operation. This coincides with Oleas, Dooley, Shinn, and Giusti (2010) who found change

agents to be proactive, honest, and nice people, even though they were also identified as heterophilous (Rogers, 2003). The term heterophilous implies that the change agent is different, in some form, than the subjects adopting the prescribed innovation. In this case, the parent of the student who adopted the innovation shared by the son is a result of the son perceiving that relative advantage to bring value to himself by gaining the acceptance of the researcher.

### **Research Question Six**

At the time of this, research there were no agricultural practices taught in the primary school found to be diffusing to community members. This is due to the fact that school children in this research were not sharing information with their parents, except for the case of the child that exemplified the prompted adoption theme. This is in contrast with Moriba, Kande, and Edwards (2011) who found that farmers of Tikonko in Africa were adopting taught agricultural practices due their perceived relative advantage and compatibility (Rogers, 2003). This research found that among parents interviewed, they had not observed the relative advantage of seeking to learn what their students were learning regarding agriculture from school. Further, Ooleas, Dooley, Shin, and Giusti (2010) found that innovations diffused through Chimaltenango, Guatemala more effectively when the change was initiated by opinion leaders. Additionally, Ooleas, et al. (2010) found that in their study the opinion leaders were found

to be heterophilous. This research did not include in its design the examination of opinion leaders who might have been heterophilous. Students who were also children of the interviewed parents were seen as homophilous (Rogers, 2003) in this research.

### **Research Question Seven**

When interviewed, practicing farmers of the community who did not have children enrolled in Life Academy of Kimuli, Uganda, had not learned of new agricultural practices from school aged children. This is due, in part, to the school children not sharing with their parents what agricultural knowledge they have learned in school. Manganyi, Place, and Letsoalo (2007) concluded that farmers did not adopt innovations when communication channels were not effective. The finding of Manganyi, Place, and Letsoalo (2007) coincided with this research in that innovative agricultural practices taught in Life Academy of Kimuli, Uganda, will not be adopted by local agricultural producers if communication channels are not effective. Additionally, as discussed for research question six, with regard to parents and their perceptions of their own children not being opinion leaders, such may also be the case with farmers of the community. Ooleas, Dooley, Shin, and Giusti (2010) found that opinion leaders who were heterophilous effectively diffused an innovation whereas the children of the Kimuli village may not be seen as opinion leaders amongst local farmers.

Adults interviewed expressed a desire for agricultural education for themselves. Perhaps this might be explained in Rogers (2003) case where the adopters of an innovation was in response to desire to gain approval of the foreign change agents delivering the message regarding the innovation.

### **Implications**

With such a need to improve upon agricultural practices in order to address the hunger needs of third world locations, education of new innovations is crucial (Walker, 1998). Evidenced in this study is perceptions held by residents of this third world community may be addressed in order to facilitate adoption of innovations. Teachers did perceive that the agricultural content was of value to their students. However, one teacher only saw the taught agricultural content to be compatible (Rogers, 2003) with existing agricultural practices of Kimuli, while three teachers perceived there to be relative advantage (Rogers, 2003) from the same content. Teachers' perceptions of the agricultural content taught in science courses of Life Academy in Kimuli, Uganda are not consistent with one another. Additionally, findings from this study show in part, parents do not perceive that what their children are learning regarding agriculture may be of any advantage to their farming operations to adopt. However, one parent did share that he was allowing his daughter space in his garden to practice what she was learning from school. Because parents may not perceive value of the taught agricultural content their children are gaining, children were not, in

most cases, serving as communication channels (Rogers, 2003) to diffuse potential innovations in their homes.

Community members perceived that they would be well served to be educated with regard to new agricultural practices in the same manner as students who were enrolled in Life Academy Primary School, Kimuli, Uganda. However, this study did not find community members to have adopted agricultural content that was taught at Life Academy Primary School. This was in part due to barriers (Rogers, 2003) such as time management and chores for which students were responsible after school.

Children reported that they were fond of the taught agricultural content. This agreed with Mabie and Baker (1996) ) who found that activities of agricultural context increased student knowledge of scientific practices, increased motivation to engage in activities, and students reported that activities were fun when agriculturally based practices were present.

### **Recommendations for Practitioners**

1. Practitioners may benefit from incorporating a relationship with foreign individuals in order to foster motivation for children to share content learned with their parents regarding agricultural practices.
2. Practitioners may provide agricultural safety training to both adults and students which might be an enhancement upon existing understanding for farmers in Kimuli, Uganda.

3. Practitioners may provide education regarding marketing crops in such a manner necessary to enhance the farmer and broker relationship which was discovered in this study to be lacking by negative perceptions of brokers held by farmers of Kimuli.
4. Practitioners may provide benefit to farmers by utilizing a cooperative agricultural practice model. This might not only provide benefit to profit margins of farmers, but this may provide a source of knowledge to be created as farmers work together to reach new levels of production and prosperity.
5. Teachers of agricultural content may utilize a model not unlike that of Supervised Agricultural Experiences, a component of school-based agricultural education in the United States. This may foster experience-based individualized agricultural education for students enrolled in Life Academy Primary School of Kimuli, Uganda.
6. Teachers of agricultural content may incorporate formal agricultural education to adult producers of Kimuli, Uganda.
7. Teachers may benefit from professional development that addresses the value of taught agricultural content to improving existing agricultural practices. This may provide a common goal for all teachers to seek to improve agricultural production, via their students, for the next generation of agricultural producers.

### **Recommendations for Further Research**

1. Further research is necessary to determine if those students influenced by the researcher are still sharing their learned agricultural knowledge with their parents.
2. Further research is needed to determine if, as a result of the researcher's presence during the time of data collection, agricultural knowledge diffused into the community and has been adopted by local agricultural producers.
3. Further research is needed to determine if local farmers perceive relative advantage of adopting agricultural practices taught in an adult agricultural education format from science teachers employed by Life Academy of Kimuli, Uganda.
4. Further research utilizing quantitative methods may provide understanding with regard to farmers' perceived relative advantage of agricultural education geared towards improved agricultural practice.
5. Future qualitative research in Kimuli, Uganda, may benefit from the use of semi-structured interview formats to address the challenges of potential language barriers.
6. Further qualitative inquiry may be utilized to investigate what systems of agricultural education have been employed in Kimuli, Uganda that brought foreign individuals to help with agricultural practices.

7. Further research is needed to explore teachers' attitudes and perceptions regarding adult agricultural education.

### **Summary**

The literature review provided background for this study, began with a review of agricultural education research previously conducted in Uganda. Due to the location of this study, pertinent to background understanding was to identify many studies and their outcomes in locations similar to this one. Additionally, the researcher reviewed studies that investigated the integration of science into agricultural education in the United States and abroad. Once understanding was gained regarding the body of knowledge about science and agricultural integration, the researcher sought to review studies of the same topic abroad. Finally, the researcher sought to include studies that had been conducted utilizing Rogers' (2003) Theory of Diffusion of Innovations.

The purpose of this study was to determine to what extent agricultural content taught as an integrated subject within the science curriculum of Life Academy Primary School of Kimuli, Uganda, diffuses throughout the rural village. The researcher sought to investigate attitudes and perceptions of teachers of agricultural content, students, parents of the students, and community members in general. The methodology employed to understand attitudes and perceptions of key stakeholders was the qualitative method known as phenomenology, as well as thematic analysis to identify emergent



themes. The researcher sought to utilize semi-structured interviews to understand the essence of stakeholders' perceptions regarding agricultural content.

Several themes emerged, which provided understanding to the researcher regarding perceptions of the agricultural content in Kimuli, Uganda. The themes are identified as: 1) Contextualized Teaching, 2) Improved Agricultural Practices, 3) Barriers to Students as Communication Channels, 4) Prompted Adoption, 5) Standard Agricultural Practices, and 6) Barriers to Agricultural Production.

Contextualized teaching referred to the teachers' perceptions and understanding of how they integrated agricultural content into the science course. The younger teachers believed the content of their agricultural lessons to be an improvement upon existing agricultural practices of Kimuli, while the head master teacher did not. Identified in this study were barriers to students fulfilling the role of communication channels. These barriers were identified as fetching the water and responsibilities with other household chores. In one instance, a child acted as a communication channel which prompted his father to adopt practices as taught in the child's science course. This was in response to the focus group interview held by the researcher of which the child was an attendee. This phenomenon was also confirmed in other stories shared during one on one semi-structured interviews where respondents shared that foreign individuals prompted them

to adopt certain agricultural practices. Also, there were certain agricultural practices that existed at the time of this research. While one might perceive that there is only chaos, producers of the rural village actually sought to produce their products according to a system. Also identified were barriers to practices regarding agriculture. Those barriers were the markets and the lack of agricultural safety understanding.

This study sought to incorporate qualitative methods due to its exploratory nature of rural Kimuli, Uganda (Campbell & Martin, 1992; Marshall & Grossman, 2006). Additionally, the theoretical framework of Rogers' (2003) Diffusion of Innovations was employed to determine the diffusion of taught agricultural content to stakeholder groups of Kimuli, Uganda. As such this study may not be generalized to populations other than that of this study. However, understanding may be gained in that themes did emerge which may provide insight for educators and extension agents when examining agricultural education and practice in rural African environments. Many studies have been conducted both in the United States and abroad regarding agriculture and science integration as well as Diffusion of Innovations theory. However, as future studies are continually conducted in rural third world environments, qualitative methods might enable donor nations (Campbell & Martin, 1992) to address perceived needs of residents of third world communities in order to be of service in the education of production of food and fiber for citizens both locally and internationally.

## References

- Balschweid, M. A., & Huerta, A. (2008). Teaching advanced life sciences in an animal context: agricultural science teacher voices [Electronic version]. *Journal of Agricultural Education*, 49(1), 17-27. doi:10.5032/jae.2008.01017
- Bjoraker, W.T., & McClay, D.R. (1960). Vocational agriculture in an era of change [Electronic version]. *Journal of American Association of Teacher Educators in Agriculture*, 1(2), 2-6. doi: 10.5032/jaatea.1960/02002
- Brannon, T., Holley, C. W., & Key, J. P. (1989). Impact of vocational agriculture/FFA on community leadership. *Journal of Agricultural Education*, 30(3), 37-45. doi:10.5032/jae.1989.03037
- Breazeale, D., Mangheni, M. N., Erbaugh, J. M., & Swaibu, M. (2004, May). *Making university curricula and training programs responsive to employer needs: the experience of makerere university's agribusiness education program*. Proceedings of the 20<sup>th</sup> Annual AIAEE Conference, May Education and extension for multifunction agriculture, Dublin, Ireland.
- Camp, W.G., & Crunkilton, J.R. (1985). History of agricultural education in america: the great individuals and events. *Journal of the American Association of Teacher Educators in Agriculture*, 26(1), doi: 10.5032/jaatea.1985.01057
- Campbell, M., & Martin, R. (1992). Qualitative research as a tool for agricultural and extension education [Electronic version]. *Journal of Agricultural Education*, 55-60. doi: 10.5032/jae.1992.04055
- Creswell, J.W. (2007). *Qualitative inquiry and research design: Choosing among five approaches* (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage.
- Crotty, M. (2003). *The Foundations of Social Research*. Sage.
- Dailey, A. L., Conroy, C. A., & Shelley-Tolbert, C. A. (2001). Using agricultural education as the context to teach life skills [Electronic version]. *Journal of Agricultural Education*, 42(1), 11-20.
- Dooley, K.E. (2007). Viewing agricultural education through a qualitative lense. *Journal of Agricultural Education*. 48(4). 32-42. Doi:10.5032/jae.2007.04032

- Duvel, G.H. (2006). Proceedings from AIAEE '06: Rethinking the use of Opinion Leaders in Different Cultures. Clearwater Beach, FL.
- Eck, D., & Torres, R. M. (1996). Factors associated with administrators' attitudes toward agricultural education at the primary school level in Belize. *Journal of International Extension and Agricultural Education*. Spring, 25-32.
- Elliott, J., & Claves, T. (2002). Proceeding from AIAEE '02: Technology Use By Private Agricultural Extension Agents in Messinia Prefecture, Greece. Durban, South Africa.
- Erbaugh, J. M., Donnermeyer, J., Amujal, M., & Kyamanywa, S. (2003, August). The role of women in pest management decision making in eastern uganda. *Association for International Agricultural and Extension Education*, 10(3), 71-81.
- Erlandson, D.A., Harris, E.L., Skipper, B.L., & Allen, S.D. (1993). *Doing naturalistic inquiry: A guide to methods*. Newbury Park, CA: Sage.
- Frempong, F.A., Zinnah, M., & Adam, I. (2003). Proceedings from AIAEE'03: Teaching Agricultural Science at the Basic Level in Developing Countries: A Case Study of the Nature and Constraints at Cape Coast Distric of Ghana. Raleigh, North Carolina.
- Glesne, C. (2011). *Becoming qualitative researchers: An introduction*. (4th ed.). Boston: Pearson. DOI: [www.pearsonhighered.com](http://www.pearsonhighered.com)
- Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The Qualitative Report*, 8(4), 597-606. Retrieved May 17, 2013, from <http://www.nova.edu/ssss/QR/QR8-4/golafshani.pdf>
- Harder, A., & Lindner, J.R. (2008). Going global with extension: barriers to the adoption of a web-based resource [Electronic version]. *Journal of International Agricultural and Extension Education* (15)2, 69-80.
- Hatch, A. (2002). *Doing qualitative research in education settings*. Albany: State University of New York Press.
- Hess, A.J., & Trexler, C.J. (2011a). A qualitative study of agricultural literacy in urban youth: understanding for democratic participation in renewing the agri-food system. *Journal of Agricultural Education* 52(2), 151-162. Doi: 10.5032/jae:2011.02151.

- Hess, A.J., & Trexler, C.J. (2011b). A qualitative study of agricultural literacy in urban youth: what do elementary students understand about the agri-food system? *Journal of Agricultural Education*, 52(4), 1-12, doi:10.5032/jae.2011.04001.
- Hillison, J. (1998). The role of the agricultural education teacher educator, yesterday, today, and tomorrow. *Journal of Agricultural Education*, 39(1), 1-7.
- Hillison, J. (1996). The origins of agriscience: or where did all that scientific agriculture come from? *Journal of Agricultural Education*, 37(4), doi: 10.5032/jae.1996.04008
- Hulela, K., & Miller, W.W. (2003). Proceedings from AIAEE'03: The Development of Agricultural Education in the Education System of Botswana. Raleigh, North Carolina.
- Kibwika, P., & Semana, A.R. (2001, April). *The Challenge of Supporting Rural Youth for Sustainable Agricultural Development and Rural Livelihood: A Case of Uganda*. 17<sup>th</sup> Annual Conference Proceedings. College Station, TX.
- King, R.N., & Rollins, T. (1995). Factors influencing the adoption decision: an analysis of adopters and nonadopters [Electronic version]. *Journal of Agricultural Education*, 36(4), 39-48. doi:10.5032/jae.1995.04039
- Kipkurgat, T. K., Lawver, D. E., Kessell, J., & Bullock, S. (2006, May). *A process of determining needs associated with establishing an agriculture curriculum at messiah theological institute in mbale, uganda*. 22nd Annual Conference Proceedings International teamwork in agricultural and extension education, Clearwater Beach, Florida.
- Leising, (1998). A guide to food and fiber systems literacy. Oklahoma State University, Stillwater, OK.
- Leite, F.C.T., Baggett, C.D., & Radhakrishna, R.B. (2003) Proceedings from AIAEE '03: Perceptions of Brazilian Agricultural School Teachers Toward Attributes of Educational Innovations. Raleigh, NC.
- Li, Y., & Lindner, J.R. (2005). Proceedings from AIAEE '05: China Agricultural University Faculty Perceptions about Barriers to Diffusion of Web-Based Distance Education. San Antonio, TX.

- Lincoln, Y.S., & Guba, E.G. (1985). *Naturalistic Inquiry*. Beverly Hills, CA: Sage.
- Mabie, R., & Baker, M. (1996). A comparison of experiential instructional [sic] strategies upon the science process skills of urban elementary students [Electronic version]. *Journal of Agricultural Education*, 37(2), 1-7. doi:10.5032/jae.1996.02001
- Manganyi, T., Place, N., & Letsoalo, E. (2007) Proceedings from AIAEE '07: The Adoption of Institutional Arrangements in Redistributed Farms in Capricorn District of Limpopo Province, South Africa. Polson, MT.
- Marshall, C., & Grossman, G.B. (2006). *Designing qualitative research*. Sage
- Meischen, D. L., & Trexler, C. J. (2003). Rural elementary students' understandings of science and agricultural education benchmarks related to meat and livestock [Electronic version]. *Journal of Agricultural Education*, 44(1), 43-55. doi:10.5032/jae.2003.01043
- Ministry of Education, National Agricultural Education Strategy Task Force (2003): *National Agricultural Education Strategy*, Kampala
- Miller, M., & Mariola, M.J. (2008). Proceedings from AIAEE '08: The Discontinuance of Environmental Technologies in the Humid Tropics of Costa Rica: Results from a Qualitative Survey. E.A.R.T.H. University, Costa Rica.
- Miller, M., & Mariola, M.J. (2009). The discontinuance of environmental technologies in the humid tropics costa rica: results from a qualitative survey [Electronic version] *Journal of International Agricultural Education and Extension* (16)1, 31-42.
- Moriba, S., Kandeh, J.B.A., & Edwards, C. (2010). Proceedings from AIAEE '10: After Conflict Ends: Providing Technology and Training for Novice Farmers – Sierra Leone's Experience. Sakatchewan, Canada.
- Moriba, S., Kandeh, J.B.A., & Edwards, M.C. (2011). Diffusion of technologies by the tikonko agricultural extension centre (taec) to farmers of the tikonko chiefdom in sierra leone: impacts, problems, proposed solutions, and an updated outlook [Electronic version]. *Journal of International Agricultural and Extension Education*, 18(3), 45-60. doi:10.5191/jae.2011.18304.

- Mugisha, J., & Owens, M. (2008, March). *Impacts of agricultural training on young farmers in uganda*. Proceedings of the 24th Annual Meeting of AIAEE Global entrepreneurship: the role of international agricultural education and extension education march 9-15, 2008, E.A.R.T.H Univerity, Costa Rica.
- Murphrey, T. P., & Dooley, K.E. (2000). Perceived strengths, weaknesses, opportunities, and threats impacting the diffusion of distance education technologies in a college of agriculture and life sciences. [Electronic version]. *Journal of Agricultural Education*, 41(4), 39-50. doi:10.5032/jae.2000.04039
- National Research Agenda Summary 2011-2015. (2011). In *American Association for Agricultural Education*. Retrieved May 17, 2013
- Navarro, M. (2007). Proceedings from AIAEE '07: Strengthening the Links between Programs of Technology Transfer and Indigenous Knowledge Systems. Polson, MT.
- Okiror, J. J., Matsiko, B. F., & Oonyu, J. (2011). Just how much can school pupils learn from school gardening? a study of two supervised agricultural experience approaches in uganda [Electronic version]. *Journal of Agricultural Education*, 52(2), 24-35. doi:10.5032/jae.2011.02024
- Oleas, C., Dooley, K.E., Shinn, G.C., Giusti, C. (2010). A case study of the diffusion of agricultural innovations in chimaltenango, guatemala [Electronic version]. *Journal of International Agricultural and Extension Education* (17)2, 33-45.
- Patton, M.Q. (2002). *Qualitative evaluation and research methods*. Review, 19, 84 101. Sage.
- Roberts, T. G., & Ball, A. L. (2009). Secondary agricultural science as content and context for teaching. *Journal of Agricultural Education*, 50(1), doi: 10.5032/jae.2009.01081
- Roberts, G.R., Hall, J.L., Gill, E., Shinn, G.C., Larke, A., & Jaure, P. (2009). Engaging hispanic students in agricultural education and the ffa: a 39-year case study [Electronic version]. *Journal of Agricultural Education*, 50(3), 69-80. doi:10.5032/jae.2009.03069
- Rogers, E. (2003). *Diffusion of Innovations*. New York: Free Press.

- Rogers, E., & Shoemaker, F.F. (1971). *Communication of Innovations: A Cross-Cultural Approach*. New York: Free Press.
- Rollins, T. (1993). Using the innovation adoption diffusion model to target educational programming [Electronic version]. *Journal of Agricultural Education*, 34(4), 46-54. doi:10.5032/jae.1993.04046
- Shelley-Tolbert, C. A., Conroy, C. A., & Dailey, A. L. (2000). The move to agriscience and its impact on teacher education in agriculture [Electronic version]. *Journal of Agricultural Education*, 41(4), 51-61.
- Sofranko, A., Swanson, B., & Samy, M. (2004). Proceedings from AIAEE '04: An Examination of the Extent of Innovation Discontinuance, the Motivations of Farmers Who Discontinue an Innovation, and Implications for Extension. Dublin, Ireland.
- Strong, R. (2012). Improving loan distribution to farmers: informational needs of mexican banks [Electronic version]. *Journal of International Agricultural and Extension Education*, 19(3), 1-13. Doi:10:5191/jiaee.2012.19306.
- Thompson, G.W. (1999). Attitudes of Oregon agricultural science and technology teachers toward teaching integrating science. *Journal of Agricultural Education*, 40(3), 21-29.
- Thompson, G.W., & Warnick, B.K. (2007). Integrating science into the agricultural curriculum: do science and agriculture teachers agree? *Journal of Agricultural Education*, 48(3), 1-12.
- Trexler, C. J. (2000). A qualitative study of urban and suburban elementary student understandings of pest-related science and agricultural education benchmarks [Electronic version]. *Journal of Agricultural Education*, 41(3), 89-102.
- Trexler, C. J., & Meischen, D. (2002). A qualitative study of prospective elementary teachers' grasp of agricultural and science educational benchmarks for agricultural technology [Electronic version]. *Journal of Agricultural Education*, 43(2), 68-81. doi:10.5032/jae.2002.02068
- Warren, D. M., and B. Rajasekaran. 1993. Putting local knowledge to good use. *International Agricultural Development* 13 (4): 8-10.



- Walker, N. J. (1998, April). *That our lives will shine: collaborating with youth for sustainable development.* , Proceedings of the 14<sup>th</sup> Annual Meeting of AIAEE, April 16-18, 1998. Tucson, Arizona.
- Warnick, B.K., Thompson, G.W., & Gummer, E.S. (2004). Perceptions of science teachers regarding the integration of science into the agricultural education curriculum [Electronic version]. *Journal of Agricultural Education*, 45(1), 62-73. Doi:10.5032/jae.2004.01062
- Wilson, E.B. & Curry, K.W. (2011). Outcomes of integrated agriscience processes: a synthesis of research. *Journal of Agricultural Education*, 52(3), 136-147.
- Witt, R., Pems, D.E., & Waibel, H. (2008). The farmer field school in senegal: does training intensity affect diffusion of information? [Electronic version]. *Journal of International Agricultural and Extension Education* (15)2, 47-60.

## Appendix A

### IRB Letter of Approval

01/12/13

"Official" Approval, Protocol #12-407 EP 1301

#### "Official" Approval, Protocol #12-407 EP 1301

IRB Administrator (Susan Anderson, PhD)

IRB / Office of Research Compliance

115 Ramsay Hall (basement)

Anderson, Susan, PhD, 2013-2014

Anderson, Susan, PhD, 2013-2014

Dear Mr. Williams,

Enclosed is your "Official" Approval of the protocol for the study titled "The Effect of the 2012 Olympic Games on the Health of the General Public" under federal regulation 45 CFR 46.110(b,7).

#### Official notice:

This e-mail serves as official notice that your protocol has been approved. A formal approval letter will not be sent unless you notify us that you need one. By accepting this approval, you also accept your responsibilities associated with this approval. Details of your responsibilities are attached. Please print and retain.

#### Consent document:

Since you have received scanned copies of your consents, it is assumed that you have begun your research.

Please note that you must use copies of the documents when you consent participants, and provide a copy (signed or unsigned) for them to keep.

#### Expiration:

Your protocol will expire on January 13, 2014. Put that date on your calendar now. About three weeks before that time you will need to submit a final report or renewal request.

If you have any questions, please let us know.

Best wishes for success with your research!

Susan

Susan Anderson, IRB Administrator

IRB / Office of Research Compliance

115 Ramsay Hall (basement)

Anderson, Susan, PhD, 2013-2014

Anderson, Susan, PhD, 2013-2014

Anderson, Susan, PhD, 2013-2014

## Appendix B

### Child Assent Letter



#### COLLEGE OF EDUCATION COUNSELING AND TEACHING

#### PARENTAL PERMISSION/CHILD ASSENT for a Research Study entitled

"Assessing the Effectiveness of a Social Skills Training Program for Children with Autism Spectrum Disorders"

Your child has been asked to participate in a research study to help answer questions about the effectiveness of a social skills training program for children with autism spectrum disorders. The study is being conducted by Dr. [Name], [Title], [Department], [University]. Your child's participation in this study is voluntary. Your child will not be harmed by participating in this study. Your child will receive a small reward for participating in this study. Your child will be asked to complete a questionnaire about their experience in this study. Your child will be asked to complete a questionnaire about their experience in this study. Your child will be asked to complete a questionnaire about their experience in this study.

What will be done with your child's participation? Your child's participation in this study will be used to help answer questions about the effectiveness of a social skills training program for children with autism spectrum disorders. Your child's participation in this study will be used to help answer questions about the effectiveness of a social skills training program for children with autism spectrum disorders. Your child's participation in this study will be used to help answer questions about the effectiveness of a social skills training program for children with autism spectrum disorders.

Are there any risks to your child's participation? The researchers who are conducting this study will not know your child's identity. However, the researchers will ask to protect your confidentiality. Due to the risk of your identity being kept confidential, the risk associated with this study is a potential breach of confidentiality. Your confidentiality cannot be guaranteed.

Are there any benefits to your child's participation? If your child participates in this study, your child will receive a small reward for participating in this study. Your child will receive a small reward for participating in this study. Your child will receive a small reward for participating in this study.

DATE: [Date]  
TIME: [Time]

TELEPHONE: [Phone Number]  
FAX: [Fax Number]  
E-MAIL: [Email Address]



Parent's Signature: \_\_\_\_\_  
Child's Signature: \_\_\_\_\_

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Your child's privacy will be protected. Any information obtained in connection with this study will remain confidential. Because the child will be participating in a focus group interview, special rules of confidentiality are involved. Information discussed in the group should not be discussed with anyone outside of the group, and the confidentiality of anything your child or others discuss should be kept during the group session, outside the group as well. However, this does not mean that information will be recorded verbatim. Instead, the primary investigator will take notes on the content of any other child or person throughout the course of the interview. The focus group interview will be recorded to ensure that the primary investigator accurately records all of your child's answers. The audio recording will be transcribed. Once the transcription has been analyzed, all information that has been recorded by you will be destroyed. Information obtained through your child's participation may be used to complete a doctoral dissertation.

If you (or your child) have questions about this study, please ask them now or contact Brandon Williams at 202-334-5555 or Brandon Williams at 202-334-5555. A copy of this document will be given to you at home.

If you have questions about your child's rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone (205-334-5555) or e-mail at [human@auburn.edu](mailto:human@auburn.edu) or [IRB@auburn.edu](mailto:IRB@auburn.edu).

**By signing this form, you are indicating your willingness to allow your child to participate in this study. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO ALLOW YOUR CHILD TO PARTICIPATE. YOUR CHILD'S SIGNATURE INDICATES HIS/HER WILLINGNESS TO PARTICIPATE.**

Participant's signature \_\_\_\_\_ Date \_\_\_\_\_

Printed Name \_\_\_\_\_

Parent/Guardian Signature \_\_\_\_\_ Date \_\_\_\_\_

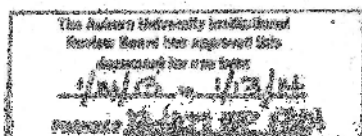
Printed Name \_\_\_\_\_

*Brandon Williams* 2/11/13  
Investigator obtaining consent Date  
*Brandon Williams*

Co-Investigator \_\_\_\_\_ Date \_\_\_\_\_

Printed Name \_\_\_\_\_

Page 2 of 2



## Informed Consent Letter

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Your privacy will be protected. Any information obtained in connection with this study will remain confidential. Because this one on one or focus group interview will be recorded, please be advised that you shall not say your name, or the name of any other child or person throughout the course of the interview. The one on one interview or focus group interview will be recorded to ensure that the primary investigator accurately records all of your answers. The audio recording will be turned off. Once the transcription has been analyzed, all information that has been recorded by you will be destroyed. Information obtained through your participation may be used to complete a doctoral dissertation.

If you have questions about this study, please ask them now or contact Brandon Williams at [brandon.williams@auburn.edu](mailto:brandon.williams@auburn.edu) or at 252-257-6000 or Vincent Vickers at 252-257-1000. A copy of this document will be given to you to keep.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone 252-1-334-844-5966 or e-mail at [ohs@auburn.edu](mailto:ohs@auburn.edu).

**WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY, YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.**

Participant's signature

Date

Investigator's signature

Date

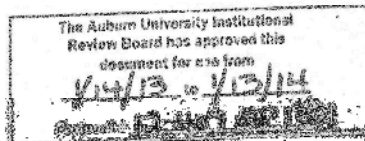
Printed Name

Printed Name

Co-Investigator

Date

Printed Name



## Appendix D

### Teacher Interview Schedule

The following questions will be asked to teachers of agricultural content.

#### Relative Advantage:

1. Do you perceive these agricultural practices are better than what students and parents are currently using?
2. Do you perceive that these agricultural practices save you money?
3. Do you perceive that these agricultural practices increase crop yield?
4. Do you perceive that these agricultural practices are more convenient than those currently used?
5. Do you perceive families are satisfied with the results of new agricultural practices?
6. Did you perceive that parents learn these new agricultural practices from their children? Perhaps people in the community will learn?

#### Compatibility

1. Do you perceive that these new agricultural practices meet familial needs?
2. Do you perceive that practices taught by you are in line with the traditional agricultural practices of Kimuli?
3. Do these agricultural practices conflict with any religious beliefs?
4. Do these agricultural practices conflict with any social norms?
5. Would you recommend these agricultural practices to a friend?

#### Complexity

1. As a teacher of this agricultural content, do you understand how to implement the new agricultural methods?
2. As a teacher of this agricultural content, do you understand how to execute the new agricultural methods?
3. To what extent do you perceive that these students are learning agricultural content, which is taught in your classroom?
4. Do students understand well enough to take to their parents?
5. Do students understand well enough to teach their parents regarding new agricultural knowledge?
6. Do you perceive that parents will adopt this new agricultural content that students are learning in your classes?

#### Triability

1. Have you, as a teacher, tried any of these new agricultural practices?

2. To what extent have you tried any of the new agricultural practices?
3. Why or why not try on a limited basis?
4. Do you perceive that limited adoption of agricultural practices help ease your uncertainty?
5. If you have tried new agricultural methods, did you learn while you were implementing and executing the new method?

#### Observability

1. Have you noticed any villagers implementing these new agricultural methods?
2. Do you perceive that students and parents will share with their friends, family, and people network about these new agricultural practices?
3. Do you perceive that parents and friends will talk to their friends, family, and people network about these new agricultural practices?
4. Do you perceive that the class monitors are taking this agricultural knowledge learned in the school home to their parents?



## Appendix E

### Parent Interview Schedule

The following questions will be asked to parent participants of this study

#### Relative Advantage:

7. To what extent are these agricultural practices better than what you are currently using?
8. To what extent do these agricultural practices save you money?
9. To what extent do these agricultural practices make more crop yield?
10. To what extent are these agricultural practices more convenient than those you are currently using?
11. To what extent are you satisfied with the results of new agricultural practices?

#### Compatibility

6. To what extent do these new agricultural practices meet your needs?
7. To what extent are these in line with the traditional agricultural practices of Kimuli?
8. To what extent do these agricultural practices conflict with any religious beliefs?
9. To what extent do these agricultural practices conflict with any social norms?
10. To what extent would you recommend to a friend?

#### Complexity

7. To what extent do you understand how to implement the new agricultural methods? If so, to what extent?
8. To what extent do you understand how to execute the new agricultural methods? If so, to what extent?

#### Triability

6. To what extent have you tried any new agricultural practices you're your students learned in their science class at school?
7. To what extent have you tried on a limited basis?
8. To what extent does limited adoption of agricultural practices help ease your uncertainty? In other words, trying new practices in small doses.
9. To what extent have you tried new agricultural methods?
10. To what extent did you learn while you were implementing and executing the new method?

#### Observability

5. To what extent have you seen any of your friends implementing these new agricultural methods?
6. To what extent have you shared with your friends, family, and people network about these new agricultural practices?
7. To what extent do you talk to your friends, family, and people network about these new agricultural practices?
8. To what extent do you provide an evaluation of these new agricultural practices to your friends, family, and people networks?

## Appendix F

### Community Leader Interview Schedule

The following questions will be asked to community leaders of this study

#### Relative Advantage:

12. To what extent are these agricultural practices better than what you perceive the village people are currently using?
13. To what extent do these agricultural practices do you perceive save Kimuli residents money?
14. To what extent do you perceive these agricultural practices make more crop yield?
15. To what extent do you perceive are these agricultural practices more convenient than those Kimuli residents are currently using?
16. To what extent do you perceive are Kimuli residents satisfied with the results of new agricultural practices?

#### Compatibility

11. To what extent do these new agricultural practices meet Kimuli residents' needs?
12. To what extent are these in line with the traditional agricultural practices of Kimuli?
13. To what extent do these agricultural practices conflict with any religious beliefs?
14. To what extent do these agricultural practices conflict with any social norms?
15. To what extent do you perceive that Kimuli residents would recommend to a friend?

#### Complexity

9. To what extent do Kimuli residents understand how to implement the new agricultural methods? If so, to what extent?
10. To what extent do Kimuli residents understand how to execute the new agricultural methods? If so, to what extent?

#### Triability

11. To what extent have Kimuli residents tried any new agricultural practices that students learned in their science class at school?
12. To what extent have residents of Kimuli tried on a limited basis?

13. To what extent does limited adoption of agricultural practices help ease Kimuli residents' uncertainty? In other words, trying new practices in small doses.
14. To what extent do you perceive have Kimuli residents tried new agricultural methods?
15. To what extent do you perceive parents are learning while they are implementing and executing the new method?

#### Observability

9. To what extent have you seen any of your friends implementing these new agricultural methods?
10. To what extent have you shared with your friends, family, and people network about these new agricultural practices?
11. To what extent do you talk to your friends, family, and people network about these new agricultural practices?
12. To what extent do you provide an evaluation of these new agricultural practices to your friends, family, and people networks?

## Appendix G

### Children/Student Interview Schedule

The following questions will be asked to children participants of this study

#### Relative Advantage:

17. Are these agricultural practices better than what you are currently using?
18. Do these agricultural practices save you money?
19. Do these agricultural practices make more crop yield?
20. Are these agricultural practices more convenient than those you are currently using?
21. Are you satisfied with the results of new agricultural practices?

#### Compatibility

16. Do these new agricultural practices meet your needs?
17. Are these in line with the traditional agricultural practices of Kimuli?
18. Do these agricultural practices conflict with any religious beliefs?
19. Do these agricultural practices conflict with any social norms?
20. Would you recommend to a friend?

#### Complexity

11. Do you understand how to implement the new agricultural methods? If so, to what extent?
12. Do you understand how to execute the new agricultural methods? If so, to what extent?

#### Triability

16. To what extent have you tried any new agricultural practices learned in your science class at school?
17. Why or why not try on a limited basis?
18. Does limited adoption of agricultural practices help ease your uncertainty? In other words, trying new practices in small doses.
19. If you have tried new agricultural methods, did you learn while you were implementing and executing the new method?
20. What would you say about that?

#### Observability

13. To what extent have you seen any of your friends implementing these new agricultural methods?

14. To what extent have you shared with your friends, family, and people network about these new agricultural practices?
15. To what extent do you talk to your friends, family, and people network about these new agricultural practices?
16. To what extent do you provide an evaluation of these new agricultural practices to your friends, family, and people networks?