The Biobuddies Project: Enhancing Agricultural Awareness in Canadian Elementary Schools

by

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ABSTRACT

THE BIOBUDDIES PROJECT: ENHANCING AGRICULTURAL AWARENESS IN CANADIAN ELEMENTARY SCHOOLS.

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This thesis explores the current agricultural perceptions in the grade two students of Guelph Ontario. This research explored current stigma as well as the misconceptions that are often associated with farming in today’s urban populations.

Primary data was collected from students through a survey conducted before and after an hour-long presentation in the classroom. The data collected was analyzed both qualitatively and quantitatively, using coding methods frequency analysis of the codes chosen by students.

Findings revealed that upon initial entry to the classroom most students defined farming through the use of animal-related examples. After the presentation, the students showed interest in other areas of farming, but still maintained a strong connection with the animal theme.

Teacher support for this program was seen to an overwhelming degree. Further research should be conducted to help promote a similar program permanently in the Ontario elementary curriculum.
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Chapter One: Introduction

1.0 Introduction

As the world’s population continues to rise, we’re seeing movement toward city life and an increased disconnect from our rural ancestors. In today’s highly technological, urbanized world there is less priority placed on agriculture in the school system (Holloway, 2004). Ironically, as the cities grow we see higher demands placed on the shrinking farm. It is the agricultural neighbors that cities rely on to supply their food. Unfortunately, today’s urban children often lack the opportunity to learn about farming, or how the science of agriculture affects them daily.

In response to this disconnect various in-school programs have been introduced, particularly in the United States. Presently there are a few opportunities available in Canada, but the majority of teachers are not using the programs in the Ontario classroom. This thesis explores how a volunteer-based in-school program, called Biobuddies, helped increase awareness and interest in agriculture for the grade two children of Guelph Ontario, and how the findings of this study may help shape future programs. 1.1 Research Context

This research targeted agricultural knowledge and perceptions among the urban youth of today. In our fast paced “digital” society, where food can be readily found in grocery stores and houses are built in tight rows, it’s no surprise that agriculture is often
overlooked and misunderstood. It’s no secret that there is a major disconnect between urban culture and the rural hands that feed them (Holloway, 2004).

Unfortunately, like most of Canada’s population, elementary school teachers know little about farming, and find little incentive to update their knowledge to learn more about it (McConaghy, 1989).

Additionally, the lack of agricultural integration into the public school system has narrowed the view of what “farming” means to our children. Hurley’s paper from 1921 describes how historically, efforts were made to include farming directly into the curriculum and positively affected the students’ performance in many of the other required elementary subject areas.

Currently in Ontario the curriculum introduces agriculture at the elementary school level, but in a very generalized and superficial way. For example, in grade one science, students learn about basic animal needs while in grade two the curriculum focuses on “life cycles” (Ministry of Education, 2007).

Fortunately, the University of Guelph has a long-standing history in agricultural education, with enthusiastic, vivacious students who have the energy and skill to help teach the key fundamental agricultural concepts. Currently, there is no system in place for undergraduate students to share their passion for agriculture within the local community. However, perhaps in the future, devoted university students will act as vehicles to teach younger generations how agricultural biology affects everyone daily.

The research done by Flay (2000), shows that special programs added to the regular curriculum is an effective way to engage and teach students. Additionally, in the
study done by Duncan et al (2006) it was seen that perceptions toward agriculture change when students are enrolled in learning-based development programs.

1.2 Problem Statement

This study measures the effects that an interactive educational classroom presentation is having on perception of agriculture in urban elementary school grade two students in Guelph Ontario. We believe this research will show a positive correlation of new understanding toward agriculture among children when they are exposed to the course information presented by a guest teacher from the University of Guelph. This study will compare how the grade two students feel toward agriculture upon initial introduction to the class, compared with their final perceptions on farming after the session with the guest teacher has been completed.

1.3 Purpose, Goals and Objectives

The main goal of this research is to close the gap commonly found between children raised in an urban community who have little experience with agricultural communities. Studies show that people from urban communities have limited knowledge about the agricultural industry (Frick et al, 1995).

The research itself features a series of “hands-on” activities that taught basic biological concepts guided through agricultural examples (primarily through examples that include animals). This initiative, “Biobuddies”, will have obvious benefits for all parties involved, and will include many people with different perspectives on agriculture.
This study attempted to gauge current perspectives on farming among second grade students of Guelph, Ontario. After initial introductions, the students were asked to record on a survey sheet what comes to mind when they think of the word “farming”. Following this brief period of reflection, students were engaged in an hour-long program designed to spark interest in farming and show examples of agriculture, from a different angle. Conclusively, students were asked to record the new information they learned, as well as disclose what other topics may be of interest for future sessions. Student surveys were analyzed to look for possible changes in opinion, and determine if the classroom experience had a positive effect on attitudes, understanding and knowledge for agriculture.

Additionally each classroom teacher was also given a survey to return after the presentation was completed. It’s important to understand how the elementary teachers feel about agricultural education, as well as teacher surveys help to understand the capacity that each unique class may have when learning new concepts (as each classroom functions quite differently).

The two main objectives of this research are:

1) To understand the current perspective of farming as seen by the grade two students in Guelph Ontario.
   i. Before the presentation, do the grade two students know about “farming”?
   ii. Prior to intervention, how do the grade two students define “farming”?
2) To describe the ways in which agriculture can become meaningful (relevant) to children through direct incorporation into the curriculum, via classical learning theories.

   i. As active participants in the classroom presentation, (building their experimental “egg candler”, observing the virtual farm tour DVD images, and understanding chick development) which new concepts are recorded the most by students after the hour’s session is complete?

   ii. Is experiential learning an effective way to engage and inspire learning in primary aged children?

1.4 Theoretical Perspective

1.4.1 Thesis Assumption

As with all scientific research initiatives, there are some general assumptions made to guide the smooth flow of the researching process. The nature of this study involved working with hundreds of children, in dozens of classrooms with several different teachers. These conditions have some intrinsic limitations, and some assumptions were made when collecting the data.

The survey distributed to the children was uniform, and this would assume that all the grade two students in Guelph Ontario have similar literacy competency, and that educational opportunity between the Guelph schools are equal, due to the standardized expectations of the Ontario curriculum.
Secondly, our classrooms sampled were based on the “snowball sampling method”. However, it was assumed that all the grade two science teachers in Guelph had an equal opportunity to respond to the invitation to the program, and schedule a presentation date. The local science curriculum leader, Mike Anderson, sent out an electronic invitation to all grade two science teachers, urging those interested to participate.

Third, when working with children often there are many barriers that present themselves. Obviously, while conducting the research for this study it was important to remain sensitive to the participants and adhere to the guidelines set by both research ethics boards (from the University of Guelph and the UGDSB). This limited the materials allowed in classroom sessions, however modifications made to the ‘experiments’ did generate a fun, engaging learning environment (without the introduction of live animals or fertilized eggs).

Finally, it is assumed that every child who participated honestly responded to the survey to the best of their ability. As a researcher, I trust that the data collected from each student was answered whole heartedly. This would also assume that while partaking in the classroom learning session that each child was listening and attentive during the presentation.

1.4.2 Thesis Perspective

The limited local focus of this research necessitates future research being conducted on a larger geographic area. The findings of this study reflect the grade two population of Guelph Ontario, and therefore should be regarded as case-study research.
Interestingly, Guelph, Ontario is often seen as an “agricultural hub” due to the presence of the Ontario Agricultural College (OAC) as well as some other major agricultural corporate influences within the local community (Ontario Ministry of Agriculture, Farm and Rural Affairs (OMAFRA), Ontario Farm Animal Council (OFAC) and Monsanto). For these reasons, children raised in Guelph perhaps may have an increased exposure to farming as compared to children from other cities in South Western Ontario.

1.5 Methodology

The findings of this study may help to shape future programs designed with a similar format. This study involved an outside volunteer teacher (the researcher) who helped facilitate the presentation for the grade two participants. This study was limited to Guelph, Ontario due to travel and time constraints of the Researcher, as well as consideration of the research project goals. Our main focus was to examine the perceptions of the urban children, therefore collecting data from children outside the city’s limits would not reflect the correct demographic.

Guelph Ontario is a city that has an increased agricultural flair, and therefore holds great potential to host future pilot projects. The findings from this study may provide various stakeholders in the community and school system with enough information to inspire them to make a change.

Students involved in this study were enrolled in a grade two class in the city of Guelph. Grade two students were chosen as the target population because of the fit with the Ontario science curriculum. In grade two, students are required to learn about Life
Cycles, and had learned in the previous year about caring for animals through the human-animal relationships (Ministry of Education, 2007). By designing this research study to align with the Ontario curriculum we offered a program that enhanced and supported what was already a classroom requirement.

1.5.1 Exploratory Case Study

The methodology for this research used an exploratory case study format. The presentation delivered to the children was designed in a way that would engage the grade two subjects, as well as lend an opportunity for them to express honestly what prior information they knew as well as what topics would interest them for future lesson-plans.

Currently no research has been done in this field, but this study may serve as a good baseline to build upon.

The Case Study design used in this research is of a holistic format, with multiple case studies recorded. The data collected was divided by class, and therefore the results will compare and contrast findings from one Guelph classroom to another. For the purpose of this study, each class was treated as an individual case study. The statistical results found from comparing several case-studies will reflect a larger population and provide data that hold more external validity (Byman et al, 2009).

1.5.2. Study Location

The location of this study was Guelph, Ontario. The population of Guelph according to the census done in 2006, was 114,943. The city had seen a growth of 8,773
since the previous census done in 2001. This growth rate was 1.7% higher than the average rate of population increase as seen in the other Ontario communities surveyed. The population distribution of Guelph, Ontario according to age falls very close to the Provincial average, this is one reason why Guelph is a suitable location of study.

Interestingly, Guelph, Ontario has a higher percentage of individuals who speak only speak English. In Guelph, 78.6% of individuals reported only to speak English while the provincial average is 68%. This statistic also makes Guelph a suitable region of study, because it made delivery of the survey and researchers information transfer (in the form of a classroom presentation) more reliable, as language was less of a potential limit as it may have been in another community within Ontario (Statistics Canada, 2006).

Guelph is the home of the Ontario Agricultural College (OAC), hosting a large number of University of Guelph students. The University itself prides itself on having a strong agricultural connection, one that extends it presence into the community. For example, OMAFRA (Ontario Ministry of Agriculture, Food and Rural Affairs) has a partnered with the University, which may encourage many university students and graduates to pursue a career in the agricultural field. It’s important also to recognize College Royal, an annual open house event hosted by the University that highlights many of the different programs offered at the University, especially the agricultural ones. During the spring the university opens their barn doors and offers tours to the community, often making a great weekend adventure for families with school-aged children (College Royal Society).

Based on the OAC’s influence it might be expected that many graduates of the University remain in Guelph and work in an agriculturally-related field. According to the
census data, 43.2% of post-secondary graduates living in Guelph, reported to have studied in Canada, this figure is larger than the Ontario average of 40%. Although it cannot be certain, perhaps OMAFRA, Monsanto, OFAC and many of the other agricultural research institutes affiliated with the University of Guelph may have had a hand in the way the data presented itself in the 2006 census.

However, it should be noted that on the whole, Guelph Ontario remained typical in terms of the overall distribution of graduated individuals and their respective fields of study. The majority of Guelph residents who have successfully completed a diploma or degree have specialized in the field of Architecture, engineering or related technologies. This trend remained the same for the Ontario average. The second most popular field of study was in a business or management administration type field, again this was the second most popular field in the province of Ontario. Although Agriculture did not present itself in the top four fields of study, this area of post-secondary education was seen in the census data in a much higher frequency than the rest of the Ontario. In Guelph, 2.37% of post-secondary graduate had studied agriculture compared to 0.936% average for Ontario. We may expect that this increased interest in farming may have invited a certain level of bias into the study, however it’s clear that even in the “Agricultural hub” of Guelph Ontario, Agriculture is still not seen as one of the most recognized areas of specialization within the population.

In terms of occupation and industry, Guelph followed the Ontario trends in the 2006 census. Sales and service occupations were the most popular followed by business finance and administration. According to the data, agriculture and other resource-based
industry was a lower percentage than the provincial average, however it’s important to consider that within the City of Guelph there is little free land to farm.

In the 2006 census, it was shown than the average Guelph family had a higher income than the average Ontario family earning $74,927 compared to $69,156. Additionally, Guelph had a lower unemployment rate than the provincial average %5.3 compared to %6.4.

1.5.3 Methodology Framework

Using a multiple-case study approach this study analyzed how the grade two students of Guelph Ontario responded to researcher intervention (in the form of a classroom activity and presentation about local poultry farming practices). A literature review along with a series of qualitative and quantitative analysis will shape the findings for this research study.

1.6 Thesis Structure

Chapter One introduces the research questions, purpose and goal of the study as well as outlines basic methodological approaches and location of research.

Chapter Two presents the relevant literature, as well as the theories applicable to this area of research. It serves to provide the background information required to understand the fundamental building blocks behind this area of study.

Chapter Three is used to describe in detail the way the data for this project was collected. This chapter also includes the advantages and limitations of data collection methods that were employed for this research project.
Chapter Four summarizes the results for this study using a combination of qualitative and quantitative techniques to test the data collected. The general trends observed among the different case studies is presented to highlight the key areas of interest.

Chapter Five combines the data collected from the elementary schools in Guelph Ontario with findings in comparable studies. Additionally, the Biobuddies program is evaluated as an effective way to introduce agriculture to the elementary school children.

Chapter Six presents a summary of the project while suggesting possible steps for similar initiatives for similar programs in the future.

2.0 Literature Review

The basis of this research project attempts to understand what current agricultural perceptions exist in North America, with main focus on the children’s perceptions. Furthermore, this experiment tests if integration of agricultural concepts into the standardized curriculum would be an effective way to teach the basic concepts of farming while changing overall opinions that may exist in society about farming.

In the literature available we will explore what stigma is currently attached to the term “farming”. Once this has been covered this literature review section will outline some of the prevalent theories behind how children learn new concepts, followed by understanding some of the major theories behind how science curriculum is developed and the most successful theories used to teach this information. Finally we will explore
the social theories behind the educational system and the effectiveness of using the
school system as a tool to help teach the importance of farms.

The purpose of this section is to provide sufficient background and an
understanding of the literature that was used to base this Biobuddies research project.

2.1 Current Agricultural Perceptions

In today’s fast paced “digital” era, where food can be readily found in grocery
stores and houses are built in tight rows it’s no surprise that agriculture is often
overlooked.

Over the past several decades there has been an overall decline in the number of
farmers. This decrease in farms has meant that remaining farmers have been forced to
change their business model to meet the increased global demand for food. Ironically, it’s
often these newer farming practices (“factory farms”) that have given modern day
farmers a poor reputation with their urban neighbors (Wimberley et al, 2002).

In the following section we will outline some of the common perceptions that
have formed in North America surrounding the Agricultural Industry. Interestingly there
are parts of the population who believes it is fairly educated in their “agricultural
terminology” while there still remains a large portion of people who don’t know much
about where their food comes from. Both these categories of the population have shaped
the overall perception that North Americans hold toward farming.

2.1.1. Organic Farming and Animal Welfare Issues
Studies done on agricultural perceptions have revealed that consumers have become confused over one of the common terms used in the marketing of our agricultural produce; organic. It seems that people believe that the term “organic” implies certain animal welfare practices are in place (Harper et al, 2002). It seems that in today’s world where often industrialization of farming has become a concern, and this term has become a key player in the way consumers will pick their products (Harper et al, 2002).

The reason that consumers believe that organic foods are the right choice is because often they associate these foods to be a healthier choice overall. People are concerned about consuming foods that have been treated with hormones or other chemicals, and they believe that “organic” choices will be free of these (Harper et al, 2002).

Interestingly, the growing concern for animal welfare has seemed to increase however, there is little support to show that consumers understand animal welfare policies or know what common farming practices are (Harper et al, 2002). Perhaps consumer perceptions would change if the information were to be presented to the public differently.

### 2.1.2 Industrialization of farms

Today it seems that often farmers are criticized for “over-producing” or factory farming. Although not everyone is against the industrialization of farms it seems that those who are the most opposed have little farming experience (Wimberley et al, 2002). When people’s values are challenged, and new information is presented old values may be dispelled and there is the capacity for change in perception (Wimberley et al, 2002).
To help dispel the negativity toward large-scale farms it’s important to teach everyone about how the farms work.

Today small family farms are quickly becoming a thing of the past. We can see that there’s a shift from the smaller farms to much larger more productive agriculture. Although there are obvious economical reasons for this shift in farming, it seems that overall the idea of Agricultural Industrialization has been given a bad reputation (Lobao and Stofferahn, 2008).

Studies have shown that people see the move toward large-scale farms putting smaller communities at risk, and is dangerous to the ecosystems. People also see the larger farms as potential vectors for introduction of health concerns spread through mass-produced food (Lobao and Stofferahn, 2008).

Hidden among the readily available, mass produced food, there seems to be niche markets that perhaps cater to the people who feel strongly against mass production. Today these niche markets are becoming more readily available to the general population. Introduction of ‘organic farming’ or ‘the ethical trade movement’ has introduced a new belief system into society and how they pick a producer (Codron et al, 2006). In the new millennium the way you grocery shop has become somewhat of an ethical decision!

Consumers are buying into these new movements but they remain unclear about the specific philosophical beliefs that drive them (Codron et al, 2006). This research suggests that consumers are spending without fully understanding the facts about how these foods are derived.
As mentioned earlier in Wimberely’s research, these perceptions can be changed through proper presentation of information. While industrialization continues to spread negative opinions toward farming will continue unless people become more informed.

### 2.2.3 Farm to School initiatives

Farm to school initiatives are introduced into schools for a variety of different reasons. Sometimes they are designed to teach children about farms, while other programs simply support local farmers through buying produce to use in school kitchens. This section looks at the different literature available surrounding these initiatives and critiques the overall effectiveness of a few different programs.

According to the study done by Duncan, perceptions of agriculture can change when students are enrolled in learning-based development programs (Duncan et al, 2006). There are several ways that farming can be successfully introduced to schools, either through a “one-time” food festival or on a more regular basis through purchasing local produce in the cafeteria (Izumi et al, 2010).

In some areas of the United States farm to school initiatives have been introduced as a means to counter increased rates of childhood obesity. It’s thought that through increased awareness for where food comes, students may become more inclined to make healthier choices (Bagdonis et al, 2009). In addition to teaching proper nutrition, these programs are designed to include farmers directly in the schools. Featuring local produce on the cafeteria menu helps build a rapport between producers and the school community. Additionally, students learn how tasty eating local can be (Bagdonis et al, 2009)!
In the research done by Bagdonis et al, parents and community members were invited to partake in the farm-to-school activities (farm tours, cooking lessons). Surprisingly, the invited adults showed minimal interest in becoming involved (Bagdonis et al, 2009).

Perhaps the lack of parental interest is mirrored in the children, because results showed that the children knew very little about what fresh produce was available (Bagdonis et al, 2009). Introducing students to new fruits and vegetables in school is a good way to expand their palate as well as show the parents new healthy options (Bagdonis et al, 2009).

Interestingly, in some American schools agriculture is offered as a high school course. Studies published on these programs show a greater ethnic and social diversity in agricultural students compared to past years, this may indicate increasing interest in farming across a variety of backgrounds (Retallick, 2010).

Although no program is designed perfectly, in the research done with Retallick, some agricultural teachers reported that often their curriculum isn’t taught to its fullest potential. Parental influence, mark driven students and mandatory curriculum requirements currently stand in the way of agriculture teachers. Like many curriculum-focused programs, the teachers involved in this study felt there was little flexibility in the program which prevented them from showing information in a creative and fun way (Retallick, 2010).
2.1.4 Producer’s Perspective

Unfortunately farm-to-school initiatives do not often generate very much income for the local producers, however producers recognize the importance of keeping food in schools nutritious. For this reason and to support the local economy, farmers may accept the financial cut in order to stay involved. This relationship leads to good local publicity for producers and sometimes a cost-cut for those who are organizing the farm-to-school program (Izumi et al, 2010).

2.1.5 Future of Farming

The future of farming in Canada is becoming more of a concern everyday, as fewer Canadian youth have expressed an interest in entering the field. It is apparent that to ensure success in the agricultural industry, our society should begin investing in our future now. Unfortunately, many of today’s children who are raised on a farm have no desire to takeover their family’s farming business. Interestingly, many of these children hope to own property in the country, but do not plan to farm professionally (Cummins, 2009).

Perceptions of agriculture has proven to be different when compared between urban and rural communities, and perhaps this stems from the issue of a lack of experience and knowledge among the urban people (Wimberley et al, 2002). It’s important that we begin to educate those with little farm experience, because ultimately it’s the urban population that holds the power to shape policies directly affecting the future of farmers (Wimberley et al, 2002).
2.2 How Children Learn

According to the Handbook of Research on Science Education, the way children learn is unique and complex, and thus requires a special consideration when designing an effective curriculum. There are a few different theories behind how children learn best, and this section of the literature will outline some of the researched areas in the field.

2.2.1 Hands-on Approaches

It’s been shown that a hands-on approach to learning is very important when children are learning a new concept or skill (Kaiser, 2005). In children aged from 8-13 years of age a combination of hands-on approaches as well as “consensually driven explanations” while working together in smaller groups are some of the most effective strategies to teach scientific concepts (Abell and Lederman, 2007). In this model, students work together and share and discuss ideas, through a process that becomes a form of socially constructed knowledge building.

With this model, after discussion has been generated in smaller groups, ideas are then presented to the whole class, reinforcing the learned concepts as well as sharing amongst the other class what may be to them, new ideas (Abell and Lederman, 2007).

Unfortunately, no learning method goes without potential draw-backs. Often when students work together in small groups the work becomes divided among members, we then see the risk of an individual learning only “their assigned part” which would leave gaps in the information they retain for themselves (Abell and Lederman, 2007).
2.2.2 Experiential Learning

The experiential learning model has been used in vocational training as well as professional training. This method of teaching individuals focuses less on abstract concepts and much more on creating concrete experiences (Denise and Harris, 1989). Perhaps one of the reasons that experiential techniques have not been implemented more in schools is because traditionally experiential learning has taken place outside the classroom (Denise and Harris, 1989).

Experiential learning is a cyclical model that is comprised of four stages. The four stages are (1) experience, (2) process, (3) generalization, and (4) application. Often this model is misused in practice, because too often the cycle is cut short without proper practice of the generalization and application stages (McCaffery, 1986).

This model supports the concept of “practicing” and “participating” in order to fully learn a new concept or skill (Kolb & Fry 1975). This is an effective approach when teaching children, since often they learn best when there are multiple levels of cognition and a variety of techniques included (Knowles, 1984). Experiential learning will offer more “doing” rather than “seeing” which would be much more engaging and beneficial for the children involved in the learning program (Aasen Heumier, 2010). It combines the idea of putting the theories learned into practice (Denise and Harris, 1989).
2.2.3 Challenge Level

One concept to consider when teaching a new concept is the overall “flow” of the activity (Gilman et al, 2009). “Flow Activities” are described in The Handbook of Positive Psychology in Schools as activities with enough of a challenge to keep the student interested, but not too far beyond the learner’s current skill level. If the students are able to complete the task they can learn something new while gaining confidence from successfully completing a tricky task (Gilman et al 2009). Studies have shown that schools are becoming more mundane, with less interaction and engagement from students. Classes that focus primarily on teacher instruction and less on participation have been shown to have less motivation and enjoyment in their student population (Gilman et al, 2009).

To successfully maintain the flow in the classroom it’s important to consider two key concepts; academic intensity and positive emotional responses. For example, a mathematics test may have a high level of academic intensity (it requires a lot of individual study and preparation) while an art project is more enjoyable and relaxing. Often the skills learned that are high in academic intensity are worked on individually compared to the more group-focused tasks that generate high positive emotional responses. Through combining these two concepts classrooms can maintain the “flow” of the lesson. The right balance in academic intensity and emotional responses keeps the level of challenge in the task at the right level to maintain student interest. It is important to teach concepts that will challenge students enough in an interactive, skill-based way without becoming too relaxed or mundane (Gilman et al, 2009).

Supporting this more collaborative approach to learning can be applied to the way a
The teacher introduces science experiments. The scientific methods approach to experimentation has several steps, they are as follows;

1) Make Observations
2) Formulate a hypothesis
3) Deduce consequences from hypothesis
4) Make observations to test the consequences
5) Accept or reject the null hypothesis based on the observations

Studying the scientific methods with an experiential approach allows students to test their own theories and hypothesis and generate their own conclusions (Denise and Harris, 1989). When a teacher uses this model with a collaborative approach in the classroom students are more engaged than working individually on a science project (Taylor and Ferrari, 2011). When students are given the time to reflect on their experience, the information is further absorbed by participants (Denise and Harris, 1989).

### 2.2.4 Teacher and Curriculum Influence

A teacher of curriculum bias may affect the way students perceive certain subjects. Critical education theorists look at the way that different learning systems have prioritized some school subjects over others. According to the critical pedagogy theory when some knowledge becomes more favored than others we see that some of the less popular subjects can become marginalized through a lack of education (Darder et al, 2009). In North America we see that science and mathematics are two subjects that are given a high priority in school, because it’s believed that these subjects will help support a booming society (Darder et al, 2009).
Similar to children, teachers also learn through experience. Unfortunately, the way the academic system has been moving toward a more streamlined education system that focusing on delivering many standardized tests and looking for uniformity (Bailey et al, 2010). This shift has eliminated much of the creativity that teachers used in their past lessons, as well as an overall less productive way to teach. We know that teachers are more effective when they are delivering material in which they have personal experience. The streamlining process of the government’s curriculum has been forcing teachers to explain concepts in which they may be unfamiliar (Bailey et al, 2010).

2.3.5. The use of media

It seems that the classic teaching model primarily consisted of “chalk and talk”, but it’s been shown in several different examples that variety in media can help keep students engaged in the material (Polman, 2000). Today we see that a variety of media is introduced into classrooms to help engage and involve students (Polman, 2000).

2.3.6 Visual Learning

Studies done in primary classroom have shown that students learn well through drawing pictorial representations of a topic introduced by the teacher. In some classroom exercises students are asked to draw images that are then used to facilitate discussion and understand new concepts (Lazaros and Spotts, 2009). In some cases, teachers have found it effective to lead activities where students draw and write summaries for illustrations,
this includes several different levels of thinking and learning in a single lesson (Lazaros and Spotts, 2009).

Similarly, studies done on education in the arts, particularly drama have shown that student involvement in theatrical performances developed an increased strength in the ‘actors’ reading skills (Rose et al, 2000). This shows how student education is often a multi-level process; often strengths in one subject (such as art or drama) translates into seemingly unrelated areas of learning (such as agriculture).

2.4 How Teachers Teach

2.4.1 The role of Facilitation

An important part of how students absorb new concepts is based on the way that the information is presented. Lecture-based classrooms promote students to become passive learners, on the other hand when teachers give students the reins in a more self-directed learning style, often students feel as though they’ve been left to fend for themselves and become frustrated (Polman, 2000). It seems that often the right balance of guidance and student exploration is through presentation of information to a community of learners (Polman, 2000).

Studies have shown that students require a certain level of expectation from the teachers. However, simply memorizing and repeating information is not an effective way for students to learn and absorb information permanently (Polman, 2000). It seems that when a teacher encourages students to create their own learning tools (an example: study sheets to use on future tests), students become better at evaluating how their environment
might be used to help them learn, and become more likely to focus on the bigger picture rather than pure memorization (Polman, 2000).

2.4.2 The importance of technology

In today’s society we are seeing the introduction of technology more and more into classrooms. Unfortunately we are seeing that despite that these learning tools have become readily available often they are poorly integrated into the lesson plans (Tondeur, 2007).

Successful use of technology is starting to be used in the classroom, and has been shown to be successful in putting information into context for students. For example, when students are unable to experience a situation in real life, technological simulation can be almost as good (Gussin, 1996)! Additionally, students become active learners (through a click of the mouse) teachers benefit, as many of the software programs are designed to require minimal teacher training (Gussin, 1996).

Studies on these learning programs have shown that learning time is cut by 50%, the retention of information increases by 80% and classroom costs can be cut in half through simple introduction of “edutainment” (Halal and Liebowitz, 1994). It seems clear that there are some major advantages to having technology in the classroom as a learning tool to engage students and improve learning.
**2.4.3 Teacher investment in material**

Biobuddies is a program designed to bring in outside “experts” to teach material to participants. Research done in the past has shown that teachers who are less confident in agriculture are less likely to teach farming in their class (Knobloch, 2008). In contrast, teachers with a strong agricultural background felt more comfortable presenting the information to their students. Furthermore, it was shown that when teachers did decide to teach agriculture in their lesson plans, often they presented concepts that align with their personal epistemological beliefs (Knobloch, 2008).

In past studies, when new teaching tools were introduced to the schools they were rarely successful if they required extensive training for teachers (Fauske and Raybould, 2005). To encourage teachers to adopt new teaching aids, there must be a clear benefit that shouldn’t be overly complicated to implement (Fauske and Raybould, 2005).

In studies done looking at the success of farm-to-school initiatives, it was shown that success in the program was directly influenced by the overall enthusiasm and passion of the teacher who was presenting the information (Bagdonis et al, 2009). The way that information is presented to children will be strongly related to any personal bias that their teacher may have toward farming. Children will model their feelings toward agriculture accordingly.
2.5 Parental Influences on Learning

The way in which a child learns and develops is partially shaped through academic experiences in school, but a large portion of their learning takes place at home. There are several factors that take place in the home that we would naturally expect to shape the child’s capacity to learn.

2.5.1 Parental Involvement

Although parental involvement in a child’s education can be defined in many different ways, it’s agreed that parental interest and influence in their child’s education will reflect positively on student grades (Fehrmann, 1987).

In the study done by Fehrmann, it was shown that students who had more involved parents spent more time on homework, which then translated into better grades. Interestingly, the same study showed that families of a non-white ethnicity showed more involvement in their children’s schoolwork. Similarly, families of a high socio-economical class also spent more time involved with their children’s schoolwork (Fehrmann, 1987). This study shows how the home environment can influence student grades and learning.

It should be noted, that in the same study intellectual ability was not affected by parental influence, and daughters typically had more involved parents than sons (Fehrmann, 1987).

In studies done on primary aged children, it’s been shown that students who entered school with good literacy and social skills often preformed better and were able to learn more quickly (Hindman et al, 2010). Although it’s impossible for a researcher to
analyze all interactions between a toddler and parent, research suggests that the first few years of a child’s life will directly impact their vocabulary size and the way they can relate to other people, thus may help or hinder their ability to learn in school (Hindman et al, 2010).

Through a comparing different studies and different research it’s obvious that although hard to measure specifically, parents have the ability to shape the future in their child’s school-based learning.

2.5.2 Household Environment

In the new millennium the traditional nuclear family is becoming less common, as the definition of “family” continues to change! The home environment is a key player in determining how a child will develop in their primary years (before school age) and has also been shown to continue to impact learning ability even once the child becomes old enough to attend school. Interestingly, the study done by Iverson and Walberg in 1982, revealed that a family’s psychological environment was more important than the socio-economical environment to foster effective learning.

Supporting the findings is Mike Anderson, the curriculum leader for the Upper Grand District School Board. In an interview he noted that they’ve found in Guelph Ontario children who are first generation Canadians often help improve classroom academic averages, because of the hard-working family environment at home.

In contrast to the previous studies, there are also cases when the home may not be conducive to learning. Often teachers will give “family reading assignments” as homework. In many cultures this form of “family learning” isn’t routine, and therefore
parents are not as keen to participate (Fletcher-Campbell et al, 2009). This means that some children may practice and learn more at home than some of their peers. It’s been suggested in the literature that teachers should be sensitive to cultural differences, recognizing that parents may use different techniques to help teach their children at home (Fletcher-Campbell et al, 2009).

2.5.3 Parental Experience and Beliefs

In the study done by Bartram in 2006, data analysis revealed that often a child’s perception toward learning was influenced by a parent’s experience learning a similar subject. For example, when learning a new language was useful for a parent, their child saw the value in also learning a second language.

It was shown that ultimately, parents are able to influence opinions toward learning a new subject based on their own personal experiences. When parents show positive attitudes toward a particular subject often the same feelings are mirrored in their children, similarly for parents who attempted to learn a new subject without success this may impact their children’s feelings toward learning that subject (Bartram, 2006).

2.6 Investing in the Education of Children

2.6.1 Systems Theory

One of the most popular theories seen in the field of social science is systems theory. According to this theory, the behavior of a complex system can only be
understood fully by looking at an entire system holistically, rather than individual parts (Trevillion, 2000). Systems science looks at a network comprised of several smaller components and attempts to understand and how the different components are webbed together through relationships and interactions (Banathy, 1992).

This theory encourages conceptual linkages and an understanding of connections that may occur between individual systems and the same theory states that the system may change due to external forces or evolution within the system (Trevillion, 2000).

The Biobuddies program will follow the systems theory closely because the children will be working as a unit within the larger system of the Ontario society. Often we see that keen children leave school and share information learned with parents, or siblings. Through creating more linkages between the elementary school system and the agricultural community (as well as the university community) we can see that the foundation of the Biobuddies research relied on a systems theory approach to increase agricultural education across all levels of the Ontario population.

Biobuddies (Figure 1) included many different types of people. In order for the Biobuddies experiment to show changes in perception, it’s critical that all individuals involved in the research work as a system. Too often when activities for the classroom are designed, they neglect to consider the learning style of children (Aasen Heumier, 2010).
Figure 1. The different individuals involved with Biobuddies project.

The formal education system has shown that children have the capacity to be very good at making linkages between learned material. This is why, for years the educational system has used systems thinking to help teach children. By developing these cognitive connections, the children see how different subjects are mere puzzle pieces in a much larger system (Sweeney and Sterman, 2007). Unfortunately, systems thinking doesn’t come naturally to everyone, especially teachers. It’s critical that we consider ways to purposefully include systems thinking into the curriculum to help the children make learning connections.

2.6.2 Human Capital Theory

A second theory to consider is the human capital theory. This theory suggests that through investment in education we see people are empowered through an increased capacity of society. Economic growth and development have been residual results of installing a formal education process in communities (Olaniyan, 2008).
According to the human capital theory, people are empowered through education (Olaniyan and Okemankinde, 2008). It’s clear that economic growth and development are two of the positive outcomes generated through the education system (Olaniyan and Okemankinde, 2008).

Not only does education help increase an individual’s sense of self-worth, studies have shown that an increased investment toward education may help secure a stronger economic future for developing countries (Psacharopoulos, 1994).

The theory of experiential learning would be a way to deliver a guided curriculum to children, while encouraging them to explore and experience new topics. Combining the theory behind Human Capital Theory to introduce agriculture and then implementing an experiential program would be an ideal way to show children the new concepts at their academic level.

2.6.3 Constructivist Approach

The definition of “constructivism” states that knowledge is not found or discovered but rather is made by humans (Bailey et al., 2010). The problem with this theory is that if everyone is a constructivist, this implies that every person is constructing their own reality (Bailey et al., 2010). In the classroom this introduces the challenge where a student and a teacher may construct different knowledge, how would we determine which person was correct? To overcome this confusion in the theory of constructivism the idea of “individual psychology” has been created, labeling the learner as a person constructing a personal understanding for the material (Bailey et al. 2010).
This suggests that every person has the power to create his or her own understanding for information they are shown.

In today’s classrooms the idea of individual psychology of constructivism is very important to effectively teach students. Teachers must deliver the information to the students in a way that they can relate. Students accommodate what knowledge is presented to them and then successfully transfer this to learn a new concept (Bailey et al, 2010). If a teacher introduces a new idea to students when they do not have the proper foundation for the concept, students will not understand or learn what is expected.

In addition to having the proper ‘information scaffolding’ in place for students build their own knowledge, and often this process is thought of as an active process (Bailey et al 2010). It should be noted that there are several theorists who define activity differently, but the main principal is to encourage mental activity in the student (not necessarily requiring physical activity) (Bailey et al, 2010).

Unfortunately, one of the major problems seen today in schools is that the education system has been designed in North America to cover vast amounts of required material, leaving little room for feedback from the students. As a result, the majority of the class time focuses on answering specific questions, or full-filling required assignments, leaving little time for the students to shape their own learning through different means such as exploration (McLaren, 2007). Perhaps the way children learn is through more of a constructivist approach, and they need to be given the time and opportunity in the classroom to work through experiments and learn individually (Chaille and Britain, 2003). To empower the students the teacher should talk with the students rather than at the students (Shor, 1992).
Currently in Ontario there isn’t a program designed in the school system that will formally teach agricultural education to students in a constructivist manner, this research project will confirm if this new angle on agricultural education can help increase interest and understanding for that particular scientific stream.

The constructivist theory states that although often the hands-on approach supports this style of learning, hands-on activities alone are not enough to classify a lesson plan as constructivist. Although the means by which the children are learning is important, the context in which the information is obtained from can be equally as important. For example, a child must understand how concepts fit into the bigger picture (Chaille and Britain, 2003). The Biobuddies program aligns perfectly with this theory, since the topics addressed with the children connect directly with their everyday lives, and therefore even after the classroom lesson is complete students may go home and continue to think about agriculture and how it affects them on a daily basis.

2.6.4 Summary of Learning Theories

It is our opinion that by enhancing investment in agricultural education in children at the elementary school level through the curriculum, will build human capital and knowledge, encourage children to use systems thinking, and empower them through experiential learning. This will ensure real success in teaching agricultural concepts.
2.7 Conclusion

After reviewing the literature it seems that society has a very strong (and largely uneducated) opinions toward agriculture, ironically stemming from the urban people. It’s obvious that farming affects us all daily, and therefore an increased awareness and respect for agriculture should be promoted among the Canadian people.

Through analysis of the Systems Theory it’s shown that treating Canadian youth as a system may be an effective way to reach out to both children and adults, since the different systems will interact with each other. However, it’s important that we recognize that teaching children is not so simple, and involves several different issues. One of the major challenges when designing learning programs is to do so in a way that is sensitive to people of all ethnicities and socioeconomic backgrounds. It’s also critical to consider a teacher’s delivery of material and finally recognizes any attached stigma that may have been introduced through the media. This chapter explored the how these stipulations can alter a child’s learning experience.

After a thorough examination of those factors, we discussed the main social science theories that should be considered when developing a learning-based program for primary aged children. Systems theory, Human Capital Theory and the Constructivist Approach are all very important theories that have shaped learning, with a particular interest in pedagogy, or child-based learning.

The Biobuddies program has been designed according to these recognized theories and therefore shows real promise to be an effective way to alter and expand the current perceptions that Guelph children have toward farming.
3.0 Methods

The research for this project focused on the agricultural perceptions in primary aged elementary school children. In particular, this study researched the current feelings toward farming in the grade two population of Guelph Ontario’s public school students. This chapter outlines the basic methodology used to collect the data for this research project, as well as the techniques used to determine the sample size and analytical methods employed to test the data.

3.1 Research Design

The “Biobuddies Project” is a case study design and primarily exploratory in its nature (Yin, 1996). Currently, agriculture is introduced briefly in the science curriculum to elementary level students but to a limited degree (The Ontario Science Curriculum). For this reason, an exploratory study designed to reach as many students from different neighborhoods and classrooms was deemed to be the most effective way to have a complete picture of how grade two students of Guelph, Ontario view “farming”.

A case study approach was chosen for this research, taking a holistic approach (Yin, 1996). However, this study did limit the case studies to the Upper Grand District School Board (UGDSB), and primarily studying the schools within the City of Guelph. This research project was designed specifically to enhance the grade two science curriculum, and thus the presentation delivered was at the appropriate grade two level.
Each presentation session conducted had data collected and analyzed as a single unit of study. This allows for comparisons may be made between the different case studies and may strengthen overall results found in the data collected (Yin, 1996).

This study used a mixed methods approach. When working on human subjects combining both qualitative and quantitative data may strengthen the findings of the research. For this project we collected both deductive and inductive data, which is well suited to a mixed methods approach (Bryman et al, 2008). This project used a combination of open-ended and close-ended, which allowed for subjects to express themselves more openly on the survey sheets, while balancing the results with enough conclusive answers found through the close-ended questions.

All student participants were given identical survey questions, with wording that was age-appropriate. This helped eliminate potential bias and confusion for the research participants (Palys, 2003). The same considerations were made for teachers, to help strengthen the findings of this research through allowing comparison between the classroom data sets. Comparisons among case studies will strengthen the findings of the research (Yin, 2003).

3.1.1 Research Intervention

The focus of this particular research project was to understand what perceptions currently exist toward farming at the grade school level and evaluate how those opinions may change after children participated in a special agricultural related session. The “Biobuddies Program” was designed to align with the current Ontario science curriculum and act as an enhancement to the regular lesson, through offering the required curriculum material taught from a new angle.
Upon initial entry to the classroom the researcher was introduced as “Scientist Alison”, and came dressed in a white lab coat. Using the white coat helped to engage the children and get them excited to learn something new from what they picture to be a “real scientist”.

Before going into depth in any of the activities the researcher administered the first portion of the student survey sheet.

3.1.1.1 Student Survey Sheets

Each student participant was given an individual (and anonymous) survey sheet (See Appendix B). This survey asked three open-ended questions, as well as allowed creative expression through drawing images of “farming”.

These surveys were administered to group by the researcher. Inviting the students to complete the survey with the supervision of the teacher and the researcher helped to ensure a high-level of response rate from participants (Palys, 2003).

When providing the students with the survey sheet, the researcher explained to the primary-aged students that spelling and “correct” answers on their survey sheets would not be graded. The children were told that all children who “tried their best” would obtain a special prize. This small incentive helped to motivate everyone to complete all survey questions, and in a timely fashion. The students were not aware that their survey sheets were intended for research purposes, but they did understand that as a guest teacher, the researcher was interesting in knowing what their opinions were.

The first portion of the survey was intended to gauge initial perceptions of farming. Students were asked to think and work independently to ensure that each submitted form was reflecting one particular child. Upon completion of the first segment
of the survey, the researcher instructed the student participants to set their sheet aside and participate in the classroom activities.

For the next hour, the researcher delivered a series of activities and taught some new concepts to the children. Depending on the space available in the classroom, the students either remained at their desks or would most often collect in a circle on the floor to work together discussing and learning the new material about farming.

3.1.1.2 The Presentation

The presentation delivered to the students was designed to be interactive and different from regular classroom lessons. The session delivered was geared toward the primary school age group, and thus was comprised of several different “stages” within the hour’s session. When working with young children, often it’s more effective to present information briefly, and with a hands-on approach so they stay engaged and interested. According to Jonassen and Strobel 2006, ‘meaningful learning’ is a more effective approach to teaching students and focuses on allowing the students to understand how concepts directly relate to themselves.

Several different aspects of poultry farming were covered during the session. To reduce experimental error, the researcher attempted to deliver the information to students in the most uniform way possible. However, classroom logistics (or a more challenging group of students) sometimes required modifications to the standard presentation format.

Overall the following topics were covered within the presentation, specific information on presentation delivery can be found in Appendix A.

1) Introduction and discussion of the word “agriculture”.
2) Recognize the importance of farming, and how it affects us daily.

3) When a projection screen was available, screening OFAC’s Virtual Farm Tour DVD to serve as a visual of local poultry farms. Students and researcher would compare and contrast the Broiler and Layer Barns.

4) Discussion of how machines available may help modern-day producers maintain healthy and happy birds.

5) Group discussion and collaboration about how eggs move from the farm to the grocery store. Further, introduce the idea of why grocery store eggs will not hatch when kept warm.

6) Following the differences between an edible egg and a fertilized egg, students were introduced to how the inside of a fertilized egg changes over the three week development period.

7) Students were introduced to the process of ‘candling’ and were then invited and participated in an ‘egg-speriment’, which includes building their own candler. For the final stage of the experiment the students had the opportunity to use their candler to look inside a plastic egg (provided by the researcher) and discover what letter had been hidden inside of their egg.

3.1.1.3 Final Survey Segment

Once the presentation was completed students were asked to return to their individual work-stations and finish the remaining two questions on the survey sheet in which they had initially been working.
The final two questions on the student survey were also open-ended and more reflective in nature. First, the survey asked students to reflect on the presentation and state one new fact that they had learned. The second (and final) question asked students to state if there was anything they would like to learn more about in the future. These open-ended questions were designed to understand which information the students remembered the most in the hour session, as well as see if students would express an interest in learning more about agriculture (and if so, what about agriculture in particular would they like to know more about).

All students were asked to fully answer the remaining questions, and think critically about their answers before submitting surveys to the researcher. While collecting the data from the students the researcher made sure to re-read the answers (often words were spelled phonetically and therefore may be a challenge to decipher) as well as discuss with the student specific details about what was written, to ensure that the written words were understood by the researcher. This was important for the post session coding process. Individual students who were struggling to answer or write their thoughts received extra support from the classroom teacher or researcher to guarantee that all survey sheets could be collected in a timely manner.

Upon successful submission of their survey sheet, the students were awarded their prize donated by OFAC. Each student received a large farming activity poster, which students could work on independently while the remaining students continued to complete the survey sheets.
3.1.2 Teacher Survey

In addition to the student survey, data collected was from each classroom. In many cases the teacher who was present during the session was not the regular classroom teacher. However by asking for the teacher’s opinion, the researcher was able generate statistical findings based on the teachers’ professional opinions.

The Teacher Survey (see Appendix C) was administered to the teachers toward the end of the session, this ensured that the lesson had been fully completed, and the answers given by teachers would reflect the entire presentation.

Since the survey was administered by the researcher, it was important to mention to teachers that honest answers would not reflect any marks or negatively impact the researcher personally. The researcher expressed to teachers that it was important to answer the survey questions honestly.

In contrast to the student survey, the teacher survey was comprised mostly of close-ended questions and a series of Likert scale questions. However, there was opportunity at the end of the survey to add additional comments. The data collected from the teachers was to be tested primarily in a quantitative nature, due to the lack of additional notes in the “comments” portion of the teacher survey. Qualitative analysis done was based on the conversations and observations made by the researcher.

3.1.3 Sample Size Determination

This study used a non-random sampling method and participants were invited to partake based on a snowball sampling technique.
The Upper Grand District School Board (UGDSB) worked along-side the University of Guelph to conduct this research project. With the help of the Science Curriculum Leader, a mass e-mail was sent to all grade two science teachers in the city of Guelph Ontario. Candidates received a brief electronic poster that highlighted the program while providing the contact information for the researcher, Alison Brock (see Appendix D).

Interested science teachers had equal opportunity to contact the researcher and set up an appointment to have the session conducted with their classes.

This sampling method was the most effective for a study of this nature since class schedules, lesson plans and other commitments are different from one class to another. Direct contact with the researcher allowed for the teacher and researcher to agree on a pre-planned date.

The cohort used for this study was grade two students. When agreeing to participate in this study, the UGDSB requested that the research presentation should align with the current Ontario Science curriculum. In grade two science, students learn about animal life cycles, which seemed like a good fit to introduce some basic agricultural concepts.

3.1.4 Date of Study

The UGDSB requested that all research be done after the month of September, to allow for teachers to establish routine in their classrooms. As a result, once both the University of Guelph Ethics board approved the study, as well as the UGDSB had cleared
this project the participants received notice of the project October 10, 2011 and data collection began shortly after ending on December 13th 2011.

3.2 Ethical Treatment of Participants

As always when working with human subjects it’s important to consider how the participants may feel before, during or after their involvement with the study. Ethical consent was required on two levels for the Biobuddies project, both from the University Ethics Board as well as the Research board through the UGDSB.

3.2.1 Informed Consent of Participants

There was concern that it would be difficult to obtain informed consent sheets from parents and guardians to allow their children to participate in the research project. Often, children forget to sign and return forms to their teachers, and excluding a child from the presentation who had simply forgotten the signed form could raise other set of ethical issues.

Considering all the potential limitations when working with children, the researcher worked with the University of Guelph Ethics board to design a method of using passive consent for all participants. A week prior to the scheduled presentation date, teachers distributed the appropriate consent form to all students and asked them to bring it home to their parents (See Appendix E). Parents were invited to contact the researcher directly should they have any questions or concerns or wish that their child not participate.
3.2.2 Ethical Data Collection Methods from student participants

This study was both challenging and interesting to design in terms of ensuring proper ethical practices. Due to the high-volume of children involved in this study it was a challenge to create a data collection method that would promise a high response rate. As a researcher, it was simply too risky to rely on hundreds of eight year-old children to complete and return their survey sheets. Another problem was trusting the students to work on their survey sheets at home, it would be uncertain if the student had extra help to answer the required open-ended questions.

As a solution, the researcher provided time within the classroom session for students to complete and return all survey sheets. As an added incentive for the children to thoughtfully respond to the open-ended questions, there was a small prize (a poster and stickers) awarded to each child. Every participant in attendance was awarded this small token of appreciation, regardless of the quality of survey returned to the researcher.

All participants were supported if they required extra help to complete the survey, as well as during the presentation segment of the research. While working with children it’s important to remain sensitive to their feelings, and recognize that although the research is conducted among a homogenous age group, each participant is faced with a different childhood, and their experiences, feelings and thoughts are unique (Kirk, 2007). As a researcher it is important to respect every child’s personal boundaries and recognize when a certain request seems challenging or uncomfortable (Kirk, 2007).

Should a student wish to withdraw during the session, they were able to do so without penalty, and their classroom teacher would re-assign a new task for them. The
Biobuddies presentation delivered to the students was specifically designed in a way that would invite discussion and collaboration among the children throughout the session, since another key component of ethical research involving human participants is to foster an open and welcoming environment (Wester, 2011). No child was ever singled-out or targeted based on their ethnicity, ideas or opinions.

3.3 Analytical Framework

The nature of this project uses a systems-theory approach to uncover the results or changes seen through introduction of the Biobuddies program into the Guelph classrooms. It’s important when doing research in the schools to recognize that this environment is a complex system in itself (Keshavarz et al, 2010). While conducting the research for this study data was collected at several different levels to help capture information from different aspects within the school system.

The educational system can become a very complex, and political system to study (Keshavarz et al 2010). Systems thinking explores patterns and relationships while recognizing that due to the social nature of the theory there are bound to be inherent randomness and unexpected outcomes (Morgan, 2005). For the purpose of this study that aspect was not explored, the different levels of study for this project can be seen in Figure 2.

This study focuses primarily at the teacher and student level to understand if introduction of new agricultural lessons were received positively by students.
3.4 Data Analysis

Using the systems theory as a framework for this project a combination of qualitative and quantitative techniques were applied to analyze the data. Quantitative data was analyzed through examination of the frequencies of codes chosen by the grade two students. Qualitative observations were made by the researcher and recorded while working in the classrooms.

3.5 Strengths and Limitations

3.5.1 Case Study and Mixed Methods Approach

There are several advantages and disadvantages to using a case study approach when doing social science research. Similarly, combining qualitative and quantitative
levels of analysis may broaden the scope of the research however, that often comes with some limitation.

When looking at case study research one of the major limitations is that statistical findings are often reliant on the case study’s environment (Yin, 1996). As described earlier, Guelph, Ontario is recognized to have a strong agricultural history, and therefore the children within Guelph may have a stronger farming background than children living in a different part of Ontario.

In contrast, the high volume of participants in this study strengthens the data. It’s important to note that school locations within Guelph was not a limitation when sampling, and all geographical aspects of the city were covered in this research project.

A final place for potential research bias in this multiple-case study research approach is that each classroom who participated in the research project was unique. Thus replication of the environment for each experiment was challenging (Yin, 2003). Although the researcher attempted to replicate the experience as closely as possible from one class to the next sometimes time constraints or classroom management issues made this difficult.

Data analysis for this study used mixed methods techniques. Often when using mixed methods researchers will use numbers as the “divide” between quantitative and qualitative data (Maxwell, 2010). The challenge for this is often that we see numbers introduced to the data, with little meaning or context. Proper application of a mixed methods technique employs both qualitative and quantitative questions within the same study. Both methods must be actively working together when using a mixed methods design (Creswell, 2003).
3.5.2 Data Collection Method

Despite the best efforts made when designing the study there will inevitably be some limitations to the data collection methods. This study relied primarily on researcher observation, teacher surveys and student surveys as the three ways data was collected.

The limitation of the researcher observation lies in the possibility that there may be some inherent bias from the researcher’s perspective due to a vested interest in the study. Additionally, the results of the experiment depend largely on the way the presentation is delivered to the children. If the presenter was chosen from a random group of volunteer individuals perhaps the results of the study may have been different.

The researcher made observational notes for each case study while working in the classrooms. These notes reflect a snapshot of that particular case at a certain day and time. For example, on Halloween morning the classroom visited was more excited than usual and dressed in costume. Had the researcher visited that same group of children the day before, the overall impression of the class may have been very different. Fortunately, observations were made directly after visiting the classrooms, which helped keep each case study’s picture be complete and accurate.

There were two different surveys used as data collection tools for this project. One survey was distributed to teachers, and the other to students. The researcher did stress to participants that honest answers were important, however there is always the risk that some individuals may have attempted to answer the survey questions with what they may think of as the “right” answer rather than answer with an honest answer.
The final limitation to this study is linked to the age group chosen for this study. Some children may have been limited in their ability to express themselves in writing. Due to the high-volume of participants one-on-one interviews were not feasible. It seemed that creating an age-appropriate survey was the best way to sample this larger population. To help account for any difficulties the children may have had, the researcher circulated the classrooms while children worked independently on their sheets. This allowed for the researcher to clarify answers with those that seemed to be struggling to write as well as elaborate on any answers that seemed to be short.

In conclusion, it’s clear that every study has strengths and weaknesses. Recognition of where the potential limitations may be helped maintain the validity of the findings within the data. Systems theory recognizes potential bias that occurs while working in a socially driven study, and this has helped to maintain validity in the Biobuddies project (Morgan, 2005).

Chapter Four: Results

4.0 Introduction

In an attempt to obtain a robust sample population that would be representative of grade two students in urban centers in Ontario we selected a convenience sample from the region around the City of Guelph. Sixteen of twenty-four elementary schools, in the City of Guelph Ontario served as the data source for this report. While working in the classrooms data was obtained in several ways; surveying the teachers, the students and through direct researcher observation.
4.1 Sample Population Overview

A total of sixteen schools within the Guelph’s city limits participated in this study. In many of the schools there were multiple classes who expressed an interest in participating, and therefore a total of thirty classes contributed data to the final analysis.

Every child who participated in the presentation completed and submitted their survey to the researcher. In total, we collected 655 surveys from students. The total population of grade two students in Guelph was 1100 (Anderson, 2012). Fortunately with a large sample size we are able make some observations that reflect a large fraction of the grade two population. However, due to the nature of the snowball sampling technique used, we are unable to generalize to the entire grade two population of Guelph Ontario.

Additionally, all teachers involved in supervising the presentation were asked to complete a teacher’s survey. It should be noted that the total sample size of the teacher’s population is difficult to determine, as many of the teachers were substitutes or taught only science. The findings from these teacher questionnaires are mainly to indicate general trends and overall impressions of how the students responded to the presentation as well as provide an outlet for teachers to voice their opinions (as experts) showing how a similar program may best be delivered to fit the needs of the curriculum and all stakeholders (teachers, students and parents).
4.2 Initial Perceptions

4.2.1 Initial Student Perceptions

After the initial introductions were made students were instructed to complete the first part of their survey sheet. Students were asked to think of the word “farming” and then write down in the space provided what came to mind. The purpose of this question was to act as a baseline to provide initial agricultural perceptions in the grade two population. The researcher made notes of the general trends in the data collected, but also worked directly with students as they completed their work individually.

Often students claimed that they “had never been to a farm!” or that they “didn’t know what farming means!” When the researcher noticed particular students were struggling, they were encouraged to close their eyes and imagine being on a farm. This form of simple guided imagery often sparked the more hesitant children to write something down.

In contrast, there were a select few who claimed to “live on a farm!” but when faced with the word “agriculture” there were very few students who were able to successfully recognize or define this word.

When working with the students, it seemed that most often they relate to animals when they hear the word “farming”. Many students identified particular species (cows, horses and pigs being the more popular ones) but there was also a trend toward the idea of “caring for animals”.

Another common theme within the student’s initial perceptions was the idea of “hard work”. It seems that the students recognize that farming is not an easy job, and that “caring for animals” is a big responsibility, though few students mentioned the idea of food for human consumption, or plant agriculture. When analyzing the data it was common to see an illustration of the stereotypical big red barn with a fence line containing a few choice animals.

Often, when students included the “plant” or “food” code on their survey sheet it often made reference to an experience that they may have personally had. For example, several children thought of ‘apple picking’ when they were asked to define farming. Perhaps this is because they had gone to a local orchard with their parents, and considered this as their true farming experience. Students were also more likely to mention plant agriculture through incorporating words like; crop, plowing or cultivation. It seems that at this young age, children are excited to expand their vocabulary and occasionally were keen to demonstrate their knowledge.

4.2.2. Quantitative Results of Student Ideas on “Farming” Prior to Presentation

The codes chosen to analyze the student data was designed to look at the different common aspects that children would associate and use to define the term “farming”. The idea of plants, farm building structure, human influence, animals and food were five different categories considered when analyzing the student data collected. After running the frequency analysis it was seen that the most popular category chosen by the grade two students was “animals”, with a mean value of 46.14. All other codes were fairly close in
overall frequency (plants = 11.76, structure 12.54, food 13.15 and human 16.32) (See Appendix F).

The quantitative results show that Guelph Ontario’s grade two students have a narrow view toward farming. When asked to define “farming” most often they provide examples including animals more than any other aspect of farming.

4.3 Qualitative Observations During the Presentation

Prior to the data collection process, the researcher had very little experience working in the community of Guelph Ontario. It was interesting to note the amount of ethnic diversity among some of the schools, as well as how regardless of the socioeconomic backgrounds or ethnicity, one thing remained fairly consistent; our children do not know very much about agriculture, industry production or reproduction.

It seemed that regardless of race, grade two students had similar initial perceptions and understanding of farming before their presentation date. The most significant difference identified was the ability for students to express the information they knew, on paper. It was clear that in some schools the students were more academically advanced than others. Surprisingly, the ability to write a full sentence appeared to be easier for children on the North-East end of the city while children closer to the core of Guelph generally found it to be a real challenge.

Although notes were made after each classroom visit (with particular attention to the way the students and teacher interacted as well as the overall impressions from the school structure and community) each group of students were unique. This posed a challenge for the researcher to present the information in a uniform way. However,
despite the small variance in presentation lengths and varied teacher support, in general
the teachers and students were keen to host a “special presentation” in their classroom.

A large portion of the presentation was dedicated toward group brainstorming and
discussion (this allowed for the researcher to gauge what the students knew). During this
time some themes that surfaced were the personification of animals.

When challenged to think about why some eggs may not be fertilized, one student
suggested that “the Mommy and the Daddy chicken were not married and that means
they can’t have babies in their eggs.” To help teach some of the key concepts (such as the
chicken living arrangements and the different aspects of the poultry industry; layers vs.
broilers) it was often helpful to use animal personification, as this seemed to be a way to
keep the information at a child’s level and helped them feel as if they could better relate
to the birds. For example, to teach the difference between the Layer birds that provide
eggs and the Broiler birds that are bred for meat the researcher explained that “Like
people, animals have jobs. Who can describe what a chicken’s ‘job’ might
be?” Additionally, showing the virtual farm tour images of the battery caged birds or the
busy broiler barns may upset children if not presented properly. The researcher noted that
when the children understood that “chickens like company, and often live with many of
their brothers and sisters” they seemed okay with the concept and understood that large
farms are required to feed large populations. The researcher was careful to keep the
information at the proper grade two level in all classes.

The researcher also observed that several children (in many different classes)
were surprised to learn that the agricultural industry is designed with mostly single-
species farms. The children were surprised to learn that their eggs come from a farm with
only chickens, it seems most children thought that industrial farms followed the traditional “Old MacDonald’s Farm” multi-species design.

4.4 What the Students Learned

4.4.1. Qualitative Results of Students’ Learning

The Biobuddies presentation was designed in a format that introduced several different themes, keeping the presentation fast-paced and interesting for the students. Some of the main ideas explored in the hour’s seminar included: describing how to properly care for a chicken, the life cycle of a chicken and how the inside of the fertilized egg develops and finally discussing what the actual poultry barns look like.

After the students participated in the seminar, they were asked to complete the remaining questions on their survey sheet. In this second portion of the survey they were asked to state a fact that they had learned during the presentation. Many students required some additional support to spell some of the new words, and this provided an extra opportunity for the researcher to help converse with the students about what they enjoyed learning the most.

Again, to ensure that the information was at the appropriate level for students, the researcher started the discussion about egg fertilization by asking if anybody had previously tried hatching some of their own eggs. In each class there was always roughly one student who admitted to attempting this impossible feat, yet the children all seemed to understand that hatching an egg from a grocery store’s carton would never work.
It may be hypothesized that perhaps parents have told concerned children that eating eggs does not result in killing unborn chicks. Yet, it still seemed that in most cases, parents have left out the scientific details about fertilization. To engage the children and solve the mystery (as well as allow the researcher to understand the scientific theories that surface in a grade two mind) an open-discussion about the *whys* behind our chick-less grocery store eggs began. Some of the more common theories included:

- Special chemicals used by farmers will help eliminate chicks inside eggs
- There is a special type of chicken that lays eggs without chicks inside
- The eggs are kept too cold on the farm, which either freezes the chick or makes it disappear
- The eggs are cooked before they go to the grocery store so the developing chick would die.
- The eggs are “unfertilized” (although often when this word was used, the student wasn’t able to elaborate very much on what that meant).

Perhaps it’s this element of mystery in the magical egg, that captured the interest of the students. As shown in the quantitative results (below in section 4.4.2), most classes were most interested in learning about “chicken development”. It was observed by the researcher that even in the most rowdy classes, the children seemed to really show an interest in learning about the inside of a developing egg and understanding where the adorable fuzzy chicks come from. Additionally, they enjoyed developing their own
candling tool (which I’m sure many children believed they’d use again, perhaps on a real egg).

When technology in the classroom permitted, OMAFRA’s Virtual Farm Tour DVD was used as a visual aid to help show children a comparison between layer and broiler barns. The results showed that classes of students who had the opportunity to view the DVD were more likely to mention the “farming system” theme when reporting an interesting fact that they learned through the presentation. Often in the classrooms that viewed the DVD, there were many comments made about how interesting it was to learn that there are farms specifically designed to house chickens. Quite often the students were surprised to learn that their grocery store eggs come from farms that often keep thousands of birds at one time.

Additionally, several teachers had questions about the farm structure as well as how the chicks develop in an egg. Qualitative observations indicate that passion for learning about the hatching process and animal life is something that both adults and children are interested to know more about.

4.4.2. Quantitative Results for What Children Learned

After the hour presentation the students were asked to reflect and record on their survey what they had learned. The major themes covered in the presentation were coded by the researcher and recorded after the data sets were collected.

Using the SPSS computer data analysis software we found that the most popular concept learned after the presentation was about chicken development. The mean frequency across the Guelph classrooms for chicken development was found to be 41.28,
followed by farming system at 29.93 then uncategorized student observations at 20.14 and finally the least mentioned topic by the students was about chicken nutrition at 8.62.

The children therefore showed a much more diverse appreciation for farming and the Guelph Classrooms showed an overall equal distribution in learning about the chicken development, the chicken nutrition, the farming system and other non-chicken observations (categorized as “random”). This is different from the initial opinions on farming where there was a strong tendency among students to consider farming as being specifically to animals, and all the other categories were not significantly different. The results from this study showed that when the students are shown new information some became more interested in the other aspects of farming that they perhaps they had no prior exposure to.

4.4.3. Paired-Sample T-test for Farming System

When looking at the student responses before and after exposure to the Biobuddies program there seemed to be an overall increase in the frequency of students that mentioned the idea of the overall farm structure, or agricultural systems. Before the Biobuddies session the mean frequency of students that included the farm structure in their description of a farm was 12.54%, however when asked after the program about what they had learned the popularity for the farm structure increased to 29.93%. Upon application of the Paired Sample T-test with SPSS analysis we can see that there is a significant difference between these means (p=0.00), and therefore the Biobuddies program did increase overall awareness for the farm structure.
4.5 What Would Students Like to Learn Next?

4.5.1 Qualitative Findings on Students’ Interests

As a final question on the student survey the children were asked simply to fill in the blanks to the statement “I’d like to learn more about…”. Unfortunately quite often at the end of the session time was limited, however a final attempt was made to gauge what the students are most interested in learning about next. Students were asked to be as specific as possible when responding to the question, and it’s therefore no surprise that occasionally some creative answers surfaced.

Most children did reply to this question showing some level of interest in learning more about agriculture. However it is difficult to judge if perhaps the students were under the impression that a ‘correct’ answer to the question would include the idea of farming. In conclusion, the data does suggest that in general, the grade two students of Guelph Ontario are curious to learn more about farming.

Some popular answers that came up included;

- “Learn more about cows.”
- “Learn more about chickens.”
- “How do chickens take care of themselves? How can a farmer tell if his chicken is healthy?”
- “How do eggs get fertilized? How do the eggs form in the hen’s body?”
- “What comes first? The chicken or the egg?”
- “I’d like to learn more about free-range and organic eggs”
- “How did the mama teach them to walk?”
- “The life cycle of chickens”

Students were excited to learn more about food-animal agriculture, especially about the life cycles of different animals. In the primary science curriculum there is a unit on animal Life Cycles, which may indicate why the students were so keen to know more. Students were enamored with the idea of baby animals and how they must be cared for, they were really curious to know more about the entire process of a chick’s life, from how the egg is formed inside the hen till right after it cracks through the shell.

Despite the strong findings supporting an interest in agriculture, there were students who want to learn about other (seemingly) unrelated topics. A few examples mentioned by the grade two students included;

- “Automotive engineering”
- “Leopards”
- “Reptiles”
- “Volcanoes”
- “Cats”
- “Dogs”
- “Potions”

Often students who expressed an interest in learning about a topic unrelated to agriculture still showed an interest in learning about animals. This idea would support our findings from the second question on the survey; the majority of the grade two students found topics that included examples about animals are the most interesting to learn about, and the children are therefore more likely to retain and remember that information.
Every class showed that majority of children wanted to learn more about farming, and through qualitative analysis of the results the curiosity levels seem to be high, with an interest in all the different aspects of farming.

4.5.2 Quantitative Findings on Students’ Next Steps

As a final reflection the students were asked to reflect and report on their survey sheet what other topics they would like to learn about. It seemed that many students responded with a farming example, in an attempt to answer “correctly”. However, most children did provide specific issues that were agriculturally related which were of interest to them. Data analysis of the surveys revealed that the majority of Guelph Ontario students showed a strong interest in learning more about farming. Overall the mean for students who were coded to answer “farming” was 80.56%, students who provided an answer that was not agriculturally related was 16.12%. Finally there was a small group of students who answered with a response that was related neither to farming, nor another topic, these students were coded as “random” and they were 3.29% of Guelph student participants.

4.6 Teacher Results

4.6.1 Researcher Observations on Teacher-Student Relationships

While working in the classrooms it was evident that each group of students had a different student-teacher dynamic. The teachers who had a good rapport with students
often helped the researcher by offering suggestions on how their students will learn best during the presentation.

It should be noted that on occasion there were substitute teachers, or part-time teachers who worked with the class. It was observed that in these classes the teachers were less invested in how much the children absorbed during the presentation. These teachers were also unable to offer advice on how that particular group of students would learn best.

Regardless of whether the supervising teacher was the permanent teacher or not, across the board this study showed that the teachers of Guelph, Ontario thought that addition of the Biobuddies program to the school system would be very beneficial. While talking with some of the teachers individually they mentioned that they felt their students knew little about farming, and in particular where their food comes from. Additionally, some of the teachers from working-class schools mentioned that they felt often their students left school in the afternoon and had few extra-curricular planned. These student would never visit events such as the College Royal open house at the University of Guelph. The same teacher expressed that often parents of children within these neighborhoods don’t involve their children in any out-of-school learning experiences. She expressed that by bringing the agriculture to the schools they would be able to show more children to agriculture in a way that wasn’t reliant entirely on parents.

4.6.2 Teacher Survey Results

The purpose of the teacher survey was to collect information on student abilities from an educational expert. Since each classroom presented a unique set of challenges
and strengths it was very valuable to get insightful information from the classroom teacher. From a research perspective, it’s important to understand the general idea of how each class typically learns new information. Through using the teacher as a gauge, the researcher was able to understand if the student response to Biobuddies was typical or if they seemed more engaged than they would be in an ordinary science lesson.

Teachers were asked on their survey to rate their students’ prior knowledge of agriculture. Although there were some teachers who felt their students had a strong background in farming, the majority of teachers did not rate their students as ‘agricultural experts’. The survey sheet used a Likert scale (rating answers on a scale of 1-5) (Trochim and William, 2006). Five was the highest possible score, and one was the lowest. Figure 3 depicts each classroom teacher’s response to the question on initial perspective. Interestingly, none of the teachers rated their students with the highest possible score, a five.
Figure 3. Teacher rating on Student Agricultural Knowledge

The most popular rating among the Guelph Teachers was a 2, which shows that most teachers feel the grade two students do not know very much about farming.

Another question on the teacher survey that provided some interesting results was looking at an educator’s confidence in teaching farming to their students. Although there seemed to be some variation in the overall comfort levels, researcher observations suggest that teachers do recognize the importance in learning about farms. One teacher responded on the survey; “I’m not terribly confident now, but I’m a quick learner”. This was a sentiment shared among many of the teachers. Currently, in the elementary school
system teachers are somewhat a ‘jack of all trades’ and often must teach subject material out of their comfort-zone. Many teachers expressed that if they were provided with enough support they would be able to include agriculture into their classroom lessons more easily.

The Figure below, Figure 4, shows the results to question 5 on the teacher survey (See Appendix C). The question specifically asked teachers to rate their confidence in their ability to teach farming to students on a Likert scale. The teachers were able to rate their feeling from one to five, with one being the least confident. As Figure 4 shows, half of respondents felt fairly comfortable to teach agriculture while the remaining teachers were split between those who considered themselves as experts and those who felt they were unfit to teach farming.
As mentioned earlier, the majority of teachers did show an overall willingness to include farming into their science curriculum if the teaching material was made available, or if there was a volunteer to run a program similar to Biobuddies.

Finally, when the teachers were asked on their survey if a program like Biobuddies would be a good addition to the curriculum the scores came back as a resounding “yes!” Some of the teacher comments included;

- “The presenter was very knowledgeable about how to present material to grade two students.”

- “The students were engaged, and left today with lots of new facts.”

**Figure 4.** Teacher Confidence in Teaching Agriculture
- “Wonderful presentation- scheduling more time would have solidified concepts and allowed for final q &a.”

- “The presenter was fantastic with children, well prepared and organized.”

- “Could have had more variety of farms, free range too!”

- “Great presenter and fun activities. I think a next step for my students would be to clap the words with longer syllables and do more activities to learn the materials.”

- “Thank you for giving the class such an interesting experience.”

The positive feedback would suggest that overall teachers feel that the Biobuddies program is an effective way to teach agriculture at the grade two level. It was noted on a few occasions that more time and a broader look at farming would be beneficial. The teachers noticed that their students were interested in learning more, and a few suggested devoting some extra time at the end of the session specifically to answer student questions.

Finally, the teachers noticed that the students enjoyed building their own egg candlers that they were able to take home. Some teachers suggested including images of an industrial-sized candler. In one particular class while the children were working on decorating their personal egg candlers the projection screen showed images of a farm candling their eggs. This was well received by the students, they were excited to see the life-size example of what they were building.

Based on the findings from the Teacher Survey, the Biobuddies program was considered very age-appropriate. The presenter was able to manage a group of grade two students effectively, and maintain their interest for the entire session.
4.7 Conclusions

In summary, both researcher observations and quantitative analysis as well as statistical testing using the SPSS computer program generated some significant findings on agricultural perceptions among a selected population of grade two students in Guelph Ontario.

Initial perceptions measured in this study indicate the children had limited views on the definition of farming, and most often used animal-related examples to help define agriculture. Although children did seem to understand that the farming industry involves lots of hard work, they didn’t have much knowledge on how the local industrial farming system is set-up. As expected, there was little insight reported on the financial impact that farming has on the local economy as described through jobs, sales of equipment or suppliers.

After the hour presentation, the children showed a more diversified view on what farming means and its impact. The students continued to see animal development and care as major themes that were of interest to them. However, interestingly, exposure to the OMAFRA virtual farm tour, and some real-life images helped to increase the number of students who were interested in the physical farm structure.

The teacher questionnaires collected after the presentation revealed that teachers felt their students had a poor understanding of agriculture (or industry or reproduction) prior to the Biobuddies session. After the activities had been completed the teachers responded on their survey sheets very positively toward the Biobuddies program. All
teachers felt that it would be an effective way for their students to gain a better understanding for farming.

Through a combination of Researcher observation, and quantitative and qualitative data it’s clear that regardless of the neighborhood or school, the students of Guelph Ontario have a narrow perception of agriculture, however the results from this study show that there is a strong interest to learn more about farming when provided with adequate teacher support to initiate these activities in the classroom.

Chapter Five: Discussion

5.0 Introduction

The mixed methods research conducted in this study was designed to understand the current agricultural perceptions of the grade 2 students in Guelph Ontario, and discover if students have the capacity and interest to learn more about farming. The data collected was primarily through written surveys, however the study also included some one-on-one discussions with participants as well as researcher observations, to help understand the current system holistically.

5.1. Support for In-School Agricultural Programs

5.1.1 Student’s Current Agricultural Perceptions
While working in the classroom it was clear that the Guelph students have a strong affiliation and love for animals. The quantitative data collected from the student surveys supported this by showing that when asked “what does farming mean to you?” each of the thirty classrooms involved had “animals” as their most popular category chosen. This information was analyzed through SPSS and showed clear results.

After conducting a frequency analysis on the Guelph classrooms, it was seen that there was differences between the categories coded by the researcher. The code “animal” was chosen more frequently than all other codes (other codes included; food, plants, human impacts, farm structure).

The analysis showed that when the researcher initially entered the classrooms the grade two students had little diversity in definition toward farming. In general, the students defined farming most often through examples that include animals. This trend was seen across all the classrooms involved in the study, regardless of neighborhood, social strata or location in Guelph.

Agriculture is a very large and important industry, and what the student data suggests is that children may not understand the magnitude of farming, or how it affects them on a daily basis (Bagdonis et al, 2009).

5.1.2. Student Ability to Learn About Agriculture.

As mentioned in the previous section, the grade two students initially defined “farming” through examples including animals. However, after the presentation student responses defining agriculture were less focused on animals and had responded with the different “categories” used to define farming.
This was shown through application of a frequency analysis done on the survey question that asked the students “what did you learn?”. Statistically, it was shown that there was an increased variety in codes chosen by students. This is interesting, because initial perceptions had such an emphasis on purely animal examples. What this suggests is that when the students participate in practical hands-on experiences and are exposed to new learning technologies, they have the capacity to retain new information.

Additionally, students often come to school with pre-conceived notions or theories, and this may shape the way students currently understand certain ideas (Wood, 1994). By working with the current ideas that students have and using hands-on techniques, it’s possible to help students build their own knowledge about science and farming, which is much more effective than simply lecturing students (Wood, 1994).

This was seen in particular with the classrooms that had exposure to the OMAFRA Farm Tour DVD. Students who saw the projected images of the local farms seemed to mention concepts involving the farm’s structure, which was information covered through the DVD. Today, it’s becoming more main-stream to involve computers in the classroom as a teaching aid (Tondeur et al, 2007). However, studies show that comfortably adopting technology into a classroom depends on factors such as resource availability and teacher views (Sangrà et al. 2010).

Fortunately while working in the Guelph schools, most classrooms had access to a projection screen and computer. Adding a technological component into the lesson was fairly easy and well received by the students. Although at times some additional set-up time was needed, overall the use of the DVD was a valuable asset to the program. Students were engaged and excited to see the clear images of what real farms look like,
and the DVD often gave the students the impression that they were sitting directly in the barn. For the purpose of this study OMAFRA donated a few copies of the DVD, however additional copies were available upon request. Perhaps an effective way to encourage increased agricultural learning would be through creating and providing teachers with more interactive learning technologies.

5.1.3. Student Interest to Learn More

This study showed that an overwhelming percentage of students were eager to learn more about farming. The mean value of students who wanted to learn more about something agriculturally related was 80.56%. The data collected from students show a fairly diverse range of interests in the agricultural industry.

While working in the classrooms, time constraints limited the number of questions that were answered, however the majority of classrooms did have keen students who wanted to share their information (“My Grandpa was a farmer, and I love farms!”) or ask a question. This aligns with the theories behind “meaningful learning” where students are actively participating and engaged (Jonassen and Strobel, 2006). Through the process of formulating and asking questions the student participants showed that they were absorbing the information presented and creating their own knowledge on the topics of farming.

It’s possible to argue that a reason why the children were so keen to learn more about agriculture was a consequence of the Biobuddies program design. The presentation was purposely designed to be a high-energy, quick-paced hour-long presentation, including many different activities. Hands-on learning styles have been shown to be a
highly successful way to teach science curriculum (Kaiser, 2005). Unfortunately, when we look at teaching agriculture in the schools it’s obvious that often using hands-on examples with real farm animals isn’t a possibility. Therefore, to teach agriculture in the urban Ontario classroom some creativity and innovation is required by teachers.

Studies done by Rix et al 2012, showed that including exciting activity-based lessons during school is received positively by students. This fun experience built positive attitudes for the students toward science. It could be argued that Biobuddies created the same results for the Guelph participants. The children may have learned some new facts, however they also gained a more diverse perspective toward farming and are excited to discover more. Teachers also seemed to gain new information and enjoy the presentation, it’s questionable however if the Guelph teachers would take the initiative to plan and teach a similar lesson voluntarily.
5.1.4. Teacher Support for Biobuddies

Based on the findings from this study we can see that in general Guelph teachers feel their students have a poor understanding of farming. Perhaps this low level of knowledge is a top-down issue, as we also found that the teachers themselves had a varying degree of comfort toward teaching agriculture. In past studies it’s been shown that teachers are more likely to teach subjects that match the teacher’s beliefs (Knobloch, 2007). Based on this, only the teachers who have strong feelings and knowledge about agriculture are likely to offer lessons on farming in their classroom. To help bring agriculture to the classroom, teachers must have the appropriate resources to guide their lesson plans.

Many of the subjects covered in today’s school have an assigned textbook to help enhance the learning experience. Children (perhaps too often) accept the information read from credible published sources to be truthful and valuable information (Darder et al, 2009). For example, the science of chemistry became well known and understood once experts in the field began publishing chemistry textbooks (Kaiser, 2005). A textbook style approach would introduce agriculture to classrooms seamlessly, and act as one way to include farming in schools.

When the Guelph teachers were asked if they thought Biobuddies would be an effective way to introduce farming into the schools, there was a unanimous “yes!” Perhaps the idea of inviting an outside “expert” to teach the lesson was appealing to those teachers who lacked the courage to learn about farming.

If we continue to marginalize agriculture through a lack of proper representation in the curriculum we will see that the distance between urban society and agriculture will
grow as agricultural concepts becomes more and more foreign to most North American children. To effectively transfer the learning objectives to our students we must use a pedagogic approach. This model would consider the way which children will learn the most effectively.

Currently Ontario Agri-Food Education (OAFE) is a program designed to support Ontario teachers in providing curriculum-aligned resources. However, they don’t provide volunteer teachers to deliver the sessions. OAFE does have programs designed to train teachers to facilitate some of their curriculum-aligned sessions, however as mentioned earlier, when a teacher doesn’t feel comfortable with a particular subject they are less likely to teach it to their class (Knobloch, 2008). Additionally, a teacher that isn’t personally invested in a particular subject area (such as agriculture) would not volunteer to spend the extra time to learning the material.

The Ontario public school classroom curriculum requirements remain firm, and extra time is often hard to find. Interestingly the scope of this research was limited only by the availability of the researcher herself. The teachers of Guelph Ontario were extremely accommodating and keen to have an outside volunteer participate in their classroom. Unfortunately, due to scheduling limitations, the researcher had to turn away some classes and start a waiting list! This high-demand for the free presentation shows that despite the time crunch created by the curriculum, most teachers are able to find an hour-long block to fit in a special presentation.
5.2 Challenges to Biobuddies Program

After analyzing the qualitative and quantitative results from this study, it’s clear that a program like Biobuddies would be a great way to gently introduce the students of Ontario public schools to local farming systems. However, despite the strong support seen in the classroom there remain a few barriers that must be addressed in order to ensure success in the program.

5.2.1. Need for Volunteer Teachers

Currently at the University of Guelph there is a student population that is passionate and knowledgeable about farming. Additionally, many of these individuals are undergraduate students who may be looking to expand their resume, or gain experience directly in the community. Undergraduate students are often fairly busy, but with a large enough pool of “experts” to draw upon there could be enough flexibility within the team of volunteers to help expand the Biobuddies program into many more schools and grades than where touched through this research project.

One of the barriers through relying on the undergraduates would be making sure that each participant was properly trained and comfortable working with kids. Fortunately, the researcher for this study had a strong background working with primary-aged children and was able to design and present the material to students in an age-appropriate and fun way. If the scope of the Biobuddies program expanded and used a large group of students from the University of Guelph, it would be very important that
each volunteer teacher had basic training, and understood the template for their lesson plan.

A second barrier for using volunteer teachers would be making an undergraduate student schedule match with the elementary classroom schedule. Fortunately, this barrier could easily be overcome with a proper management protocol in place. Teachers would be requested to submit a list of possible dates and times that would be ideal to host the session, and the student volunteers would submit their similar information as well. Through a little bit of organization and collaboration students would be assigned particular classes that seem to match with their schedules. The Biobuddies program was purposely designed as an hour’s session to help make it easier for both teachers and undergraduate volunteers to commit to participating. Despite the hectic curriculum timelines (and the busy lives of a university student), an hour isn’t a large commitment, and perhaps might be a positive enough experience for the undergraduate student to decide to teach additional lessons.

5.2.2. Constraints in the Curriculum

Currently, the elementary school curriculum is becoming increasingly standardized, and leaving little space for flexibility and creativity from the teachers (Bailey et al, 2010). This added pressure of “teacher conformity” may be a potential barrier for teachers to invite Biobuddies into their classrooms. Teachers may worry that dedicating time in the classroom to an additional presentation may take away from potential class time spent meeting provincial requirements. To help alleviate some of this stress, Biobuddies was designed to align with the Ontario science curriculum. This
partnership with the science curriculum really shows students that agriculture is in fact very scientific. Additionally, by working with the topics covered in the curriculum teachers feel that the Biobuddies program is an enhancement to topics covered in class.

Through a combining typical classroom lessons with the hands-on approach of Biobuddies, students will have a great opportunity to learn the information that is expected of them (Polman, 2000). We know that using a variety of teaching styles and strategies is an effective way to help students learn (Polman, 2000). Additionally, including hands-on approaches has been shown to be an effective way to help students understand new information, particularly the scientific concepts (Kaiser, 2005).

The second potential barrier to implementing the Biobuddies program into the public school system is funding. While booking presentation dates with the Guelph Teachers the most commonly asked question was “How much will this presentation cost?” Unfortunately in the public school system there are little funds to contribute toward additional programs. Therefore in order for a program such as Biobuddies to be successful it’s imperative that it wouldn’t cost teachers or schools any additional money.

With the increasing concern for Canadian food security and management practices (Hiranandani, 2010) it’s important that we begin to invest in formal education about agriculture, to help address current issues as a proactive way to control the future. It’s essential that we promote agricultural awareness and respect for the industry, empowering the industry with the Human Capital Theory.

Finally, the prevalence of agricultural misconceptions and negative attitudes (Uli et. al, 2010) a positive, interactive investment in the form of formal in-school “training” about agriculture would be a positive addition to the Canadian classroom. By increasing
education, we empower students through teaching them new skills and facts, increasing their knowledge base (Khan & Ghadially, 2010). It’s critical that we provide the children with sufficient information about agriculture so they are able to come to form their own opinions and ideas about the industry as a whole (Uli et. al, 2010 and Duncan et al, 2006).

Fortunately it is possible to design an interesting and fun curriculum-aligned program for the students, it may just require additional creativity from the curriculum designer, without tremendous financial cost to the schools. The Biobuddies presentation used very few resources, and relied simply on photocopies and prize donations from local agricultural business (OMAFRA posters, and Grain Farmers of Ontario stickers). It therefore is possible to create similar presentations for other age groups.

**5.2.3 Parent Support and Opinions**

Only a fraction of what a child learns occurs in the formal educational system. As stated earlier, a large part of children forms their opinions and ideas relies on the way their parents feel about certain issues (Bartram, 2006). In order for a program such as Biobuddies to gain success and respect among the community it’s important that parents of student participants are positive and supportive of this new learning venture.

All students who participated in the presentation were given a passive consent form prior to participation. Parents were invited to contact the researcher directly with any concerns they may have. Interestingly, of the 655 students who were involved there were no parents who reached out to voice their concerns. In fact, in only one case did a student’s parents make special arrangements to attend the Biobuddies session (in hopes to
perhaps learn something themselves!). It’s questionable if the lack of parental concern would be a barrier or an advantage to launching a program such as Biobuddies. However, it’s clear in the literature that maximizing the parental support and interest in subjects taught in the classroom will only help drive up interest in students (Bartram, 2006).

5.3 In-School Biobuddies Programs Can Bring Together the Community

5.3.1. Biobuddies Can Help to Broaden Agricultural Perceptions

While working in the Guelph classrooms it was clear that the children had a strong interest in animals. In fact, some of the students were disappointed when they learned that the Biobuddies presentation was going to be learning about animals and that it wouldn’t in fact involve any real animals!

The statistics from this study show that these qualitative observations match the quantitative results. Upon entry to the classes the students had a very narrow-view on farming, and when asked, most of the children defined farming by referencing animals in some way.

In 2008, Lakin and Littledyke participated in a similar study designed to teach children about healthy eating and food choices. In this study the children were involved in curriculum-related activities that were designed to teach the students about where their food comes from and healthy eating. After completion of this study, the children involved had a much better understanding for how vegetables arrived on their dinner plates. Additionally, the students showed an increased desire to make healthier choices and eliminate some of the more processed food items that were once a staple food.
Our findings suggest that Biobuddies may have similar results to the study done by Lakin and Littledyke. By including formal lessons on farming into the curriculum, children may gain an appreciation for agriculture and the way it affects them daily. It’s been proven that in-school programs can be an effective way to teach new information or perspective for a subject that may have not received much thought in the past.

Our statistical findings in this study support the idea that participants learned new information about farming, as the data collected from the student surveys shows that after the presentation students showed more interest in many of the different aspects of poultry farming, including the barn structure itself (an area that got very little acknowledgment initially).

The Biobuddies presentation offered information on one small aspect of the farming industry, poultry farming. It would be possible to create similar modules within the Biobuddies program that could introduce other areas of agriculture. This would be a very effective way to continue to expand student understanding toward farming, and could greatly broaden the number of student participants (and grade levels). An expansion of the Biobuddies curriculum would allow for interested teachers to enroll in multiple classroom visits! With such success shown in a single one-hour session it’s exciting to imagine what may be accomplished with a second visit.

5.3.2. Biobuddies Encourages Undergraduate Involvement

The University of Guelph has a strong agricultural history and as a result has always attracted students that have a keen interest in farming. Currently there are few
opportunities for students to volunteer within the city of Guelph, and share their love for farming.

The Biobuddies program has been designed in a way that would not require a tremendous time commitment from Undergraduate students, but would offer a lot of valuable experience in educating the general population about farming. In a similar study done by Bassi, Service-Learning programs (those designed to help teach the students new skills while contributing to the community) were an effective way for undergraduates to learn vocational skills for the future. The program in this study was also seen to be beneficial to the community, as the students offered a valuable service to the public (Bassi, 2011).

In the study done by Bassi, the participants were nursing students, and were advocating against tobacco smoking in local public schools. It’s argued that the success of this program may be due in part to the fact that the nursing students had a strong interest in promoting healthy lifestyles (Bassi, 2011). Therefore, using a similar model for the Biobuddies project, in order to maximize the success of the program it would be very important to hand-pick undergraduate students who were passionate about farming. It’s clear that when a teacher has personal investment in the subject matter they will be better teachers (Knobloch, 2008).

5.3.3. Biobuddies Can Showcase Local Farming

Guelph Ontario is often seen as a real “agricultural hub”. However, based on the findings of this study, it seems that the majority of the students (and many of the teachers) seem to have a fairly narrow-minded view on what farming really means.
While working with the children, the researcher showed images of local farms. Unfortunately it’s not possible to bring the children outside of the schools to visit the farms themselves, but through the use of technology students were able to travel on a “virtual farm tour”. This segment of the presentation was very popular with the students, and often they were surprised to learn that the images projected on the screen were of local farms.

The Biobuddies presentation was designed to increase an overall awareness and respect for farming. However, through use of local examples this research study was able to successfully showcase what types of agricultural initiatives are taking place close to home. In fact, many of the children claimed to have seen or visited the farms that were shown during the activities.

Similar farm-to-school initiatives have been used in the United States to help promote the local food movement, while supporting farmers closer to home (Izumi et al, 2009). What was discovered through initiation of these programs is that producers created meaningful connections with the schools and the community. It seems that promoting local foods can be an excellent way to personalize agriculture and where food originates.

For the purpose of this research project, the information presented to the children related only to the poultry industry. However, even within this one aspect of farming there remains tremendous opportunity to explore different local ventures (egg barns, broiler barns, hatcheries and the process of delivering products to the grocery stores). Even while limited to poultry farming the students were interested and inquisitive, therefore it can be assumed that they would have benefited from meeting a “real” local
farmer. Introducing the students to a Guelph producer would have allowed them to ask specific questions, and personalize farming. Creating a rapport with a local producer may help to overcome the disconnect that currently exists between the urban and rural people.

5.3.4 Biobuddies Engages Children in Different Learning Styles

While conducting the research for this study it was important to consider the age group of children who would be participants of the presentation. The scope of this project included several different schools hoping to include all the grade two students, regardless of what an individual’s strengths or weaknesses may be. To ensure that children maximized their learning potential, a variety of media was used and several different activities were facilitated to meet the needs of the different learning styles.

According to the study done by Johnson in 2006, when students were asked which learning method they most preferred, it was revealed that group work (in smaller groups) and hands-on activity based learning was most popular. The Biobuddies project was designed in a way that would facilitate group discussion and combine it with hands-on experimentation. For a large portion of the lesson the students were invited to work within smaller groups. Although some aspects of the Biobuddies program included working independently, in many classes the desks were arranged into small groups allowing for collaboration among classmates.

According to the research done by Gillies and Ashman (2000), when students are assigned to work in smaller groups, the students who are weaker find support from their group-mates. Similarly, with the Biobuddies project many of the activities allowed the option for classmate collaboration. For example, while the children were working on
labeling their diagrams they were able to find support from their neighbor if a particular aspect of the assigned task confused them. By allowing the Biobuddies program to include group-work students finished the program feeling positive about the experience they had (Johnson, 2006).

5.3.5. Biobuddies Offers Opportunity for New Opinions

Biobuddies offers a unique opportunity for student participants. Including undergraduate students as program facilitators invites new opinions and teaching styles into an already established classroom routine. Introducing new styles and ideas has potential to tremendously benefit the children, however there are some guidelines that the volunteer student teachers should adhere to.

According to the article written by Ward and Wells in 2003, when a visiting teacher enters into the established classroom it’s very important to maintain a strong respect for the regular teacher. The undergraduate students must remain courteous and polite while recognizing that although they are delivering a special presentation, they are still a visitor to the classroom. It would be important for the undergraduate student communicate with the regular teacher and understand if there is any particular information or protocols that they wish would be included in their presentation.

Secondly, as a visiting classroom facilitator it would be highly important that the presentation is well prepared and rehearsed. Classroom time is a valuable commodity, and it’s important that none of it is wasted through disorganization (Ward and Wells, 2003).

According to Patterson and Norwood’s research in 2004, when children were
working with an experienced, passionate teacher they were more successful learners. Our research with the Biobuddies projects followed a similar model, the presenter (and researcher) was passionate toward working with children and had a strong agricultural education. The success of the program was largely due to the fact that information was taught to the students by an energetic and excited teacher. Using the agricultural undergraduate students as teachers we would expect similar results. The elementary students would learn more about the subject when delivered by an agricultural expert (the undergraduate). Similar to the research done in 2004 by Patterson and Norwood, who’s study focused on mathematics.

5.4 Conclusions

Discussed throughout this section is the functionality of a community project similar to the Biobuddies project. What this research project revealed was that a formalized volunteer-based program has tremendous potential to teach the urban elementary school students of Guelph Ontario about farming. Based on the results of this research, a single hour session is enough to broaden a child’s view on agriculture.

In this section we discussed the benefits to inviting the agricultural undergraduate students to participate as program facilitators. Engaging the local university students will help strengthen their sense of community involvement while providing relevant local examples of farming. To help ensure that the volunteer teachers were effective a formalized training process may need to be designed to ensure that each facilitator was respectful and organized when presenting to the Guelph children.

Based on the findings of this study, designing a program to engage both the
university students and the elementary school students would benefit the entire community. It seems that the current barriers preventing such a program could be easily broken with a stronger partnership between the school board, the teachers and the University of Guelph.

Chapter Six: General Conclusions

6.0 Summary of the Study

This research examined current perceptions of agriculture among grade two children in Guelph Ontario. The city of Guelph was chosen as the research location because often it is considered to be an agricultural “hub”. Additionally, Guelph’s university offers several specialized agricultural courses at the undergraduate (and graduate) level, which creates opportunity to develop potential out-reach programs in the future.

This study worked directly within the grade two classrooms and collected written data from the students that would later be coded to show whether students defined “farming” in a particular way. What was found was that when the researcher initially entered the classrooms, most of the students used animal-related examples to define “farming”. Following the initial portion of the student survey, students participated in an hour-long presentation that introduced various aspects of the poultry industry including; caring for chickens, images of local poultry barns, discussing the different components of
the poultry industry (layer barns vs. broiler barns) and finally how baby chicks develop inside an egg.

Upon completion of the classroom presentation, the students were asked to reflect on their findings, and record what new facts they had learned. Statistical analysis of the themes coded in the student data, determined that the children had diversified their views of farming. It is no surprise that the students still mentioned chickens and caring for the birds on their student surveys most frequently. However, there were more students that recognized other aspects of agriculture, such as the farm’s building structure, rather than exclusively defining agriculture through animal examples.

Student participants were asked what they would like to learn about in the future, and an overwhelming majority of students stated that they would like to learn more about farming. Many of the children provided specific topics and ideas that they were curious about. These findings suggest that the grade two students of Guelph Ontario are interested to know more about farming and how it affects them daily.

In addition to the data collected from student participants, the teachers who were supervising the session were asked to fill out a survey. This survey was in a Likert-type format, and when statistically analyzed showed a range in overall comfort-levels when asked about teaching agriculture to students. However, when the teachers were asked if a program such as Biobuddies would be an appropriate introduction to farming there was overwhelming support from every teacher that was surveyed.
6.1 Cumulative Findings

This study showed that currently the grade two students of Guelph Ontario show little diversity in the way they define agriculture. Interestingly, this study also showed that Teachers also feel that their students do not have a particularly strong understanding for the different aspects and elements of “farming”. However, when enrolled in an in-school farming presentation, the students show both interest and an aptitude to diversify their ideas.

Past studies have shown that in-school programs can be a successful way to drive support for local producers as well as encourage students to make healthier food choices (Bagdonis et al, 2009). The students of Guelph Ontario were often surprised during the presentation when they were shown images of the local farms. Despite the stereotype that Guelph has developed to be an “aggie town”, this study showed that the local students have narrow view of farming, and many student participants had never been exposed to an industrial farm.

The format of the Biobuddies presentation was well suited for the targeted age-group. The ability to utilize a variety of activities and themes while encouraging group-work among the students captured the interest of most children. Providing an opportunity for hands-on learning is an ideal way to help children build on new ideas and skills that were taught in the earlier “lesson” part of the presentation (Kolb and Fry 1975).

Perhaps another reason why the Biobuddies program was successful was in part due to the enthusiasm and passion that was delivered during the presentation. As supported by past studies, teachers who have a personal connection or specialize in a particular subject generally teach that information more effectively (Patterson &
Norwood, 2004). The researcher delivering the Biobuddies program did have a background working with primary-aged children and also had a passion for farming. This ensured that the energy level throughout the presentation was always high, and helped maintain a level of excitement among the students.

6.2 Recommendations

This research project showed that a gap exists in the elementary school curriculum. Teachers have limited time and resources to teach students about the importance of farming, and as a result the grade two students of Guelph Ontario have a limited views toward farming.

Fortunately, the Biobuddies program has proven that there is potential to capture the interest of the students and demonstrate how agriculture directly impacts their lives. Additionally, with the aid of some creative planning and expertise on different farming systems, it’s possible to create several different classroom presentations that could easily be included into the science curriculum. The Biobuddies presentation was developed to align with the standard grade two science requirements, and therefore was viewed by teachers as an enhancement to their lesson plan rather than simply absorbing classroom time.

Analysis of the quantitative and qualitative data collected through this study demonstrated that this program would be a positive addition to the Ontario elementary schools. There is an increased potential in Guelph Ontario due to the availability of possible volunteer facilitators through the University of Guelph. While conducting this
study the majority of Guelph schools contacted the researcher with interest to participate in the program and were interested in booking presentations. This suggests that demand for a curriculum-based learning program is high in the public school system. An added incentive to initiate the program stems from the benefits that the university student facilitators would gain by volunteering within the community and practicing hands-on teaching skills (Bassi, 2011).

To ensure success in future programs it’s recommended that the University of Guelph creates a partnership with the local school board, the Upper Grand District School Board. Additionally, the University of Guelph would require a program coordinator to help interview potential facilitating candidates (as success of the program would largely rely on enthusiastic, fun people). The second major role of the program coordinator would be to develop a few different presentations, and train the volunteers to properly deliver the session.

Ultimately, creating an open-line of communication between the University and the elementary school board (UGDSB) would facilitate enhanced understanding of the particular curriculum needs, to focus development objectives for future programs. This insight from the school board professionals, would help the university program coordinator develop different lesson plans, that are both relevant and age-appropriate.

Finally, while developing the program it would be very important to consider the interests of the students. This particular study showed that grade two children were most interested in animals. Therefore, to maintain the interest of the students the presentations should include animals. Similar research would need to be done before developing programs for an older student population.
6.3 Future Research

More research is needed in this field, to determine how children perceive agriculture. It’s important to conduct future research in the elementary schools to understand what aspects of farming are of most interest to students. Currently there is a large disconnect between children their local food knowledge. It’s important that we begin working directly with children to develop a greater appreciation for agriculture, as industrialization continues to grow we’re seeing a shift away from our rural roots (Holloway, 2004).

By working directly within the schools and the children we gain an enhanced understanding of what students would like to learn. By tailoring the program to meet the interests of students, we expect that a greater understanding and respect for farming would develop, helping to lessen the gap between the rural producers that are currently feeding our urban children.

References Cited


Bassi, Sherry S. 2011. Undergraduate Nursing Students Perceptions of Service-Learning through a School-Based Community Project. Nursing Education Perspectives 32:3


DeCustai, C.L. and Johnson J.E. Parents as Classroom Volunteers and Kindergarten Students’ Emergent Reading Skills. The Journal of Educational Research. 97: 5: pp 235-245


Fehrmann, P.G., 1987 Home Influence on School Learning: Direct and Indirect Effects of Parental Involvement on High School Grades, Journal of


Izumi B.T., Wright W., and Hamm M.W. 2010. Farm to School Programs:
Exploring the Role of Regionally-Based Food Distributors in Alternative Agrifood Networks. Agriculture and Human Values. 27: pp 335-350


Knobloch, N. 2008. Factors of Teacher Beliefs Related to Integrating Agriculture into Elementary School Classrooms. Agriculture and Human Values 25: pp 529–539


Polman J.L. 2000. Designing Project-Based Science Connecting Learners
Through Guided Inquiry. New York: Teachers College Press. Chapters 1, 4


APPENDIX A

To begin the presentation the researcher would present each class with the written word “agriculture”. Although this is a fairly large word for the grade two reading level, some children were able to phonetically sound out the word, and collectively as a class we could collaborate and hypothesize what this word may mean. However, more often than not, the children were unable to define agriculture, although some did admit to have heard the word used before.

Once the concept of agriculture had been introduced to the children the researcher moved the discussion toward the importance of farming to everyday life. Together the children and researcher would discuss why farms are so important. When the proper media was available, a DVD of images of local industrial poultry barns was projected to support the visual learners. OFAC’s Virtual Farm Tour DVD was an excellent resource to showcase locals farms, allowing the students to compare and contrast Layer and Broiler poultry barns.

While looking at the inside of the barns, the researcher and children discussed what a chicken requires to remain healthy and happy (fresh food and water, shelter and love!). The researcher also explained the structural differences seen in an egg barn compared to a broiler barn, and showed the children how the use of machines and technology help the modern-day producers.

The Virtual Farm Tour shows briefly how the egg cleaning process works, and gave a basic understanding to students about the transition of eggs from the farm to the store. This was a nice way to lead into the final topic in the great chicken debate; why don’t our grocery store eggs hatch?

Students were given the opportunity to volunteer personal theories. Though there were many creative ideas, few were able to provide the scientifically accurate reason. However, the majority of the students understood that there are no baby chicks inside grocery store eggs. This discussion question was used by the researcher as a way to teach students about the biology of the developing chicken egg.

After the inside of the developing egg was better understood, the students learned about ‘candlers’ and how large farms may use this type of equipment to help see the
inside workings of a developing egg. Through the use of a toilet paper roll and a flashlight the students were given the opportunity to build a personal-sized candler to peek inside of plastic eggs provided by the researcher. During the time students were decorating their toilet paper roll candlers, they were also given a diagram of the inside of an egg, and asked to colour and label the image. This helped to keep all students focused and working at their desks, as some students were quicker to finish colouring their rolls than others.

Each plastic egg had a letter coded for inside the shell, and when properly using the toilet-roll candler and the flashlight students were excited to discover what letter they had hidden inside their egg.
APPENDIX B

Biobuddies Student Survey

- To me, farming means…

- This is what a picture of a farm looks like

- Today I learned that…

- I would like to learn more about…
APPENDIX C
Please circle one number for each answer, 1 being the lowest. Also, feel free to add additional comments to each question, should there be anything you wish to have noted.

My class enjoyed today’s biobuddies session.
1 2 3 4 5

In my opinion, the grade two students in my class had a good grasp on agriculture prior to today’s session.
1 2 3 4 5

After today’s session my students will leave school excited about agriculture, and have learned some new facts about farming.
1 2 3 4 5

The session was interactive and designed in a way that students could understand.
1 2 3 4 5

As a grade 2 teacher, I feel confident in my ability to teach agriculture to my students.
1 2 3 4 5

If biobuddies was offered as a permanent module in the Ontario science curriculum, it would be an effective way to introduce the science of farming to kids.
1 2 3 4 5

Please feel free to add any additional comments adjacent to the questions, as well as on the back side of this form.
ATTENTION ALL GRADE 2 TEACHERS!:

The University of Guelph is partnering with the UGDSB to brings you....

A FREE LEARNING OPPORTUNITY!

The grade 2 students of Guelph have been selected to participate in a study to gauge local perceptions on agriculture.

In September, a University of Guelph graduate student will be available to visit your class (at a class time convenient for you) and deliver a one-hour presentation and activity on the growth cycle of chickens.

What to expect:
- A short survey for students to understand what background knowledge they may have
- A general overview of the Agriculture of poultry
- Understanding an egg & how the chick grows inside the egg
- A craft!
- A summary colouring/survey to see what the children absorbed.
- Finally: A small prize for ALL participants!

For more information, or to book your appointment please contact:
Alison Brock brocka@uoguelph.ca
APPENDIX E

To Whom it may concern,

The University of Guelph has partnered with the Upper Grand District School Board in a collaborative project aimed to better understand the grade two students perspective on local agriculture.

Biobuddies, is a 1.5 hour educational session that will be presented, delivered and run in your child’s class this coming Fall. Designed specifically for grade 1-3 students, this interactive session will explain agriculture to them, from a scientific angle. During the activities we will work to understand the life cycle of chickens, and will use some basic “creative crafting” to understand how local producers can grow and hatch healthy chicks.

The researchers from the University of Guelph will be looking for general classroom trends, as well as participant interest in farming and the Biobuddies program, but no names or individual scores will be obtained. We believe this unique and innovative program will provide an exciting scientific experience for grade 1-3 students in Upper Grand District School Board classrooms this Fall.

If you have any questions or concerns please contact Alison Brock at brocka@uoguelph.ca

Thank you for your support in our project!
APPENDIX F

Results From the Initial Impressions (Survey Question 1)
“To me, farming means…”

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Frequency tables showing codes chosen by students upon initial introduction to the class.

Results from After the Presentation (Survey Question 2)
“Today I learned that…”

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Chicken Development</th>
<th>Chicken Food</th>
<th>Farming System</th>
<th>Random</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Valid</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>N Missing</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mean</td>
<td>41.2847</td>
<td>8.6170</td>
<td>29.9323</td>
<td>20.1367</td>
</tr>
</tbody>
</table>

Frequency of most popular topics covered in presentation. Categorized based on codes mentioned by students.

Comparison of Perceptions on Farm Structure Before and After the Presentation

<table>
<thead>
<tr>
<th>Paired Samples Statistics</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 afarmingsystem</td>
<td>29.9323</td>
<td>30</td>
<td>15.88822</td>
<td>2.90078</td>
</tr>
<tr>
<td>bstructure</td>
<td>12.5373</td>
<td>30</td>
<td>10.70852</td>
<td>1.95510</td>
</tr>
</tbody>
</table>
Paired Samples Correlations

<table>
<thead>
<tr>
<th>Pair</th>
<th>afarmingsystem&amp; bstructure</th>
<th>N</th>
<th>Correlation</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>30</td>
<td>-.214</td>
<td>.255</td>
</tr>
</tbody>
</table>

The Next Steps (Survey Question 3)

“I would like to learn more about…”

Statistics

<table>
<thead>
<tr>
<th></th>
<th>farming</th>
<th>nonfarming</th>
<th>random</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mean</td>
<td>80.5693</td>
<td>16.1223</td>
<td>3.2940</td>
</tr>
</tbody>
</table>

Frequency table showing topics students are most interested in learning more about.