EXPLORING SECONDARY AGRISCIENCE TEACHERS' AND STUDENTS' USE, ATTITUDE TOWARD, KNOWLEDGE, AND PERCEPTIONS OF COMPUTERS AND TECHNOLOGY TOOLS

A Record of Study

by

KIMBERLEY ANN MILLER

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

DOCTOR OF EDUCATION

May 2011

Major Subject: Agricultural Education

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Approved by:

Co-Chairs of Committee,	Theresa Pesl Murphrey
	Scott Burris
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	Cynthia Akers
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ABSTRACT

Exploring Secondary Agriscience Teachers' and Students' Use, Attitude Toward, Knowledge, and Perceptions of Computers and Technology Tools. (May 2011)

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Computers are an ever changing facet of everyday life; almost all businesses, including schools, are dependent on technology, from research to information delivery. With the rapid advances in computer technology made every year combined with the increasing availability of computers to students, it is important to continually investigate how secondary agriscience teachers' and students' use and view computer technology, both personally and educationally, in order to effectively utilize this advancing educational tool for the benefit of both groups. The purpose of this study was to describe agriscience teachers' and students use, attitude toward, knowledge and perceptions of computers and technology tools in order to better understand how secondary agriscience teachers use computers in their instruction and how agriscience students use computers for school and social purposes. This study explored both teacher and student opinions about school assignments that require computer use and how often both groups utilize the computer for work and entertainment.

The study consisted of three parts. The first part sought to document agriscience teachers access to computers and related technologies and how they utilize computer tools for classroom and student assignments. The second part of the study sought to document computer access of agriscience students to computer tools and software used for both educational and personal reasons, and identify agriscience students' general attitude towards computer technology. The third and final part of the study sought to describe how agriscience students use the Internet and related technologies for school and personal reasons and identify students' general attitude towards the Internet. Teacher data were collected from teachers in the Southern Region of California. Student data were also collected in the Southern Region of California using random selection of school sites and quota sampling to obtain a sufficient number of student responses. Findings revealed that while teachers and students have access to computers and the Internet, both at home and at school, these groups are not utilizing technology as effectively and regularly as one might believe. In-service training for teachers and additional requirements of student computer and Internet use for school purposes should be considered a priority for increasing efficient use of computers and Internet technologies for educational purposes.

DEDICATION

This document is dedicated to all individuals in secondary agriscience education who continually strive to make their classrooms positive and exciting learning environments. Your students appreciate you and need you. Continue to be innovative and work daily to guide agriscience students along the right path for their interests and wellbeing.

ACKNOWLEDGEMENTS

I would like to thank so many individuals whom I have had the honor of meeting and working with thus far.

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when we are sick you can fix us?" Thank you, Tanner, because through that statement, I am reminded how simple life really is, and that we should all work daily to keep it as uncomplicated as possible.

To all of the teachers in the Southern Region of the California Agricultural Teachers Association who participated in the teacher survey, thank you for your time and your dedication to our noble profession. To my fellow teachers and their students who assisted me with student data collection, my project would not have been possible without your help, support, and dedication to advancing high school agriscience. Thank you for being fellow innovators in our profession. And to my students at Mission Viejo High School, for tolerating me when I was tired or had to travel and be away from our classroom. You would be amazed at how the smallest of actions, like doing your work for the substitute teachers, meant so much to me as this project came to an end.

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INTRODUCTION

Today's high school students are members of not only the "Millennial generation," but of the newly recognized "Generation Z," both of whom are living in the "digital age" (Posnick-Goodwin, 2010). These students are assumed to have the skills needed to utilize technological tools and Internet resources both inside and outside of the classroom. In addition, a number of assumptions regarding high school teachers' use of computer technology exist. While past research has revealed a number of general areas regarding computer technology use in education, current research falls short of describing technology use by agriscience students and their teachers.

Today's students have an abundance of information tools at their disposal, ranging from early technologies such as radio, film and television, to an ever increasing number of entertainment devices that allow this media to be mobile and accessed when and where the user desires (e.g., DVD's, MP3 players, iPods ™ and video games) (Babcock, 2001). Students live in an information-rich society where school is not their only method of obtaining information about the world around them. Schools, and more specifically teachers, must compete for student attention by "one-upping" the competition that the "digital age" creates (Molner, 1997). Computer technology provides teachers with a common link to educate and entertain students in a classroom setting, as long as both teacher and student have a similar understanding and interest in this ever-changing and quickly growing component of education.

This record of study follows the style of the *Journal of Agricultural Education.*

To help guide the innovative and technology minded secondary agriscience teacher, research must be conducted to increase an awareness of what students know about the technology tools that are available. This study sought to describe technology use in education by exploring secondary agriscience teachers' and students' use, attitude toward, knowledge, and perceptions of computers and technology tools. Findings from this study can be used by both education administration and agriscience teachers in their efforts to add computer-based assignments or lessons to the curriculum in an effort to serve the Millennial generation and Generation Z effectively.

Overview of the Literature/Theoretical Framework

Early use of computers in education was primarily in math, science and engineering, mainly as a problem-solving tool, permitting students to deal directly with problems more likely to be encountered in the real world (Levien, 1972). In 1959, the University of Illinois started PLATO, the first, large-scale project using computers in education (United States Congress, 1982). Several thousand terminals made up a system of computers that were used by undergraduates as well as elementary school students specifically in reading. Other pioneers who began using computers in education were Kemeny and Kurtz (1968), who developed the computer language BASIC, that was used to create computer-based instructional materials for all subjects and levels of education, and Atkinson and Suppes, who developed a rapid feedback program providing students with the ability to master subjects through drill-and-practice (Taylor, R., 1980).

Regardless of the catalyst that helped bring computers into modern classrooms, computers are a tool that is a part of everyday life. In 1985, Bork (as cited by Molner,

1997) declared that computer use in education is a highly dynamic technology and over the next 25 years would become the dominant delivery system in education. Exactly twenty five years later, this statement carries a tremendous truth. Computers can be found in every school at every academic level. Almost all businesses, including schools, are dependent on technology on all levels from research and development, production, record keeping, and all the way to delivery (Agarwal, 2010).

General computer technology use by both teachers and students has been studied internationally in areas such as teacher attitudes towards computers (Teo, Lee & Chai, 2008; Yuen & Ma, 2004; Yushau, 2006), general use of the Internet by teachers (Afshari, Bakar, Laun, Samah & Fooi, 2009; Logan & Zevenbergen, 2008), student attitudes towards computers and the Internet (Selwyn, 1997), and how gender impacts the use of the Internet by students (Tsai, Lin & Tsai, 2001). Nationally, similar areas of computer use have been researched, including Loyd and Gressard (1984) and Jones and Clarke (1994) who both developed separate computer attitude scales for various levels of students. A nationwide study conducted by the Center for Technology in Education (Sheingold & Hadley, 1990) revealed, among other things, that considerable time and effort is invested by a teacher who uses computer technology in the classroom.

Additionally, a key incentive for teachers to use computer technology was their students' ability to use computer technology effectively on their own (Sheingold & Hadley, 1990). Although these studies have effectively contributed to the greater body of knowledge regarding computer technology use by teachers and students, many of these and similar studies are dated. Given the advances in computer technology over the

past ten years, and how rapidly computer technology changes annually, it is important to understand current use of technology by teachers and students in order to better understand what motivates both groups to use computer technology.

In order to study agriscience teachers' and students' use, attitude toward, knowledge, and perceptions of computers and technology tools, it is important to understand the specifics of their generations, both "Generation NeXt", or the "Millennial Generation" (Taylor, M., 2009) and "Generation Z" (Posnick-Goodwin, 2010). Dr. Mark Taylor has studied "Generation NeXt", or the "Millennial Generation" since 2006 and has documented characteristics of students at the elementary, secondary, and post-secondary levels of education in detail (Taylor, M., 2009). Taylor (2009) stated that Millennials are "the products of a technology rich, consumer driven culture," (p. 5), and goes on to write that there is a "serious mismatch"(p. 5) between what students of this generation expect from school and what schools can offer in an education.

Although there are mild disagreements regarding what age group defines Generation Z, this group needs to be included when considering what modern agriscience students know about computer technology. Most researchers agree that this generation is as young as eight years old and as old as current high school seniors and that they "see technology as their friend and grasp it much more quickly than previous generations" (Posnick-Goodwin, 2010). Whether agriscience students are "Millennials" or "Generation Z," they are currently the individuals that make up the modern classroom. Understanding the specifics of how these students utilize their technology skills can be a useful tool for agriscience teachers.

An important aspect of studying both teacher and student use of computers and technologies is understanding each groups adoption of these innovative tools. The theoretical foundation used for this study was Rogers' diffusion of innovations. Rogers (2003) defined and described the five stages of the innovation-decision process: knowledge, persuasion, decision, implementation and confirmation. Rogers explained that awareness of an innovation by an individual strengthens their motivation to learn more about the innovation at hand. This study sought to provide foundational information regarding both student and teacher knowledge levels about computer technology including how and why these populations currently utilize computer technologies. Rogers (2003) classified individuals into five adopter categories based on rate of adoption. These categories included: innovators, early adopters, early majority, late majority, and laggards. Table 1 provides characteristics and details for each category.

Table 1

Detailed Characteristics of Individuals in Rogers' (2003) Adopter Categories (based on rate of adoption)

Category	Main characteristic	Detail
Innovators	Venturesome	More cosmopolite Not afraid of setbacks First to try things out
Early Adopters	Respect (category associated)	Looked to as role models More integrated into social system Decreases uncertainty by adopting
Early Majority	Deliberate	Above average in their social system Often do not lead adoption process Most numerous adopter category
Late Majority	Skeptical	Not willing to immediately adopt Look to others for verification of adoption System norms must favor an innovation
Laggards	Traditional	Last to adopt Almost no opinion leadership Suspicious of innovations and change

Adapted from Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.

Although there are exceptions to each of the categories shared by Rogers (2003), use of these categories can be helpful to better understand a specific adoption process. Understanding the adoption of technology by agriscience teachers and students can assist one in gaining a better perspective of how these groups are utilizing computer technology and how all stakeholders in secondary education can assist with and improve educational programming efforts.

Statement of the Problem

Currently, there is a lack of information regarding the general knowledge of high school agriscience students and teachers and how both groups utilize computers, related technologies, and the Internet. This study sought to add to the body of knowledge in agricultural education and contribute rich data that educators can use and build upon in their classrooms and within their curriculums.

The National Research Agenda for Agricultural Education and Communication (2007), a document utilized often by leaders in agricultural education to focus research interests of individuals, is organized into 5 broad areas dimensions: "agricultural communications, agricultural leadership, extension and outreach education, agricultural education in university and post secondary settings, and school-based agricultural education" (p. 2). The broad topic of agriscience teacher and student computer technology use fits properly into four research priority areas and matches five separate priorities that are found in the fifth broad discipline dimension of agricultural education in schools. The first research area, "Enhance program delivery models for Agricultural Education" states a relevant priority area is to examine innovative models to enhance program delivery in Agricultural Education (p. 18). The second research area, "Provide a rigorous, relevant standards based curriculum in Agriculture, Food and Natural Resources" relates to computer use in two priority areas: establish curriculum standards for Agricultural Education as an applied academic area and establish curriculum standards for Agricultural Education as preparations for high demand, high wage careers (p. 19). The third research area, "Increase access to Agricultural Education instruction

and programming" states a relevant priority to assess the elements of school based agriculture programs that lead to academic and career success (p. 20). Lastly, the fourth research priority area, "Prepare and provide an abundance of fully qualified and highly motivated agricultural educators at all levels" seeks a priority in identifying and validating instructional practices for serving diverse student populations (p. 20).

The advancement of technologies that are available to teachers and students provides new opportunities to enhance the classroom experience. However, it is not known to what degree agricultural educators understand the vast world of computer technology. This study provided insight into agriscience teacher and agriscience student use of computer technologies for educational purposes.

Purpose

The purpose of this study was to describe agriscience teachers and their students, in order to better understand how high school agriscience teachers use computers in their instruction and how students use computers in school and socially. This study explored both teacher and student opinions about school assignments that require computer use and how much they use the computer for school work and for entertainment.

Research Objectives

The specific objectives for this study included:

1. Describe secondary agriscience teachers use of computer technology,
2. Describe secondary agriscience students' use, attitude toward, knowledge and perceptions of computer technology, and
3. Describe secondary agriscience students' use, attitude toward, knowledge and perceptions of the Internet.

Methodology

Design

This research project was descriptive in nature, employing quantitative methods while incorporating open-ended questions. Quantitative data was collected incorporating a Likert-type 5-point scale set of questions to determine frequency of computer and technology tool use and attitudes toward computers, related technologies and the Internet. Instruments included demographic data, general use and specific software information and use of Internet tools by agriscience teachers and secondary agriscience students.

Population

The Southern Region California Agricultural Teachers Association was accessed for this study and was the population of greatest interest to the researcher. While the ideal target population for this study would be all agriscience teachers in the state of California, the researcher lives and works in the Southern Region of California and has a working relationship with the agriscience professionals in this region. Therefore, all

Southern Region agriscience teachers (n = 92) and their students as listed in the California Agricultural Teachers Association Directory (CATA) were potential contacts for participation. At the conclusion of the data collection phase of this research study, 80 teachers (N = 92) participated in the teacher portion of this study resulting in an 87% response rate.

To obtain substantial student numbers, program teachers were contacted and their students scheduled to participate. Olejnik (1984) wrote that in conducting an analysis of variance with four groups, an alpha level of .05 and a statistical power of .7, one would need a minimum sample size of 884 to detect a small effect size from classification (i.e. freshman, sophomore, junior and senior). Therefore, scheduling with schools for survey completion was completed once a minimum of 884 agriculture science students were scheduled to complete the survey instrument. A total of 915 secondary agriculture science students completed the survey instrument.

Data Collection

Teacher Data

Data was collected using an online questionnaire. Dillman's (2007) procedures for email and online survey delivery was utilized. Pre-notice emails were sent several days in advance explaining the project, its intentions, and noting that a link to the survey instrument would be emailed within a few days. The participation email included a link to the survey instrument, created in Survey Monkey™, enabling teachers to complete the survey at their convenience and on the computer of their choice. All emails were sent individually, in accordance with Dillman's principle 11.2 regarding the personalization

of participation email requests (p. 368). Follow-up emails were sent to non- respondents approximately ten days after the initial mailing and again a week later once again explained the study and provided a link to the survey instrument. Remaining non-respondents were contacted by phone and encouraged to complete the survey. Data collected from late respondents was compared to early respondents. Given that no significant difference was found between early and late respondents, this data was pooled with initial data collected following appropriate measures for handling non-response (Lindner, Murphy & Briers, 2001).

Student Data

Student data collection for this study incorporated random sampling and quota sampling techniques. All agriculture program names, teacher names, number of students enrolled and program phone numbers were entered into a Microsoft Excel spreadsheet and randomized. According to this randomized list, teachers at each program beginning with the first program listed were contacted and asked to participate in student data collection. A total of 21 sites were contacted in all. Due to teacher choice and administrative constraints on student participation, nine programs declined to participate. Seven programs were secured for participation in this study for a total of 915 student participants. Each site teacher determined whether they would like their students to complete the survey instrument online or hardcopy. All sites selected hardcopies of the instrument. Each site was proctored during the completion of the survey which was administered in their classroom. Students were required to return a signed parent permission letter before participating and were provided a student information sheet

describing the purpose of the study and their rights as a participant. 100% of all students participating returned the parent permission letter prior to completing the survey instrument.

Definition of Terms

The following is a list of terms utilized throughout this study.

- Agriscience student - any student enrolled in a high school agricultural education course.
- Agriscience teacher - an individual who teaches any course in the broad subject of agriculture.
- Attitude - the way a person views something or tends to behave towards it, often in an evaluative way (Mish, 2001).
- Attitude toward Computers - level of comfort using a computer (Jones & Clarke, 1994).
- Attitude toward Internet - level of comfort using the Internet (Tsai et al., 2001).
- Computer - a programmable, electronic device that can store, retrieve, and process data (Mish, 2001). For purposes of this study, all brands of computers available to consumers are appropriate.
- Internet - a vast computer network linking smaller computer networks worldwide including commercial, educational, governmental, and other networks (Random House, 2011).
- Knowledge - the fact or condition of knowing something with familiarity gained through experience or association (Mish, 2001).

- Perception - the conscious understanding of something (Mish, 2001).
- Technology - the practical application of knowledge, especially in a particular area (Mish, 2001). For purposes of this study, the area of technology referenced is computers, devices used with computers, Internet programs and software.

EXPLORING SECONDARY AGRISCIENCE TEACHERS' GENERAL AND REQUIRED USE AND KNOWLEDGE OF COMPUTERS AND TECHNOLOGY TOOLS FOR INSTRUCTION

Introduction/Literature Review

Technology is an everyday part of our lives. From ATM machines to purchasing online tickets to a zoo, technology is everywhere and can do almost anything imaginable. The researcher See (1994) explained that technology can change or alter how people access, gather, analyze, present, transmit, and simulate information. In the past, as computers and technology made their way into everyday life, many in education agreed (Plomp, Brummelhis & Rapmund, 1996; Voogt, 2003) that technology should be used in a manner to effectively develop student skills in cooperation, communication, and problem solving and that students should strengthen abilities for lifelong learning using technology.

Computers in Education

Early use of computers in education was primarily in math, science and engineering, primarily as a problem-solving tool, permitting students to deal directly with problems more likely to be encountered in the real world (Levien, 1972). In 1959, the University of Illinois started PLATO, the first, large-scale project using computers in education (United States Congress, 1982). Several thousand terminals made up a system of computers that were used by undergraduates as well as elementary school students specifically in reading. Other pioneers who began using computers in education were Kemeny and Kurtz (1968) who developed the computer language BASIC, used to create

computer-based instructional materials for all subjects and levels of education. Atkinson and Suppes developed a rapid feedback program giving students the ability to master a subject through drill-and-practice (Taylor, R., 1980).

Computers have impacted everyday life for many, many years. The January 3, 1983 issue of Time Magazine honored the computer in replacement of their annual “Man of the Year” and called it the “Machine of the Year". A spokesperson for the magazine stated:

> There are some occasions when the most significant force in a year's news is not a single individual but a process, and a widespread recognition by a whole society that this process is changing the course of all other processes. (Time Magazine, as cited by Lee, 2010)

In 1985, Bork (as cited by Afshari et al., 2009) declared that computer use in education is a highly dynamic technology and over the next 25 years would become the dominant delivery system in education. Exactly twenty five years later, this statement carries a tremendous truth. Computers can be found in every school at every academic level. Almost all businesses, including schools, are dependent on technology on all levels from research and development, production, record keeping, and information delivery (Agarwal, 2010). Whether teachers are delivering lectures using a computer or students are conducting online research projects, computers are a part of most everyday academic life.

General computer technology use by secondary teachers has been studied globally and nationally. Internationally, research has been conducted on teacher

attitudes towards computers (Teo, Lee & Chai, 2008; Yuen & Ma, 2004; Yushau, 2004) and use of the Internet (Afshari et al., 2009; Logan & Zevenbergen, 2008). Li and Lindner (2007) studied barriers to adopting web-based instruction at an agricultural university in China and found that teachers stated time as their prime barrier to adopting web-based instruction. While a number of researchers have studied computer technology use internationally, little research has been conducted recently to determine baseline data on how teachers use computer technology, either for educational or personal needs, and how this might impact teaching and learning.

A nationwide study conducted by the Center for Technology in Education (Sheingold & Hadley, 1990) used a nomination process to determine the types of teachers who use technology in the classroom and identify what motivates them to do so. This study revealed, among other things, that considerable time and effort is invested by a teacher who uses computer technology in the classroom. Additionally, a key incentive for teachers to use computer technology was their students' ability to use computer technology effectively on their own (Sheingold & Hadley, 1990). A study conducted by Shelton (2000) that examined the computer self-efficacy, attitudes, and word processing skills of freshman college students concluded that computer instruction at the secondary level was important in "creating a technologically self-efficacious, less anxious generation of students" (p. 78). This study, and similar studies, point to the need for a better understanding of general computer technology use, not only by secondary students, but more importantly, how their teachers expect them to utilize computers for educational purposes. Given the advances in computer technology over the past ten

years, it is important to understand current use of technology by teachers and also better understand what motivates their use of computer technology.

Extensive research has been conducted regarding computer use in the field of agricultural education at the post-secondary level, including electronic technologies in teaching (Dooley & Murphy, 2001), demands for distance education (Murphrey & Dooley, 2000; Nelson & Thompson, 2005; Swan, Jackman, & Grubbs, 2005) and barriers to using instructional technology (Berge, Muilenburg, & Haneghan, 2002; Brinkerhoff, 2006; Gammill & Newman, 2005; Nelson & Thompson, 2005) which included lack of support and time. Limited studies in specific areas of computer use have been conducted in secondary agricultural education, including computer anxiety of teachers (Budin, 1999; Fletcher & Deeds, 1994; Redmann & Kotrlik, 2004), perceptions of future roles of instructional technology (Alston, Miller & Williams, 2003), predictors of technology use (Vannatta & Fordham, 2004), and how specific computer related technologies, iPods™ and MP3 players in particular, are being utilized by teachers (Murphrey, Miller & Roberts, 2009). Trend studies have also been conducted to better understand adoption rates of computer technology by secondary agriscience teachers (Kotrlik & Redmann, 2009). With computer technology changing at such a rapid rate, one cannot assume that teachers are using computer technology in the same manner or in ways that are effective for student achievement.

In order to study agriscience teachers and their use of computers, it is important to understand the specifics of the generations, both "Generation NeXt", or the "Millennial generation" (Taylor, 2009) and "Generation Z" (Posnick-Goodwin, 2010)

who are currently populating their classrooms. Dr. Mark Taylor has studied "Generation NeXt", or the "Millennial generation" since 2006 and has documented characteristics of students at the elementary, secondary, and post-secondary levels of education in detail (Taylor, 2009). Taylor (2009) stated that Millennials are "the products of a technology rich, consumer driven culture," (p. 5), and goes on to write that there is a "serious mismatch" between what students of this generation expect from school and what schools can offer in an education (p. 5).

"Generation Z" needs to be included when considering what level of computer user is working with teachers. Although there are mild disagreements regarding what age group defines this generation, most researchers agree that this generation is as young as eight years old and as old as current high school seniors (Posnick-Goodwin, 2010). Posnick-Goodwin (2010) stated that "Generation Z" is a generation "raised on video games, e-mail, and instant messaging, [and] they [students] see technology as their friend and grasp it much more quickly than previous generations" (p. 10). No doubt that they are a generation of students in elementary and secondary classrooms now and should be considered when studying computer technology in education.

Potential motivators for agriscience teachers to utilize computer technology effectively include their students and expectations of school administrators and colleagues. Studies show that computer use by secondary students continues to increase, possibly motivating teachers to do the same. Tucker (2007), in a report written for Education Sector reported that in the 2005-06 school year, United States virtual schools served 700,000 students and that most of these virtual schools were secondary schools.

The author goes on to state that in 2006-07, Missouri, North Carolina, South Carolina, and South Dakota were the latest to establish state-run virtual high schools and that Michigan requires students to take an online class to graduate from high school (Tucker, 2007).

Theoretical Framework

An important aspect of studying teacher use of computers and technologies and how well it matches the current generation of secondary students is to better understand teachers' adoption rates of these innovative tools. Rogers (2003) defined and described the five stages of the innovation-decision process: knowledge, persuasion, decision, implementation and confirmation. Rogers goes on to explain that awareness of an innovation by an individual strengthens their motivation to learn more about the innovation at hand. Have agriscience teachers adopted computers and are they using this technology to its fullest? This study sought to achieve a foundational understanding of teacher awareness and knowledge of computer technology including how, and for what tasks, they currently utilize computer technologies.

According to Webber (2003) "the impact of technology is one of the most critical issues of education" (p. 119). Webber continues on to state that "we continue to grapple with how we might best make use of interaction and communication technology in schools" (p. 119). Agriculture educators are continually challenged to determine their effects on the education of their students and to consider how instructional strategies that they currently utilize increase academic achievement in traditional areas of education (National Research Agenda: Agricultural Education, 2007). What specific computer

skills are agriscience teachers asking their students to utilize when completing in-class and homework assignments and do these assignments match the skill levels of Generation NeXt and Generation Z? This study sought to describe how agriscience teachers are currently using computer technology within their curriculum.

Purpose and Objectives

The purpose of this study was to establish baseline data to better understand how and in what capacity secondary agriscience teachers use computer technology. Five objectives guided this inquiry.

1. Describe agriscience teachers' original methods of gaining knowledge of computers and related technologies.
2. Describe agriscience teachers' required use of computer technology for record keeping at their school site.
3. Describe agriscience teachers' use of computers and related technologies for classroom and student assignment preparation.
4. Describe agriscience teachers required student use of computer and related technologies during class time.
5. Describe agriscience teachers required student use of specific computer applications or related technologies in class or at home

Methods and Procedures

Population

While the ideal target population for this study would have been all agriscience teachers in the state of California, the researcher lives and works in the Southern Region of California and

has a working relationship with the agriscience professionals in this region. Therefore, the population of this study was all secondary agriscience teachers in the Southern California. The contact list of all teachers in the identified area was determined utilizing the *California Agricultural Teachers Association directory.* All 92 teachers in the Southern region of California were contacted in person at a regularly scheduled regional meeting and via email and asked to participate in the study. Once the second initial contact was made via email, an official request for participation that included a link to an electronic survey was emailed to all possible participants in June of 2010 (*n*=92). Dillman's email survey dispersion and follow-up procedures were utilized for data collection (Dillman, 2000). A total of 80 teachers completed the survey, yielding a response rate of 86.96%.

Instrumentation

The electronic instrument used to collect data was a five part questionnaire designed by the researchers and utilized questions from previous studies that investigated teacher and student computer use (Russell, O'Dwyer, Bebell & Tucker-Seeley, 2004). Cronbach's alpha reported by the original researcher was .89 and .77 for two different portions of the instrument.

Part I of the questionnaire included six questions regarding computer ownership, computer classes taken and how teachers have learned how to utilize computer technology in the classroom. Teachers were also asked to rank themselves as to how comfortable they are using computers. The response choices for ranking were: Not Comfortable, Comfortable, and Very Comfortable. Participants were also asked to rate

their level of computer use and experience. The response choices for rating included: Non User, Novice, Intermediate or Advanced.

Part II of the electronic questionnaire included four Yes/No questions regarding teachers' specific school site requirements for maintaining a grade book, submitting grades and completing student daily roll sheets online. Part III included a series of 15 questions regarding how teachers use computers and related technologies in their classrooms and where, in the students daily, weekly, monthly or yearly assignments, teachers ask students to use computer technology for assignments or projects. Terms used to describe the frequency of use were utilized in the response categories. The five response choices included: Several times a week, Several times a month, Several times a year, Once or Twice a Year, and Never. Part IV of the questionnaire included two open-ended questions. Responses to the open-ended questions are not included in this paper. The questionnaire concluded with demographic questions including age, years teaching, ethnicity, and gender.

Data Collection

All teachers listed in the Southern Region section of the California Agricultural Teachers Association (n = 92) were provided a web site link to the survey instrument. Of the 92 teachers contacted via email, 69 teachers responded within ten days, for an initial response rate of 75%. After ten days, a follow-up email and link to the survey instrument was sent to non-respondents and again a week later. Those remaining non-respondents were contacted by phone and encouraged to complete the survey online or asked if they would like to complete the instrument by phone while the researcher

recorded their answers. Since no differences were found between initial respondents and non–respondents, data collected over the phone from late respondents was pooled with the initial data collected, in accordance with Lindner, Murphy and Briers (2001) and their work regarding handling non-response. Eighty survey instruments were completed for a final response rate of 86.96%.

Findings

A total of 80 teachers responded to the survey; however, 3 participants chose not to respond to questions regarding age, years teaching and gender. Of the 77 respondents reporting, 56.3% were female and the average age of respondents was just over 41 years old (*SD* = 11.14). On average respondents reported teaching for just over 14 years (*SD* = 9.56). Of the 80 respondents reporting on further questions, all respondents (100%) reported having a computer available to them at school and all but 1 (98.6%) reported owning a computer at home. A majority of teachers (63.8%) listed their level of computer use and experience as intermediate and none of the respondents categorized themselves as non-users. Almost all respondents (92.5%) rated themselves as either “comfortable” or “very comfortable” with computers and related technology (Table 2).

Table 2

Description of Agriscience Teachers in the Southern Region of California, June 2010

Characteristic	*M*	*SD*	*f*	%
Age (*n* = 77)	41.44	11.14		
Years Teaching(*n* = 77)	14.08	9.56		
Gender (*n* = 77)				
Female			45	56.3
Male			30	40.0
Level of Computer Use and Experience (*n* = 80)				
Non-User			0	0
Novice			10	12.5
Intermediate			51	63.8
Advanced			19	23.8
Comfort Using Computers and Related Technology (*n* = 80)				
Not Comfortable			6	8.7
Comfortable			46	57.5
Very Comfortable			28	35.0
Own Home Computer (*n* = 80)				
Yes			79	98.8
No			1	1.3
School Provided Computer (*n* = 80)				
Yes			80	100
No			0	0

Objective One: Describe agriscience teachers' original methods of gaining knowledge of computers and related technologies

Over one-third of teachers (38.8%) have taken 1-2 computer classes and only 11 respondents (13.8%) stated they have never taken a computer class (Table 3). When asked their specific method of learning about computers and related technologies, the highest number of respondents (40.0%) stated that they taught themselves to use a

computer and related technologies, while a lower number of teachers (16.3%) said that they learned about using computers because they were required in another subject or course. Fourteen percent of teachers learned how to use a computer by trial and error and only eight teachers (10.0%) said that it was a co-worker or friend that helped them learn how to utilize a computer.

Table 3

Agriscience Teachers' Computer Classes and Method of Learning About Computers

Characteristic	*f*	%
Number of Computer Classes Completed (*n* = 80)		
None	11	13.8
1-2 classes	31	38.8
3-4 classes	30	37.5
5-6 classes	8	10.0
Method of Learning About Computers and Related Technology (*n* = 80)		
Self-Taught	32	40.0
Trial and Error	14	17.5
Formal Computer Classes	13	16.3
Trained Within Another Subject/Required Use	13	16.3
Taught by a Friend/Co-Worker	8	10.0

Objective Two: Describe agriscience teachers required use of computer technology for record keeping at their school site

One respondent chose not to answer the four questions related to computer use for classroom management (Table 4). When asked about required computer use at school, almost all teachers (96.2%) answered that they were required to submit daily

attendance online or using a computer. Fewer teachers (75.9%) reported being required to maintain a computer-based grade book. Although a lower number of teachers (60.8%) reported a requirement to maintain an online grade book, 91.1 percent of teachers reported being required to upload or file their progress reports, quarter and semester grades online (Table 4).

Table 4

Required General Classroom Management Use of Computers by Agriscience Teachers

Question	*f*	%
Does your school require you to take/submit daily student attendance online or using a computer? (*n* = 79)		
Yes	76	96.2
No	3	3.8
Does your school require you to maintain a computer-based grade book using a grading software program? (*n* = 79)		
Yes	60	75.9
No	19	24.1
Does your school require you to maintain an online grade book? (*n* = 79)		
Yes	48	60.8
No	31	39.2
Does your school require you to upload your grades, progress reports, etc. online? (*n* = 79)		
Yes	72	91.1
No	7	8.9

Objective Three: Describe agriscience teachers use of computers and related technologies for classroom and student assignment preparation

In regards to how often agriscience teachers use computers for various tasks regarding classroom and assignment preparation, respondents indicated high frequency in a number of areas (Table 5). A large number of teachers reported using a computer to deliver in- class instruction several times a week (56.2%) and several times a month (30.0%), and a large majority of agriscience teachers reported creating a test, quiz or assignment for students several times a week (62.5%) or several times a month (35.0%). The most impressive data was the use of computers to create handouts for students. Seventy percent of Agriscience teachers use computers for this purpose several times a week. Only 8.75% of teachers utilize computers for creating Web-based activities for students or incorporating the Internet into a lesson several times a week and 23.7% of teachers stated that they never use computers for this purpose for classroom preparation.

Table 5

Frequency Distribution of Agriscience Teachers Regarding the Use of Computers for Classroom Preparation (n = 80)

Frequency Preparation Statement	*f*				
	1	2	3	4	5
How often do you use a computer to deliver in-class instruction?	2 (2.50%)	2 (2.50%)	7 (8.75%)	24 (30.0%)	45 (56.2%)
How often do you make handouts for students using computer technology?	1 (1.25%)	0 (0.00%)	4 (5.00%)	19 (23.7%)	56 (70.0%)
How often do you create a test, quiz or assignment for students using computer technology?	0 (0.00%)	0 (0.00%)	2 (2.50%)	28 (35.0%)	50 (62.5%)
How often do you create Web-based activities for students or incorporate the Internet into a lesson?	19 (23.7%)	10 (12.5%)	20 (25.0%)	24 (30.0%)	7 (8.75%)

*Note.*1=Never, 2=Once or Twice a Year, 3=Several Times a Year, 4=Several Times a Month, 5=Several Times a Week

Objective Four: Describe agriscience teachers' required student use of computer and related technologies during class time

Agriscience teachers reported that they do ask students to use computers during class in a variety of ways in varying degrees (Table 6). The highest number of teachers (45.0%) reported that they ask students to work in class on general work using a computer several times a month. Students are asked only several times a year by teachers (41.2%) to conduct research or locate information using the Internet in class, and only 5.00% of teachers ask students to work in groups on school work in class using the computer. An even lower number of teachers (3.75%) reported asking their students to solve problems or complete assignments in class using a computer. The least frequently assigned task asked of students by teachers in class was presenting information to the class using a computer; no teachers reported using this technology several times a week and only 13.7% of teachers use computers for student presentations several times a month.

Table 6

Frequency Distribution of Agriscience Teachers Regarding Student Assignments Requiring "in-class" Computer Technology Use
(n = 80)

Frequency of Student Work Statement	*f*				
	1	2	3	4	5
During class time, how often do students work using computers?	8 (10.0%)	8 (10.0%)	23 (28.7%)	36 (45.0%)	5 (6.25%)
During class time, how often do students work in groups on school work using the computer?	8 (10.0%)	17 (21.2%)	24 (30.0%)	27 (33.7%)	4 (5.00%)
During class time, how often do students conduct research or locate information using the Internet?	6 (7.50%)	10 (12.5%)	33 (41.2%)	28 (35.0%)	3 (3.75%)
During class time, how often do students present information to the class using a computer?	8 (10.0%)	24 (30.0%)	37 (46.2%)	11 (13.7%)	0 (00.0%)
During class time, how often do students use a computer to solve problems or complete assignments?	13 (16.2%)	17 (21.2%)	23 (28.7%)	24 (30.0%)	3 (3.75%)

Note. 1=Never, 2=Once or Twice a Year, 3=Several Times a Year, 4=Several Times a Month, 5=Several Times a Week

Objective Six: Describe agriscience teachers' required student use of specific computer applications or related technologies in class or at home

Agriscience teachers reported utilizing computers for a variety of specific types of assignments; some types were reported with a higher frequency of use than others (Table 7). Teachers most often, or "several times a year," either at home or at school, ask their students to produce reports or papers using computer technology (48.7%). Agriscience teachers reported that they ask their students slightly less frequently per year to create pictures or artwork using computer technology (42.5%), create multimedia projects, such as PowerPoint™ (43.7%) and to produce graphs, charts or diagrams using computer technology (28.7%). Sixty percent of agriscience teachers stated that they "never" ask their students to produce videos or movies using a computer and 65% of agriscience teachers stated that they "never" ask their students to produce Web pages, Websites or other Web-based publications.

Table 7

Frequency Distribution of Agriscience Teachers Request for Student Work Completed Using Computer Technology (n = 80)

Frequency of Student Work Statement	*f*				
	1	2	3	4	5
During class or at home, how often do you ask students to produce reports or papers using computer technology?	4 (5.00%)	14 (17.5%)	39 (48.7%)	21 (26.2%)	2 (2.50%)
During class or at home, how often do you ask students to produce pictures or artwork using computer technology?	10 (12.5%)	23 (28.7%)	34 (42.5%)	12 (15.0%)	1 (1.25%)
During class or at home, how often do you ask students to produce graphs, charts or diagrams using computer technology?	19 (23.7%)	25 (31.2%)	23 (28.7%)	12 (15.0%)	1 (1.25%)
During class or at home, how often do you ask students to produce multimedia projects (power point, etc.) using computer technology?	13 (16.2%)	21 (26.2%)	35 (43.7%)	10 (12.5%)	1 (1.25%)
During class or at home, how often do you ask students to produce Web pages, Websites or other Web based publications?	52 (65.0%)	13 (16.2%)	7 (8.75%)	8 (10.0%)	0 (00.0%)
During class or at home, how often do you ask students to produce videos or movies using computer technology?	48 (60.0%)	20 (25.0%)	8 (10.0%)	4 (5.00%)	0 (00.0%)

Note. 1=Never, 2=Once or Twice a Year, 3=Several Times a Year, 4=Several Times a Month, 5=Several Times a Week

Conclusions

Based on the findings of this study, it can be concluded that agriscience teachers located in the Southern Region of California have access to computer technology, available both at school (school provided) or at home (self provided). A majority of these agriscience teachers perceive themselves as intermediate to advanced computer users. Agriscience teachers can be described as being at the decision and implementation stages of Rogers' (2003) innovation-decision process when investigating computer use and ownership due to a majority of teachers using computers and implementing different types of computer-related tasks during various times of the school year.

Findings related to required school site tasks using the computer revealed that almost all teachers are required to take/submit daily student attendance online or are using a computer to upload student grades and progress reports online. However, there is a significant drop from this requirement to the number of teachers required to maintain either a computer-based or online grade book. While teachers are expected to submit some information online, not all are required to use computer technology to maintain grades and other student data.

It is interesting to find that although teachers report the ability to utilize the computer for classroom preparation, teachers are not utilizing computer technology for in-class student work time or asking students to utilize the computer regularly for homework or projects. These findings align closely with the trend study findings of Kotrlik and Redmann who found that although a high number of teachers "… [changed]

to accommodate technology in my classroom or laboratory", a much lower number incorporate technology to the extent that students use technology in the learning process (2009). Even more interesting is that out of all types of assignments potentially asked of students, Web-based projects were assigned the least. It is possible that agriscience teachers continue to struggle with how they can best use computer technology in their schools, as shared by Webber (2003).

Implications and Recommendations

This study sought to address research needs related to agricultural education in schools specifically in regard to "enhanc[ing] program delivery models for agricultural education" and "prepar[ing] and provid[ing] an abundance of fully qualified and highly motivated agricultural educators at all levels" (National Research Agenda: Agricultural Education, 2007, p. 8). Implications exist as a result of the findings and conclusions shared in this study related to agriscience teacher computer use. Based on findings, there is a need for teachers to be exposed to how technology can benefit the educational process and there is a need for training and incentives to utilize technology effectively. At a time when students are being expected to enter the job market with computer skills, agriscience teachers must add to that skill-set through the use of computer-based activities in the classroom. It cannot be assumed that agricience teachers are utilizing technology to its full potential based on the findings of this study.

Several recommendations can be made utilizing the data collected. A substantial number of teachers are required to upload student grades and attendance online, but teachers are not necessarily required to maintain a computerized grade book. Districts

and school sites should investigate the feasibility of purchasing online grade book software and training teachers on the appropriate use of on online grade books to stream line the process of grade reporting. Training teachers on more Web-based tasks and requiring more online work may encourage teachers to incorporate more Web-based activities in class or prompt teachers to require students to complete more Web-based activities as homework.

It is interesting to consider that one sometimes makes the assumption that teachers are using technology in their classrooms for a variety of purposes – such as student presentations – however, the findings from the study presented here reveal otherwise. The responding teachers do not frequently ask students to present information in class using technology or to create multimedia presentations (e.g., PowerPoint™). Considering that these particular tasks require specific software tools, data should be collected to determine accessibility of various computer programs needed by teachers and students. Further studies should also be conducted to determine strengths and weaknesses of agriscience teacher knowledge of various types of tools and software. Onsite studies at various school sites or completion of online quizzes by teachers and students requiring completion of various tasks could hold value when determining each group's competencies in various areas of computer technology use in education.

An extremely high number of teachers use computers, either at home or at school, to prepare lessons. However, a much lower number of teachers ask their students to utilize computer technology in class or at home for assignment completion.

Training could be implemented to assist teachers in learning how to better incorporate computers for student use during class time. However, a low number of teachers using computers during class time could possibly be related to or dependant on subject matter or class curriculum. Further studies within the broad subject of agriculture science should be conducted to discover when and in what specific topics agriscience teachers are more inclined to use computer technology, especially Web-based creation assignments. Strategies need to be developed to aid teachers when learning how to incorporate this aspect of computer technology into the agriscience classroom.

At a time when technology is being touted as a way to improve and enhance education, it is important to recognize that the findings of this study reveal that while computer technology is available, it is not being utilized to the extent that one might think. Findings reveal minimal use for student assignments that could potentially be associated with new and emerging technologies related to web-based programs that students currently utilize in everyday activities. An investigation into specific student, computer oriented, tasks such as presenting information in class or assigning Web-based activities should be conducted to determine perceived barriers that teachers hold in coordinating and asking students to complete these types of computer-based assignments. Inquiries should include questions related to generational values, student ability or non-ability, interest or non-interest of teachers and availability of computer technology.

General computer use for specific student tasks holds an intrinsic value in education today. "Generation NeXt" and "Generation Z" are technology savvy and learn

better using technology (Taylor, 2009). Similar studies should be conducted throughout California and in other states to determine if the findings in this study hold true for other populations. An exploration of socio-economic differences could be conducted to determine if the cost of computers has an impact on the use of computers or if there are differences between rural and urban locations and accessibility of computer technology and the Internet. Because computer technology changes so rapidly, studies similar to this should be replicated to determine changes in teacher use of computers and their rate of adoption in specific uses of computer technology.

EXPLORING SECONDARY AGRISCIENCE STUDENTS' ATTITUDE TOWARDS AND REQUIRED AND PERSONAL USE OF COMPUTERS AND TECHNOLOGY TOOLS

Introduction/Literature Review

Computer technology is a part of everyday life (Ray, 2001). From keeping track of finances and daily schedules to maintaining contact with family and friends on the other side of the globe, computers are a tool that most everyone knows exist and few can work without. Even if an individual does not own a computer, cell phone or similar device, computers of all sizes and abilities can be found in cars, planes, general appliances, alarm systems and thousands of other devices utilized daily by individuals (Ray, 2001).

Computer technology has become a part of peoples' lives quickly and systematically, and businesses and education have been impacted by its continued and expedient development. In 1979, it was estimated that 15 million personal computers were being used worldwide and in 1981, IBM was the first mainframe developer of a personal computer (Murdock, 2008). Schools began to utilize computers in education in 1983 and by that time 25% of high schools were using personal computers for post-secondary (college) placement and career guidance (Murdock, 2008). By 1988, 60% of all workers in the United States were using computers and laptops were being developed. From 1995 until present day, the Internet has developed into the world's most relied upon and extensive information database. To exemplify how rapidly computer technology has developed, Kurzweil (2008) stated that "a computer in a cell

phone today is a million times cheaper and a thousand times more powerful and about a hundred times smaller than the one computer located at MIT in 1965" (p. 4).

Through the rapid advancement of computers and technology, today's students have an abundance of information tools at their disposal, ranging from early technologies like radio, film and television, to an ever-increasing number of entertainment devices that allow this media to be mobile and accessed when and where the user desires (e.g., DVD's, MP3 players, iPods ™ and video games) (Babcock, 2001). Students live in an information-rich society where school is not their sole source of obtaining information about the world around them. Schools, and more specifically teachers, must compete for student attention by "one-upping" the competition that the "digital age" creates (Molner, 1997). While researchers have conducted studies investigating computer technology use internationally (Isman & Celikli, 2009; Garland & Noyes, 2008) little current research has been conducted to establish baseline data on how students use computer technology, either for educational or personal needs, and how this might impact teaching and learning.

Nationally, a number of specific areas of computer technology use by secondary and post secondary students have been investigated. Loyd and Gressard (1984) created the “Computer Attitude Scale,” which was originally developed to assess teacher and college student computer technology attitudes. Jones and Clarke (1994) altered the Loyd and Gressard scale and developed the “Computer Attitude Scale for Secondary Students,” or CASS, "to enable teachers and researchers to assess individual student's attitudes toward computers…" (p. 315). A nationwide study conducted by the Center for

Technology in Education revealed that a key incentive for teachers to use computer technology was their students' ability to use computer technology effectively on their own (Sheingold & Hadley, 1990). A study conducted by Shelton (2000) that examined the computer self-efficacy, attitudes, and word processing skills of freshman college students concluded that computer instruction at the secondary level was important in "creating a technologically self-efficacious, less anxious generation of students" (p. 78). This study and similar studies point to the need for a better understanding of general computer technology use by secondary students.

Research has been conducted within specific subject areas of education related to computer and technology use by students. O'Dwyer, Russell, Bebell and Seeley (2008) studied student math test scores and compared them to computer use at both home and school. This study revealed that teachers asked students to use computer technology during class time more often than asking them to complete projects using computer technology at home. Donnell (2009) studied visual and performing arts student and teacher attitudes toward computer technology, and concluded that the more faculty members liked using computers, the more students liked using computers. Wingenbach (2000) studied the relationship between academic achievement and exam delivery methods, comparing students who completed an exam using pencil-and-paper method to students who completed an exam electronically. It was concluded that students who completed the exam using the pencil-and-paper method scored significantly higher than those who completed the exam electronically. Given the changes in computer

technology and the overall student and teacher populations, the question arises as to whether or not the results would be the same today.

A number of dated research studies can be found regarding secondary and post-secondary student computer use in the field of agricultural education, including knowledge of microcomputers and student experiences (Bowen, Mincemoyer & Parmley, 1983; Church & Foster, 1984), microcomputer use as an instructional tool (Becker & Shoup, 1985), how students use microcomputers in their classrooms (Henderson, 1985) and comparing computer-based instruction to traditional instruction in post-secondary education (Marrison & Frick, 1993). More recent topics focused on computer use at various educational levels by students have studied topics such as required computer tasks of undergraduate students (Johnson, Ferguson, Vokins & Lester, 2000), examining university student computer experiences and knowledge (Johnson, Ferguson & Lester, 2000), and required computer competencies of post-secondary agriculture students (Bedgood, Murphrey & Dooley, 2008). In 2007, a study conducted which included three different high school agriscience classrooms determined that the inclusion of a technology-based exam feedback system was positively received by secondary students and could be a "promising, developing technology for improving student achievement and positively impacting the classroom environment" (Conoley, Croom, Moore & Flowers, 2007). Recognizing that computer technology changes at a rapid rate, the importance of continually investigating the computer knowledge of agriscience students and methods of integrating technology into the secondary classroom

is essential to agriscience student success in secondary and post-secondary education and the agriculture industry.

Although there is a lack of modern information regarding secondary agriscience student use of computer technology, limited information is available regarding what type of learner modern secondary agriscience students are and how they prefer to learn (Ricketts, Duncan, & Peake, 2006). Taylor (2009) provided a description for the Millennial generation and specifically described how this generation utilizes technology. The Millennial generation is a technology-oriented group of students who have been dubbed "digital natives" (Taylor, 2009). Taylor reported that this generation of students are easily bored and need high stimulation or interactivity to avoid "shutting down" to what they are being asked to complete. The author explained that Millennials prefer technology and texting to face-to-face meeting and conversing and that this group will remain strong technology users as they move up the educational levels.

Generation Z, the most current generation of students, ranges in age from eight to high school senior and is a technology-savvy group of learners (Posnick-Goodwin, 2010). In a recent issue of California Teachers Association magazine, *California Educator*, author Sherry Posnick-Goodwin (2010) wrote:

> Raised on video games, e-mail, and instant messaging, they [students] see technology as their friend and grasp it much more quickly than previous generations. They are intimately familiar with the Internet, cell phones, MP3 players and all manner of digital media. They use technology for work, for play and to form relationships with people they have never met. (p. 10)

Frantom, Green and Hoffman(2002), in a study examining children's attitudes towards technology, wrote "it is likely that the next generation of students will have never known a classroom that does not utilize some form of sophisticated technology" (p. 250). The authors go on to point out that it is "equally likely" that a requirement of student success both in school and after graduation will be computer.

The United States Census Bureau stated that there are 3.8 students per computer in secondary education across the nation and 84.3% of secondary schools provide high speed Internet access to their students, faculty and staff (United States Census Bureau, 2006, p. 169). Given the rapid advances in computer technology, especially over the past 10 years, and the easy access students have to computers in schools, it is important to continually investigate how secondary agriscience students use the computer, both personally and educationally, to insure that students are being challenged and curriculums remain rigorous and effective to maintain students' attention and encourage a desire to learn.

Theoretical Framework

Rogers' (2003) Diffusion of Innovations served as the theoretical foundation for this study. Rogers defined and described the innovation-decision process in five stages: knowledge, persuasion, decision, implementation and confirmation. The author explained that through this process individuals make decisions about new concepts and "decide whether or not to incorporate [an] innovation into ongoing practice" (p. 168). Additionally, Rogers stated that individuals can be sorted into five adopter categories based on rate of adoption: innovators, early adopters, early majority, late majority, and

laggards. These categories are useful in determining the rate of adoption of a specific innovation by an individual. Understanding where agriscience students are in the innovation-decision process and what adopter categories these students' represent can be pivotal to the creation of computer-based assignments, projects and class work for today's learner.

Taylor (2009) identified today's secondary student as "technologically savvy" and Posnick-Goodwin (2010) stated that "[they are] the most technologically advanced generation yet" (p. 10). However, there are no studies that describe today's modern agriscience student.

Purpose and Objectives

The purpose of this study was to establish baseline data to describe how and in what capacity secondary agriscience students use computer technology. Four objectives guided this inquiry:

1. Describe how comfortable agriscience students' are using computer technology and their original methods of gaining knowledge of computers.
2. Describe agriscience students' required use of computers and software for educational purposes.
3. Describe agriscience students' use of computers and software for personal purposes.
4. Describe agriscience students' general attitude towards computers.

Methods and Procedures

Population

To obtain substantial student numbers, agriscience teachers were contacted at random and their students scheduled to participate. Olejnik (1984) wrote that in conducting an analysis of variance with four groups, an alpha level of .05 and a statistical power of .7, one would need a minimum sample size of 884 to detect a small effect size from classification (i.e., freshman, sophomore, junior and senior). As such, scheduling of schools for survey completion was concluded once a minimum of 884 agriculture science students were scheduled to complete the survey instrument to ensure an adequate number of participants. Through random school selection, a total of 915 secondary agriscience students completed the survey instrument.

Instrumentation

A modified version of the *Computer Attitude Scale for Secondary Students* originally designed by Jones and Clarke (1994) and modified by Selwyn (1997) was utilized in the instrument. Permission was obtained for use of this instrument (Appendix A). The only modification to the Selwyn (1997) instrument was the removal of demographic questions that did not pertain to the study. The student instrument included two sections of questions asking students to list the frequency that they utilized specific types of computer programs for personal and educational reasons. Cronbach's alpha reported by the original researcher was .95.

Student data collection for this study followed Dillmans' (2000) procedures for data collection and incorporated random sampling and quota sampling techniques. As

pointed out by Trochim (2006), non-proportional quota sampling is a less restrictive method of collecting a minimum number of samples and is not concerned with have numbers match specific portions, but enough to represent even the smallest groups in a population. All agricultural program names, teacher names, number of students enrolled and program phone numbers were entered into a Microsoft Excel spreadsheet and randomized. According to this randomized list, teachers at each program beginning with the first program listed were contacted and asked to participate in student data collection. A total of 21 sites were contacted in all. Due to teacher choice and administrative constraints on student participation, nine programs declined to participate. Seven schools were secured for participation in this study for a total of 915 student participants. The number of students participating from each school was as follows: school A - 81 students, school B - 184 students, school C - 117 students, school D - 121 students, school E - 92 students, school F - 138 students and school G - 182 students. These participation numbers represent a fair distribution of participants across the seven schools participating.

Each site teacher determined whether they would like their students to complete the survey instrument online or on paper. All sites selected for students to complete a paper instrument. Each site was proctored during the completion of the survey which was administered in their classroom. Students were required to return a signed parent permission letter before participating and were provided a student information sheet describing the purpose of the study and their rights as a participant. All students

participating returned the parent permission letter prior to completing the survey instrument.

Findings

Of the 915 students completing the instrument, 62.5% were female. Respondents were fairly equally distributed in grade level with 25% of the respondents being freshmen, 28.7% sophomores, 25.2% juniors and 21% being seniors. Eleven students chose not to disclose their ethnicity; however, a majority of the respondents classified themselves ethnically as either White (42%) or Latio/Hispanic American (41.6%) with 15 respondents (1.6%) handwriting Native American Indian in the "Other" option (See Table 8).

Table 8

Description of Agriscience Students Surveyed About General Computer Use in the Southern Region of California, June 2010

Characteristic	*f*	%
Grade in School (*n* = 915)		
Freshman	229	25.0
Sophomore	263	28.7
Junior	231	25.2
Senior	192	21.0
Gender (*n* = 915)		
Female	572	62.5
Male	343	37.5
Ethnicity (n = 904)		
White	384	42.0
Latino/Hispanic American	381	41.6
African American	80	8.7
Asian American	55	6.0
Other (Native American Indian)	15	1.6

Objective One: Describe how comfortable agriscience students are in using computer technology and their original methods of gaining knowledge of computers

Just over two-thirds of students (61.6%) had taken 1-2 computer classes and interestingly, over a quarter (27.1%) stated that they had never taken a computer class (Table 9). When asked to state their method of learning about computers and related technologies, over half of the respondents (50.1%) stated that they taught themselves (self-taught) how to use a computer and related technologies, while a much lower number of students (18.9%) stated that they were taught by a friend or sibling. Only 16.7% of students stated that they had completed formal computer classes and only 26 (2.8%) agriscience students stated that they had learned about computers and related technologies through trial and error.

Table 9

Agriscience Students' Computer Classes and Method of Learning About Computers

Characteristic	*f*	%
Number of Computer Classes Completed (*n* = 915)		
None	248	27.1
1-2 classes	564	61.6
3-4 classes	85	9.3
5-6 classes	18	2.0
Method of Learning About Computers and Related Technology (*n* = 915)		
Self-Taught	458	50.1
Taught by a Friend/sibling	173	18.9
Formal Classes	153	16.7
Trained Within Another Subject/Class Required Use	105	11.5
Trial and Error	26	2.8

Over two thirds of agriscience students (66.3%) listed their level of computer use and experience as intermediate while 10 (1.1%) students consider themselves non-users. Almost all respondents (95.1%) rated themselves as either “comfortable” or “very comfortable” with computers and related technologies. Of the 915 students who completed the survey, 851 (93.0%) stated that they have a computer to use at home. Of those 851, just under two-thirds, or 65.7% stated that the computer they have at home is for family use and not personally owned by the student (Table 10).

Table 10

Agriscience Students' Level of Computer Use, Comfort Using Computers and Computer Ownership

Characteristic	*f*	%
Level of Computer Use and Experience (*n* = 915)		
Non-user	10	1.1
Novice	121	13.2
Intermediate	607	66.3
Advanced	177	19.3
Comfort Using Computers and Related Technology (*n* = 915)		
Not Comfortable	45	4.9
Comfortable	464	50.7
Very Comfortable	406	44.4
Student has a Computer at Home (*n* = 915)		
Yes	851	93.0
No	64	7.0
Type of Computer Ownership (*n* = 851)		
Family Computer	559	65.7
My Own Computer	294	34.5

Objective Two: Describe agriscience students' required use of computers and software for educational purposes

With regard to how often students use specific computer technologies for school purposes, respondents indicated a low frequency in almost all categories (See Table 11). Three hundred and fifty students (38.3%) stated that they use Microsoft Word™ several times a month for school purposes, and 496 (54.2%) agriscience students stated that they use Microsoft Power Point™ for school reasons. Image editing software (e.g., Photoshop™) was reported as being used once a month by 194 (21.3%) agriscience students for school reasons while spreadsheet software, like Excel™, was reported as "never" used by 673, or 73.6% of agriscience students. Adobe Acrobat™ was reported as "never" used by 747 (81.6%) of the agriscience students for school reasons and non-Internet purchased computer games were utilized the least for school reasons with 819 (89.5%) stating that they "never" use this computer technology for school reasons.

Table 11

Frequency Distribution of Agriscience Students Regarding the Use of Software and Computer Programs for School Reasons (n = 915)

Frequency of Use of Specific technologies	*f*				
	1	2	3	4	5
Power Point™	272 (29.7%)	496 (54.2%)	69 (7.55%)	55 (6.01%)	23 (2.51%)
Word™	90 (9.84%)	350 (38.3%)	205 (22.4%)	209 (22.8%)	61 (6.67%)
Excel™ (spreadsheets)	673 (73.6%)	134 (14.6%)	43 (4.70%)	37 (4.04%)	28 (3.06%)
Image Editing (e.g., Photoshop™)	529 (57.8%)	194 (21.3%)	70 (7.65%)	72 (7.87%)	50 (5.46%)
Drawing/Painting software (e.g., Adobe Flash™)	576 (62.9%)	177 (19.3%)	66 (7.21%)	57 (6.23%)	39 (4.26%)
Video Production (e.g., Adobe Premier Elements™)	736 (80.4%)	106 (11.6%)	27 (2.95%)	29 (3.17%)	17 (1.86%)
Adobe Acrobat™ (includes reader)	747 (81.6%)	93 (10.2%)	30 (3.28%)	30 (3.28%)	15 (1.64%)
Any web page/site creator (e.g., Dreamweaver™, MyWebs™)	706 (77.2%)	116 (12.7%)	31 (3.39%)	33 (3.61%)	29 (3.17%)
Purchased computer games (not Internet games)	819 (89.5%)	54 (5.90%)	11 (1.20%)	26 (2.84%)	5 (.546%)

Note. 1=Never, 2=Once a Month, 3=Once a Week, 4=2-3 Times a Week, 5=Everyday

Objective Three: Describe agriscience students' use of computers and software for personal purposes

Students reported utilizing computer software for personal reasons in a slightly different manner than for school reasons, but continued to show low frequencies in several categories (Table 12). Although a majority of students in all categories stated that they "never" use any of the specific computer software types listed for personal reasons, 245 (26.8%) agriscience students stated that they use Microsoft Word™ and 175 (19.1%) agriscience students stated that they use Power Point™ once a month for personal reasons. Image editing software (e.g., Photoshop™) was reported as being used by 163 students, or 17.8%, once a month for personal reasons. Worth noting was that 138 (15.1%) agriscience students reported using drawing or painting software (e.g., Adobe Flash™) once a month. For personal reasons, 100 students, or 10.9% of the participants use non-Internet games for personal reasons once a month and only 54 (5.90%) agriscience students utilize Adobe Acrobat™ once a month.

Table 12

Frequency Distribution of Agriscience Students Regarding the Use of Software and Computer Programs for Personal Reasons
(n = 915)

Frequency of Use of Specific technologies	*f*				
	1	2	3	4	5
Power Point™	668 (73.0%)	175 (19.1%)	36 (3.93%)	23 (2.51%)	13 (1.42%)
Word™	392 (42.8%)	245 (26.8%)	139 (15.2%)	97 (10.6%)	42 (4.59%)
Excel™ (spreadsheets)	760 (83.1%)	84 (9.18%)	26 (2.84%)	36 (3.93%)	9 (.984%)
Image Editing (e.g., Photoshop™)	459 (50.2%)	163 (17.8%)	125 (13.7%)	120 (13.1%)	48 (5.25%)
Drawing/Painting software (e.g., Adobe Flash™)	562 (61.4%)	138 (15.1%)	109 (11.9%)	78 (8.52%)	28 (3.06%)
Video Production (e.g., Adobe Premier Elements™)	746 (81.5%)	89 (9.73%)	26 (2.84%)	41 (4.48%)	13 (1.42%)
Adobe Acrobat™ (includes reader)	798 (87.2%)	54 (5.90%)	33 (3.61%)	23 (2.51%)	7 (.765%)
Any web page/site creator (e.g., Dreamweaver™, MyWebs™)	763 (83.4%)	72 (7.87%)	30 (3.28%)	31 (3.39%)	19 (2.08%)
Purchased computer games (not Internet games)	735 (80.3%)	100 (10.9%)	37 (4.04%)	32 (3.50%)	11 (1.20%)

Note. 1=Never, 2=Once a Month, 3=Once a Week, 4=2-3 Times a Week, 5=Everyday

Objective Four: Describe agriscience students' general attitude towards computers

Objective four sought to better understand agriscience students' general attitude towards computers. When responding to questions about their general attitude towards computers, agriscience students were positive about computers (Table 13). The top three individual indicators that ranked the highest were "if I need computer skills for my career choice, I will develop them" (*M =3.72*; *SD* =1.07), "I would like to learn more about computers" (*M* = 3.43; *SD* =1.05) and "when I have a problem with a computer, I usually solve it on my own" (*M* = 3.28; *SD* = 1.19). The three indicators that ranked the lowest were "computers make me feel uncomfortable" (*M* = 1.69; *SD* = .820), "working with a computer makes me feel tense and uncomfortable" (*M* = 1.67; *SD* = .869) and "computers intimidate and threaten me" (*M* = 1.60; *SD* = .763).

Table 13

Agriscience Students' Attitude Towards General Computer Use (n=915)

Questions (1 - 8)	Mean	SD
If I need computer skills for my career choice, I will develop them.	3.72	1.07
I would like to learn more about computers.	3.43	1.05
When I have a problem with a computer, I usually solve it on my own.	3.28	1.19
People that work with computers make really good money.	3.17	1.04
I would like to spend more time using a computer.	3.13	1.05
I develop shortcuts and more efficient ways to use computers.	3.10	1.12
Using the computer has increased my interaction with other students.	3.09	1.08
I feel important when others ask me for information about computers.	3.06	1.11

Table 13 - (Continued)

Questions (9 - 40)	Mean	SD
If I can, I will take subjects (classes) that teach me to use computers.	3.06	1.09
I learn new computer tasks by trial and error.	2.96	1.15
Other students look to me for help when using a computer.	2.93	1.07
People who work with computers sit in front of a computer screen all day.	2.75	1.07
If my school offered a computer camp, I would attend it.	2.46	1.17
Not many people can use computers.	2.39	1.13
Anything that a computer can be used for, I can do just as well another way.	2.32	.920
Boys like computers more than girls do.	2.30	1.13
All computer people talk in a strange and technical language.	2.30	1.07
People that use computers regularly are seen as being more important than those who don't use computers regularly.	2.28	1.04
Working with computers means working on your own, without contact with others.	2.22	1.02
Computers are confusing.	2.21	1.05
Working with computers will not be important to me in my career.	2.19	1.06
I'm not good with computers.	2.15	.990
Computers frustrate me.	2.14	1.08
I feel helpless when asked to perform a new task on a computer.	2.11	1.00
Computers are difficult to understand.	2.05	.997
Working with computers makes me feel isolated from other people.	2.05	.941
To use computers you have to be highly qualified.	2.03	.961
I don't feel I have control over what I do when using a computer.	1.99	.945
Computers bore me.	1.91	.937
You have to be a real "brain" to work with computers.	1.90	1.02
Using computers prevents me from being creative.	1.89	.927
I feel unhappy walking into a room full of computers.	1.89	.926
Learning about computers is a waste of time.	1.82	.927
Working with a computer makes me feel very nervous.	1.77	.904
Computers sometimes scare me.	1.76	.952
I get a sinking feeling when I think of trying to use a computer.	1.69	.829
I feel threatened when others talk about computers.	1.69	.821
Computers make me feel uncomfortable.	1.69	.820
Working with a computer makes me feel tense and uncomfortable.	1.67	.869
Computers intimidate and threaten me.	1.50	.763

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Conclusions

Based on findings, a large majority of secondary agriscience students have access to computers. Almost all students identified themselves as intermediate to advanced computer users and can be described as being at the decision and implementation stages of Rogers' (2003) innovation-decision process when considering computer use, ownership and experience.

Findings related to various types of software that students might use for school revealed that students, although utilizing some common programs such as Microsoft Word™ and Power Point™, are not being asked frequently to use these programs for school work. However, these students do not utilize a number of the same programs for personal reasons. While Microsoft Word™ and Power Point™ were reported as the most frequently utilized for school work, Microsoft Word™ and image editing software, such as Photoshop™, were reported as being utilized most frequently for personal reasons. Interestingly, Adobe Acrobat™, as a document reader or publisher, is used the least by agriscience students, either for school or personal reasons.

Further investigation into agriscience students' general attitude towards computer use revealed that students have a genuine desire to continue to learn about computers. They are confident that they possess the ability to develop computer skills when needed and can solve computer problems on their own. These findings align well with Posnick-Goodwin's statement regarding Generation Z having the ability to grasp technology much quicker than previous generations (2010). These findings also complement the study by Frantom et al (2002) and exemplifies that secondary students, with the ability to

work with computers on their own and a desire to learn more, are computer literate. Based on findings related to the high number of students learning about computers through trial and error, agriscience students could also be considered innovators and early adopters based on Rogers' (2003) adopter categories in relation to the use of computers. Given secondary students' generational skills and what various authors have concluded about these individuals and their extensive use of technologies, it could be that students have the ability to serve as a type of change agent for computer use in the classroom. Secondary agriscience students may be able to motivate and serve teachers through their generational demand to learn using computer technology and how they, as students, use computer technology for school and personal purposes.

Implications and Recommendations

This study sought to address specific needs of agriscience students, most significantly with regard to "…assess[ing] the elements of school-based agriculture programs that lead to academic and career success (National Research Agenda: Agricultural Education, 2007, p. 20). Implications exist as a result of this study. Based on findings, students need to be given the opportunity to utilize computers in school assignments and projects, either through formal assignments or through guided inquiry. These efforts would match the needs of Millennials and Generation Z. If students are to become truly computer literate, they must be given the opportunity to utilize computer technology whenever possible. Challenging students to use computer technology in their everyday lives for personal and non-entertainment reasons is important.

Assumptions cannot be made about students utilizing computers simply through the definition of their generation.

A number of recommendations are made based on the data collected. A vast majority of students have access to computers at home; however, students stated that a large number of these computers are shared, family computers. Considering that an overwhelming number of students have learned how to use computers through trial and error, further studies should be conducted to determine barriers to computer use by students, possibly compared to computer ownership. Parental constraints, computer sharing with siblings, and inquiry into financial limitations should also be considered.

Given that computer literacy is critical to student success, additional studies should be conducted to determine specific methods of strengthening this literacy, specifically in the areas of spreadsheets (Excel™), web page construction and design, and specialty software such as Adobe Acrobat™. Strategies need to be developed to create computer assignments that not only require students to utilize computers in school and personal work, but also increase students' computer skills at the same time. On-site studies, similar to the technology-based exam feedback project conducted by Conoley et al. (2007), should be carried out to test specific software use and program use and determine precise computer skills students possess. Conducting specific, hands-on tests involving different types of software could prove valuable when determining computer skills held by students. Although students state that they utilize a program or type of software, they very well may not be literate in the program.

An extremely low number of students stated that computers make them uncomfortable, tense or threatened, meaning that a majority are comfortable using computers. However, this comfort level may only develop over time during high school and through course work opportunities. Similar studies should be conducted to determine if there is a correlation between how comfortable a student is using computer technology and the number of courses taken, number of regular tasks assigned that require computer use and the students classification in high school.

Computers are invaluable tools in the educational system and to the generations that fill the modern classroom. Similar studies should be conducted throughout California and in other states to determine if the findings in this study hold true for other populations. Because computer technology changes so rapidly, similar studies should be conducted regularly to determine new methods of computer use by students and to describe how students use computers educationally and personally.

EXPLORING SECONDARY STUDENTS' GENERAL AND REQUIRED USE, KNOWLEDGE OF AND ATTITUDE TOWARDS THE INTERNET

Introduction/Literature Review

In 1985, there were 2,000 Internet devices "online" (NEWSdial, 2009, para. 2) and in 1995 the Internet and the World Wide Web could be regularly identified in businesses and schools (Murdock, 2008). By 2007, the Internet became the world's most extensive database of information (Murdock, 2008). Cox, of Network World, announced in August, 2010, that sometime during that month, 5 billion Internet devices would be linked to the Internet (2010). Cox (2010) predicted that this number would quadruple in ten years. Recently, Internet World Stats (2010) reported that 77.3 percent of the population of the United States uses the Internet, representing 12 percent of the world's population of Internet users.

The Internet has quickly made its way into homes, businesses and schools as a convenient and powerful tool for communicating and fact finding (Hall-Sturgis, 2001). After the development of the more modern personal computer in 1981, the development of the Internet began. In 1992, schools were using "Gopher Servers," an online tool used to find limited information that presented its contents as a hierarchically structured list of files (Murdock, 2008). By 1996, businesses began to advertise and provide services using web pages and schools began to rewire for Internet access and offer opportunities to teachers for web-site creation. Google™, one of the most popular modern methods of searching for information online, became a registered domain name search engine in 1997, creating an easier, more precise mode of finding information (Google™, 2011). In

2009, Google™ was used for approximately 31 billion searches a month (Google™, 2011).

The World Wide Web provides a powerful resource for education in agriculture and the life sciences (O'Kane & Armstrong, 1997). Internet technology enables students of all ages to visit people, places and things right from their classroom or home with the click of a mouse. Alec Mackenzie (2010) stated that "[Students] are much more connected to the outside world than previous generations; they know what is hanging in the Louvre because they've seen it on the Internet" (p. 10). Mackenzie goes on to state that "[Students] know more about the world because they visit it on the computer" (p. 10). Bill Tucker, in a report written for Education Sector (2007), stated that "while the importance of effective teaching and learning has not changed, Internet technology has enabled educators to significantly alter the experience of schooling" (para. 6).

International studies have been conducted on various topics regarding Internet technology use by secondary students, including general Internet use (Afshari et al., 2009; Logan & Zevenbergen, 2008), the relevance of attitudinal scales compared to technology advancements (Garland & Noyes, 2008), and Internet attitudes and use related to gender (Tsai et al., 2001). Tsai et al. (2001) created an Internet Attitude Scale and administered the instrument to 753 Taiwanese high school students. Results showed that while there was no significant difference between males and females using Internet technology, students who had prior knowledge of and experience using Internet technology showed more positive attitudes towards using Internet technology than those with less experience. Garland and Noyes (2008) discovered through their use of a dated

computer attitude instrument that, as technology changes, so must the terminology, instrument design and constructs studied.

Research regarding Internet technology used for online courses (Boyd & Murphrey, 2001; Johnson, Ferguson, Vokins & Lester, 2000; Layfield & Nti, 2000; Murphy, 2002; Olson & Wisher, 2002), distance education courses (Bowen & Thomson, 1995; Dooley, Lindner & Richards, 2003), and general Internet use (Rhoades, Irani, Telg & Myers, 2008) in agricultural education at the post secondary level has been thorough and remains fairly current. Student interest in online courses was reported strong in a number of subjects, including those found in agriculture and general subjects. Boyd and Murphrey (2001) studied university student interest in an online agriculture leadership class and concluded that more than eighty percent of the students were interested in taking one or more courses via the Internet.

Alston and English (2007) evaluated the effectiveness and benefits of Web-enhanced courses in North Carolina. Participants agreed that Web-enhanced courses were beneficial and recommended that more Web-enhanced courses be utilized to enhance learning and "increase technological literacy" (p. 8). Similar studies regarding perceptions of Internet technology for instructional delivery in post-secondary agricultural education have been conducted with similar results (Layfield & Nti, 2000; Shih & Gamon, 2002). In a 2001 study regarding Web-based learning, Shih and Gamon (2002) revealed no difference in how a student learned utilizing the Internet as compared to their learning style and technological background. Furthermore, students noted that utilizing Internet technology for coursework was more convenient and that they were

"motivated by the high expectations of Web-based learning" (Shih & Gamon, 2002). Rhoades et al. (2008) conducted a study to determine college of agriculture student usage of Internet technology and their attitudes toward the Internet. The authors found that students see Internet technology as easy to use and an important educational tool. Further findings revealed that college of agriculture students were substantial users of the Internet and online programs such as Facebook™, MySpace™ and search engines [e.g., Google™] and that students believe the information they obtain from the Internet is accurate .

Although a lack of current research regarding secondary agriscience students and how they utilize the Internet for educational purposes exists, research has been conducted regarding the generation of students that fill today's secondary classroom that addresses who they are and how they prefer to learn. Taylor (2009) studied Generation NeXt, or Millennials; the generation that is currently populating classrooms. He stated that today's secondary students "live on-line" (p. 2) and that they stay in contact with others mainly through social networks. He articulated that these students prefer to communicate through technology as opposed to face-to-face, and are "easily bored" (p. 2) and need "high stimulation or interactivity" (p. 2) to avoid shutting down. Taylor described Generation NeXt as positive, confident, and pragmatic and indicated their "enviable strengths" (p. 3) as adaptability and optimism. Taylor and Keeter (2010), in a report conducted by the Pew Research Center, stated that "[Millennials] are history's first 'always connected' generation. Steeped in digital technology and social media, they treat their multi-tasking hand-held gadgets almost like a body part..." (p. 1). The authors go

on to state "three quarters [of Millennials] have created a profile on a social networking site" (Taylor & Keeter, 2010, p. 1).

Generation Z represents the most modern students, as young as eight and as old as seniors in high school (Posnick-Goodwin, 2010). Posnick -Goodwin (2010) further stated that this generation has "never known a world without technology" (p. 8) and that these students are "headed for careers that don't exist today" (p. 10) largely due to the rapid advances in technology they will face in the future.

In a United States Census report, 84.3% of secondary schools provided high-speed Internet access to their students, faculty and staff (United States Census Bureau, 2011). In addition, 82% of public secondary schools have an online library catalogue that students utilize and 53% of secondary schools offer an online curriculum to students (United States Census Bureau, 2008, p. 169). With an abundance of opportunity for agriscience students to use Internet technology to enhance their education, it is important to clearly understand their Internet technology skills and abilities and how these attributes can be used to strengthen and enhance learning.

Theoretical Framework

Rogers' (2003) Diffusion of Innovations served as the theoretical foundation for this study. Rogers (2003) defined and described the innovation-decision process in five stages: knowledge, persuasion, decision, implementation and confirmation. The author explained that through this process individuals make decisions about new concepts and "decide whether or not to incorporate [an] innovation into ongoing practice" (p. 168).

Additionally, Rogers (2003) stated that individuals can be sorted into five adopter categories based on rate of adoption: innovators, early adopters, early majority, late majority, and laggards. Although there are exceptions when using each of these categories to describe individuals, it is effective to understand the attributes of individuals in each of Roger's categories. *Innovators* are "cosmopolite" and must be able to handle uncertainty about innovations and willing to take risks. *Early adopters* are "localites" and have the highest level of opinion leadership of all Rogers' adopter categories. *Early majority* are described as "deliberate" in their actions as adopters and seldom hold positions of opinion leadership. *Late Majority* are a "skeptical" group and typically adopt innovations after the average member of a group or system. *Laggards* are most often the last to adopt an innovation and do so with extreme caution. These categories are useful in determining the rate of adoption of a specific innovation by an individual.

In addition to understanding the diffusion of a technology it is also important to understand and recognize the level of technology acceptance expressed by a population. Technology acceptance can be defined as "people's attitude to the uptake and use of different technologies" (Oshlyansky, Cairns & Thimbleby, 2007). Because of the lack of information regarding secondary agriscience student use of Internet technologies, this definition plays a substantial role in understanding this specific student population, their use of the Internet, and how accepting these individuals are to using Internet technologies in education.

Purpose and Objectives

The purpose of this study was to establish baseline data to better understand how and in what capacity secondary agriscience students use the Internet. Three objectives guided this inquiry:

1. Describe agriscience students' required use of the Internet for school purposes.
2. Describe agriscience students' use of the Internet for personal purposes.
3. Describe agriscience students' general attitude towards the Internet.

Methods and Procedures

Population

To obtain adequate student numbers, agriscience teachers were contacted at random and their students scheduled to participate. Olejnik (1984) wrote that in conducting an analysis of variance with four groups, an alpha level of .05 and a statistical power of .7, one would need a minimum sample size of 884 to detect a small effect size from classification (i.e., freshman, sophomore, junior and senior). As such, scheduling of schools for survey completion was completed once a minimum of 884 agriscience students were scheduled to complete the survey instrument to ensure an adequate number of participants. Through random school selection, a total of 915 secondary agriculture science students completed the survey instrument.

Instrumentation

The *Internet Attitude Scale* designed by Tsai et al. (2001) was utilized as the instrument. Permission was obtained for use of this instrument (Appendix B). In addition to the *Internet Attitude Scale*, the student instrument included two sections of

questions asking students to list the frequency that they utilized the Internet for personal and educational reasons. An additional section included questions regarding computer use comfort level and number of computer courses completed. Demographic information was also collected from each participant.

Student data collection for this study followed Dillmans' (2000) procedures for data collection and incorporated random sampling and quota sampling techniques. As pointed out by Trochim (2006), nonproportional quota sampling is a less restrictive method of collecting a minimum number of samples and is not concerned with having numbers match specific portions, but enough to represent even the smallest groups in a population. All agricultural program names, teacher names, number of students enrolled and program phone numbers were entered into a Microsoft Excel™ spreadsheet and randomized. According to this randomized list, teachers at each program (beginning with the first program listed) were contacted and asked to participate in student data collection. A total of 21 sites were contacted in all. Due to teacher choice and administrative constraints on student participation, nine schools declined to participate. Seven schools were secured for participation in this study for a total of 915 student participants. The number of students participating from each school was as follows: school A - 81 students, school B - 184 students, school C - 117 students, school D - 121 students, school E - 92 students, school F - 138 students and school G - 182 students. These participation numbers represent a fair distribution of participants across the seven schools participating.

Each site teacher determined whether they would like their students to complete the survey instrument online or on paper. All sites selected for students to complete a paper instrument. Each site was proctored during the completion of the survey which was administered in their classroom. Students were required to return a signed parent permission letter before participating and were provided a student information sheet describing the purpose of the study and their rights as a participant. All of the students participating returned the parent permission letter prior to completing the survey instrument.

Findings

Respondents participating in this study reported having completed one to two computer classes and most stated that they taught themselves how to use computers and related technologies. A majority of agriscience students reported having a computer at home. Most students rated themselves as intermediate to advanced users and stated that they were comfortable to very comfortable using computers and related technologies.

Of the 915 students completing the instrument, 62.5% were female. Respondents were fairly equally distributed in grade level with 25% of the respondents being freshmen, 28.7% sophomores, 25.2% juniors, and 21% being seniors. Eleven students chose not to disclose their ethnicity; however, a majority of the respondents classified themselves ethnically as either White (42%) or Latio/Hispanic American (41.6%) with 15 respondents (1.6%) handwriting Native American Indian in the "Other" option (See Table 14).

Table 14

Description of Agriscience Students Surveyed about Internet Usage and Attitude in the Southern Region of California, June 2010

Characteristic	*f*	%
Grade in School (*n* = 915)		
Freshman	229	25.0
Sophomore	263	28.7
Junior	231	25.2
Senior	192	21.0
Gender (*n* = 915)		
Male	343	37.5
Female	572	62.5
Ethnicity (n = 904)		
White	384	42.0
Latino/Hispanic American	381	41.6
African American	80	8.7
Asian American	55	6.0
Other (Native American Indian)	15	1.6

Objective One: Describe agriscience students' required use of the Internet for school purposes

When asked how often agriscience students utilize Internet technologies for school purposes, respondents indicated a low frequency of use in all categories (Table 15). Considering low frequencies throughout, the most highly utilized Internet technology for school purposes in this population was social networks with 150 (16.4%) students stating that they use this Internet technology every day. Email was reported to be used by 132 (14.4%) of agriscience students every day, followed by YouTube™ used by 110 (12.2%) students every day. A majority (770; 84.2%) of agriscience students

reported never using Blogs and just over 90% (831 students, 90.8%) of agriscience students reported never using Twitter™ for school purposes.

Table 15

Frequency Distribution of Agrisicence Students Regarding the Use of Internet Technologies for School Reasons (n = 915)

Frequency of Use of Specific Technologies	*f*				
	1	2	3	4	5
Internet games	624 (68.2%)	154 (16.8%)	57 (6.23%)	63 (6.89%)	17 (1.86%)
E-mail	358 (39.1%)	179 (19.6%)	119 (13.0%)	127 (13.9%)	132 (14.4%)
Social networks (Facebook™, MySpace™)	543 (59.3%)	75 (8.20%)	63 (6.89%)	84 (9.18%)	150 (16.4%)
Blogs	770 (84.2%)	67 (7.32%)	37 (4.04%)	28 (3.06%)	13 (1.42%)
Twitter™	831 (90.8%)	34 (3.71%)	13 (1.42%)	15 (1.64%)	22 (2.40%)
You Tube™	404 (44.2%)	134 (14.6%)	100 (10.9%)	167 (18.3%)	110 (12.2%)

Note. 1=Never, 2=Once a Month, 3=Once a Week, 4=2-3 Times a Week, 5=Everyday

Objective Two: Describe agriscience students' use of the Internet for personal purposes

Students reported utilizing Internet technologies for personal purposes in a different manner than for school; however, some Internet technologies continued to be underutilized and several Internet technologies continued to never be utilized by agriscience students for personal reasons (Table 16). Social networks (e.g., Facebook™ and MySpace™) were reported by 429 (46.9%) agriscience students as being used daily for personal purposes, followed by You Tube™, used by 274, or 29.9% of agriscience students every day. E-mail was reported by 241, or 26.3%, of agriscience students as being used every day as well. Blogs continued to be reported as being used at a much lower frequency, with 705 (77.0%) students stating that they never use blogs for personal reasons. Twitter™ was the least utilized Internet technology with just over 80% (739 students, 80.8%) of agriscience students stating that they never use this Internet technology for personal reasons.

Table 16

Frequency Distribution of Agriscience Students Regarding the Use of Internet Technologies for Personal Reasons (n = 915)

Frequency of Use of Specific Technologies	*f*				
	1	2	3	4	5
Internet games	369 (40.3%)	204 (22.3%)	100 (10.9%)	158 (17.3%)	84 (9.18%)
E-mail	150 (16.4%)	151 (16.5%)	170 (18.6%)	203 (22.3%)	241 (26.3%)
Social networks (Facebook™, MySpace™)	143 (15.6%)	70 (7.65%)	85 (9.29%)	186 (20.3%)	429 (46.9%)
Blogs	705 (77.0%)	75 (8.20%)	44 (4.80%)	50 (5.46%)	41 (4.48%)
Twitter™	739 (80.8%)	49 (5.36%)	27 (2.95%)	31 (3.39%)	69 (7.54%)
You Tube™	107 (11.7%)	102 (11.1%)	120 (13.1%)	312 (34.1%)	274 (29.9%)

Note. 1=Never, 2=Once a Month, 3=Once a Week, 4=2-3 Times a Week, 5=Everyday

Objective Three: Describe agriscience students' general attitude towards the Internet

Objective 3 sought to determine the general attitude agriscience students had towards using the Internet. In responding to eighteen questions regarding their opinions about Internet use, agriscience students viewed the Internet in a positive manner (Table 17). Indicators that revealed the strongest positive attitude toward the Internet included "the Internet gives me a bigger scope of available information" (M =4.19; SD =.938) and "the Internet makes society more advanced" (M =4.15; SD =.955). Interestingly, agriscience students also indicated that they "use the Internet regularly throughout the school year" (M = 4.14; SD =.948) and that they perceive themselves as having the ability to teach themselves most of what they need to know about the Internet (M = 4.08; SD = .939). Statements that students disagreed with included "if given the opportunity to use the Internet I am afraid that I might damage it or my computer in some way" (M = 1.90; SD = .986), "I hesitate to use the Internet in case I look stupid" (M = 1.84; SD = .909), and "the Internet makes me uncomfortable" (M = 1.75; SD = .913).

Table 17

Internet Attitude Scale for Agriscience Students (n=915)

Questions 1 - 18	Mean	SD
The Internet gives me a bigger scope of available information.	4.19	.938
The Internet makes society more advanced.	4.15	.955
I use the Internet regularly throughout the school year.	4.14	.948
I could probably teach myself most of the things I should know about the Internet.	4.08	.939
The Internet helps me get the relevant information I need.	3.92	1.11
I can use the Internet independently, without the assistance of others.	3.76	1.14
The Internet makes a great contribution to human life.	3.74	1.17
The Internet allows me to do more interesting and imaginative work.	3.56	1.04
I do not need someone to tell me the best way to use the Internet.	3.41	1.19
If I have problems using the Internet, I can usually solve them one way or another.	3.38	1.13
I spend much of my time using the Internet.	3.05	1.19
I only use the Internet at school when I am told to.	2.38	1.19
When using the Internet, I am not quite confident about what I am doing.	2.16	1.11
I feel bored toward using the Internet.	1.97	1.02
I need an experienced person nearby when I use the Internet.	1.96	.970
If given the opportunity to use the Internet I am afraid that I might damage it or my computer in some way.	1.90	.986
I hesitate to use the Internet in case I look stupid.	1.84	.909
The Internet makes me uncomfortable.	1.75	.913

Note. 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

Conclusions

Based on findings, a large majority of agriscience students have computers available for use at home, whether personally owned or shared with their family. Almost all students identified themselves as intermediate to advanced computer users and can be described as being at the decision and implementation stages of Rogers' (2003) innovation-decision process when considering computer use, ownership and experience.

Study results indicated that although E-mail, social networks, and You Tube™ are Internet technologies most often utilized by agriscience students, this population reportedly uses them far more frequently for personal reasons rather than for school. These findings compliment the findings of Rhoades et al. (2008) and exemplifies that students at various educational levels are regular users of the Internet and online social network programs like Facebook™ and MySpace™. Findings further support Taylor and Keeter (2010) and their research regarding the substantial number of Millennials who participate in social networking sites. It is interesting to note that Blogs and Twitter™ are Internet technologies used the least by agriscience students even though these technologies have been documented as being convenient and quick methods of online networking with peers.

Based on findings, this populations had a high regard for Internet technologies and a high level of confidence using Internet technologies. Agriscience students reported that the Internet offers them an abundance of information and makes society more advanced. Students have fully adopted the Internet and related technologies and

can be described as being in the confirmation stage of Rogers' (2003) adoption process. This population of agriscience students, however, is not being asked to utilize the Internet for school purposes. Schools and teachers are not utilizing Internet technologies as frequently as one might think as a teaching resource.

It can be concluded that agriscience students are confident enough to teach themselves skills and competencies they may need to know regarding the Internet. They see the Internet as being a tool that provides them a bigger scope of information and see the Internet as a method of advancing society. University students in studies conducted by Rhoades et al. (2008) and Alston and English (2007) also reported the Internet was easy to understand, beneficial and accurate, again indicating that students at multiple educational levels hold the Internet in high regard.

Implications and Recommendations

This study sought to determine how agriscience students utilize the Internet, both academically and personally, to better understand how these technologies might be incorporated into their classrooms and curriculum in an effort to strengthen teaching and learning skills. Implications exist in relation to these findings. Based on student responses, schools should create more opportunities to incorporate Internet technologies into coursework and assignments. The development of online courses should be strongly considered in the area of secondary agriscience, enhanced by face-to-face meetings. Development of online courses would complement the Internet skills of Millennials and Generation Z. The incorporation of face-to-face meetings would challenge this generation to move away from their generation's comfort zone and

possibly become more diverse in their communication preferences. Millennials and Generation Z have the ability and confidence to use Internet technologies to their advantage in school, and as such should be given opportunities to utilize these abilities in structured educational settings.

Several recommendations are made based on data collected. Based on findings, there is need to provide in-service training for teachers. Developing steps to encourage use of the Internet for instruction to assist teachers on how to more thoroughly include the use of Internet technologies into curriculums should also be established. At a time when online course delivery continues to increase in popularity, especially at the post-secondary level, one wonders about secondary agriscience student Internet use and how they can more effectively enhance the skills they presently possess.

Given that E-mail was the most widely used Internet technology used by secondary agriscience students for personal and school reasons, followed by social networking sites, strategies should be developed to create opportunities for students to use these communication technologies in relation to their coursework. Creating a Facebook™ or MySpace™ sites specific to a particular group of students, extracurricular club, or a particular course could prove valuable to enhancing a traditional classroom using Internet technologies. The incorporation of Internet technologies has the potential to inspire more frequent use of similar sites, such as Twitter™, to further expand the use of various Internet technologies created for communication.

Participants in this study indicated using the Internet video site YouTube™ frequently for personal reasons, less frequently for school reasons. Methods of

incorporating videos from YouTube™ into classroom and course work should be investigated to capitalize on not only brining in current news and media but also on student interest and regular use of this particular Internet technology. Asking students to locate particular videos that relate to a current subject-specific event or recent topic discussed could prove beneficial in motivating students to use their personal interests in this Internet technology for educational purposes.

Although Millennials and Generation Z represent today's secondary agriscience students, attention must be given to whether those entering high school hold the same level of use as those graduating. Correlation studies should be conducted to discover possible differences between grade levels and their Internet technology use and skills. Other possible comparisons could mirror Tsai et al. (2001) who discovered no significant difference between perceived use of the Internet and gender but found that comfort using Internet technologies increased with how many years a student had used Internet technologies.

Barriers to secondary agriscience students utilizing Internet technologies should also be investigated and considered when developing Internet-based assignments and materials. Secondary agriscience student computer and Internet use could be controlled by parents or family finances. Students may not boast the appropriate skills for immediate inclusion of Internet technologies into their curriculum. Consideration should be taken when developing online materials or requiring the use of Internet technologies so as not to exclude those who lack the access to these technologies needed for academic success.

In a time when over three-quarters of the United States population uses the Internet, regular studies should be conducted throughout California and in other states to discover if findings hold true in other populations. Garland and Noyes (2008), through their use of a dated computer attitude instrument, found that terminology, design and constructs of an instrument used to study Internet and computer technology must remain current with modern technologies to be considered effective. Regular reviews of instruments used to measure Internet technology use should be conducted to ensure accuracy of data collected and disseminated throughout the agriscience education field.

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Summary

Current high school students and teachers are immersed in technology. However, the way in which technology is used for educational purposes varies across disciplines. In order to assist secondary agriscience teachers and administrators in taking advantage of technology, research must be conducted to establish baseline data regarding student and teacher technology use. This study sought to describe technology use in education by exploring secondary agriscience teachers' and students' use, attitude toward, knowledge, and perceptions of computers and technology tools. Secondary agriscience teachers and students located in the Southern Region of California served as the population for this quantitative study. The study included responses from 80 teachers and 915 students. Findings from the study revealed that although teachers and students have access to computers and both groups see themselves as intermediate to advanced users of computers, the Internet and related technologies, these groups are not using computers as effectively as one might believe for educational purposes. While students have positive attitudes towards computers and the Internet, teachers are not using these technologies as frequently as expected to complement student abilities, particularly in the areas of in-class presentations, general Web-based and Internet-based projects completed in class and at home, and general Internet technology utilization.

Conclusions and Implications

Teachers

Based on the findings of this study, it can be concluded that agriscience teachers have access to computer technology, both at home and at school. Teachers are confident in their abilities to use computers and related technologies, rating themselves as intermediate to advanced users of computers. Self-confidence in computer use was found to be high as a majority of teachers reported having taught themselves how to use a computer. Agriscience teachers who responded to this study can be described as being at the decision and implementation stages of Rogers' (2003) innovation-decision process when investigating general computer use and computer ownership.

Kotrlik and Redmann (2009) found that while teachers stated that they changed their classroom and curriculum practices to accommodate technology, they were not incorporating technology enough to contribute to the learning process. Similar findings were revealed in this study. While teachers reported using the computer for in-class preparation, they reported not using computers in ways that match student ability or readiness. As pointed out by Webber (2003), it is possible that teachers continue to struggle with how to best use computer technology in their schools for the educational benefit of students. Agriscience teachers reported that they ask their students infrequently to work in class using a computer. When assigning specific computer-based assignments to be completed either at home or in class, multimedia projects, videos or Web-based assignments were reported as being assigned the least. Sheingold and Hadley (1990) shared that a key incentive for teachers to use computer technology

was their students' ability to use computer technology effectively on their own. Findings of this study revealed that although students have the ability to use computers effectively, teachers are not creating assignments or incorporating the computer into regular classroom activities. Given that computer technology changes at such a rapid rate, it is possible that teachers struggle with keeping up with technology trends and computer applications in educational settings, hindering them from using computers for student assignments and activities. Thus, the implication exists that teachers will continue to struggle unless there are interventions that enable efficient incorporation of technology into instruction.

Students

This study documented that it is a misconception that students do not have access to computers or are not ready for computer-based assignments. Based on findings, it can be concluded that agriscience students have access to computers, although this access could be slightly limited due to shared computers with family members. A majority of students reported that they perceive themselves to be intermediate to advanced computer users and, just as teachers stated, students note that their most common method of learning about computers was through teaching themselves. In addition, and similar to teachers, agriscience students in this study can be described as being at the decision and implementation stages of Rogers' (2003) innovation-decision process when investigating general computer use and computer ownership. If agriscience students are not required to use computer and Internet technologies for school purposes, there is an implication that their rate of adoption for educational use could continue to lag.

Based on findings, agriscience students accessed for this study are not utilizing common computer programs, such as Microsoft Word™ and Power Point™, for school work or personal use on a frequent basis. It is important to recognize that teachers have the potential to have influence on student use of specific technologies based on teacher expectations. If students are not asked to utilize computer technologies for school work, it is possible that they may not see the value of such computer technologies. Students also may not attempt to adopt new computer technologies found effective in educational settings if not promoted by their teachers through assignments and in-class projects.

Student respondents reported a high regard for the Internet and their use of Internet technologies. They have embraced the use of a number of Internet technologies, such as video delivery sites (e.g., YouTube™), E-mail and social networking sites for personal use. These findings compliment the findings of Rhoades et.al (2008) and exemplifies that students at various educational levels are regular users of the Internet and online social network programs like Facebook™ and MySpace™. Findings further support Taylor and Keeter (2010) and their research regarding the substantial number of Millennials who participate in social networking sites. Student respondents reported Internet technologies as easy to use and important as an educational tool, even though they did not report a high use of them for educational purposes.

As shared, although students reported embracing Internet technologies for personal reasons, they are not utilizing these same technologies for school purposes. The question arises as to a student's definition of personal and educational technology use. Is it possible that students are blurring the lines of personal and educational technology

use and reserving the term “educational” for work assigned by a teacher? Is it possible that students are using technologies for tangential educational activities that are not requested directly by a teacher but can indirectly assist with a non-technology focused assignment? Regardless, it is recommended that educators and administrators take into consideration that a driving force to use computer technologies and the Internet for school purposes could be the act of teachers assigning projects that incorporate use of these technologies.

Recommendations for Research

A number of recommendations can be made from the information collected in this study. While teachers and students use computer and Internet technologies at different levels, there is a need for both populations to understand how these tools can be used effectively for education in order to create efficient computer and Internet utilization practices for all individuals. Further studies should be conducted to discover the specific practices of those agriscience teachers who are utilizing computer and Internet technologies effectively in their curriculum and classroom. Conducting a Delphi study to collect input and ideas from secondary agriscience teachers recognized as proficient users of computers and Internet technologies could prove useful in assisting more educators to adopt specific practices. A study of this kind could also prove useful for creating a curriculum to be distributed for region or statewide use by teachers.

Research focused on the collection of input from teachers and students over time could be beneficial in documenting successful methods to strengthen student computer literacy. Similar to the study conducted by Kotrilik and Redmann (2009), trend studies

that collect data at the beginning and end of a school year that incorporate the use of specific computer and Internet tools at various times throughout a school year could assist teachers in better understanding students use of computers and Internet technologies. These types of studies could yield findings that could effectively guide the incorporation of computer and Internet technologies into an agriscience classroom in the most efficient and effective way for students.

Posnick-Goodwin (2010) stated that current generations adopt technology much quicker than previous generations. Future research should be dedicated to comparing and contrasting teacher and student computer use and adoption rates of new technologies as they emerge. Correlational studies of the generations of teachers' and students' adoption rates of computers and Internet could prove helpful in determining the most efficient methods of matching student skills with teacher abilities to utilize, incorporate and manipulate computer and Internet technology. Further correlational studies should include determining whether or not there is a relationship between teacher use and student use of computers and Internet technologies. It is possible that as teachers incorporate computers, the Internet and related technologies into their classroom and lessons, students will be motivated to use these technology tools more confidently for school work and inspired to use on their own to enhance projects or for personal purposes. Today's students are technologically minded and are confident using a variety of technological gadgets and tools. Rapidly changing technology is a part of their daily life. Studies should be conducted often to remain up to date with these rapid rates of change and how these changes affect agriscience student educational success.

Feasibility studies should be conducted regarding computer use in schools and for homework assignments. While comparisons to previous research is extremely useful in contributing to the body of knowledge in agricultural education, every school site and population investigated and utilized when researching computer and Internet technology use should be viewed individually. Aspects such as socio-economics, diversity of student populations, school site and district views on emphasizing or deemphasizing technology use should be considered when reviewing findings. Furthermore, future research should target additional regions of California, other states, and nationwide comparisons.

Recommendations for Practice

There are several recommendations for practice that can be made based on the data collected from the population in this study. Webber (2003) discussed how teachers struggled with how to best use technology in schools. Based on findings from this study, it is possible that advice from professionals in the field of educational technology could be collected and shared with agriscience teachers regarding the most effective computer and Internet technologies to utilize in secondary agriscience classrooms and curriculum. It is recognized that teachers who have the desire to incorporate these technologies into their curriculum will be the ones to adopt them more quickly. However, constructive advice provided by experienced professionals could be found to be motivating for all teachers. Information regarding Millennials and Generation Z should be disseminated regularly to enable teachers to remain abreast of the technology skills and needs of the

generations entering their classrooms. Providing best-practices training for teachers with regard to the generations and their use of technology would also be beneficial.

Although assumptions are commonly made that teachers and students are using computers and the Internet for a variety of purposes, such as in-class presentations and type-written reports, findings in this study revealed otherwise. Responding teachers and students do not use computers and Internet technologies regularly for tasks such as in-class presentations or multimedia projects. Specific tasks require specific tools, therefore, information should be collected and disseminated at the school level regarding accessibility of various computer programs used or needed by teachers and students. Onsite evaluations to determine strengths and weaknesses of using particular software tools by teachers and students should also be conducted. Evaluations such as this could enable administrators to provide tools that are most suitable for their particular teacher and student populations.

Training and teacher in-services should be provided to agriscience teachers regarding effective methods of incorporating computer software, the Internet and related technologies. Strengthening awareness of online learning courses and programs already in place in various school districts could also prove helpful in supporting agriscience teacher knowledge of how computer technology is being utilized in traditional and virtual classrooms.

Just as several researchers at the post-secondary level of agricultural education have found (Berge, Muilenburg, & Haneghan, 2002; Brinkerhoff, 2006; Gammill & Newman, 2005; Nelson & Thompson, 2005), there are barriers to using instructional

technology which include lack of support and time. Input from teachers regarding barriers to using computer technology and the Internet in their classrooms is key to understanding methods to best aid teachers in improving and increasing the use of computers and Internet technologies in their classrooms and curriculum.

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APPENDIX A

PERMISSION TO USE SELWYN

COMPUTER ATTITUDE SCALE FOR SECONDARY STUDENTS

ARTICLE AND INSTRUMENT QUESTIONS

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APPENDIX B

PERMISSION TO USE TSAI, LIN AND TSAI INTERNET ATTITUDE SCALE ARTICLE AND INSTRUMENT QUESTIONS

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APPENDIX C

TEACHER INSTRUMENT

Exploring Secondary Agriscience Teacher and Student Use, Attitudes towards and Perceptions of Computers and Technology Tools

*** Instrument for Teachers ***
Entered into and delivered using Survey Monkey™

First Screen:

The research project entitled, “Exploring Secondary Agriscience Teacher and Agriscience Student Use, Attitudes towards and Perceptions of Computers and Technology Tools” is being conducted to better understand how agriscience teachers and their students are using computers and what agriscience students’ attitudes are towards computers and how they perceive computers in their academic lives. Participation is voluntary. Findings may result in the documentation of strategies that can enhance agriscience teacher instruction using computers and technology tools to match the knowledge and attitudes of agriscience students and their knowledge and attitude towards computers and technology tools. I value your time and appreciate your willingness to participate.

The following is provided for you to decide whether you wish to participate in the study:

- You will be asked to complete an online survey once
- The online survey will take no longer than 30 minutes.
- Only individuals identified…….
- The information you share will remain confidential.
- Responses will be coded to ensure confidentiality.
- Your participation in this study is requested on a voluntary basis and you may withdraw from the study at any time without penalty.

By answering the questions in the online survey, you are volunteering your participation.

If you would like additional information concerning this study before or after it is completed, please contact the investigator by e-mail or phone at: Kimberley Miller, Graduate student, Texas A&M/Texas Tech Universities - Doc@Distance Program, 949-218-6766, millerkim@svusd.org

This research study has been reviewed by the Human Subjects’ Protection Program and/or the Institutional Review Board at Texas A&M University. For research-related problems or questions regarding your rights as a research participant, you can contact these offices at (979)458-4067 or irb@tamu.edu.

Instructions: Complete each question as accurately as possible.

General Computer Use:

Do you have a computer at home? YES; NO

Do you have a computer at school? YES; NO

How many computer CLASSES have you taken?

- none
- 1-2 classes
- 3-4 classes
- 5-6 classes

Which statement BEST describes how you have learned to use a computer and computer technology?

- Formal computer classes
- Trained within another subject that required computer use
- Taught by a friend/co-worker
- Self-taught
- Trial and error

Rate your level of computer use and experience

- Non-user
- Novice
- Intermediate
- Advanced

How comfortable are you with computer technology?

Very comfortable
Comfortable
Not Comfortable

School site computer use requirements

Does your school require you to take/submit daily student attendance online/using a computer? YES;NO

Does your school require you to maintain a computer based grade book using a grading software program? YES;NO

Does your school require you to maintain a computer based grade book that is online? YES;NO
Does your school require you to upload your grades online? YES;NO

NEW PAGE

Below is a series of general statements about using computers in a variety of ways. There are no correct answers to these statements. These statements are designed to permit you to indicate the extent you utilize computers in and out of the classroom. Place a checkmark in the space that best describes your frequency of use.

How often do you use a computer to deliver instruction?

Never; once or twice a year; several times a year; several times a month; several times a week

During class time, how often do students work using computers?

Never; once or twice a year; several times a year; several times a month; several times a week

During class time, how often do students work in groups on school work using computers?

Never; once or twice a year; several times a year; several times a month; several times a week

During class time, how often do students conduct research or locate information using the Internet?

Never; once or twice a year; several times a year; several times a month; several times a week

During class time, how often do students present information to the class using a computer?

Never; once or twice a year; several times a year; several times a month; several times a week

During class time, how often do students use a computer to solve problems or complete assignments?

Never; once or twice a year; several times a year; several times a month; several times a week

How often do you ask students to produce reports or papers using computer technology?

Never; once or twice a year; several times a year; several times a month; several times a week

How often do you ask students to produce pictures or artwork using computer technology?

Never; once or twice a year; several times a year; several times a month; several times a week

How often do you ask students to produce graphs or charts using computer technology?

Never; once or twice a year; several times a year; several times a month; several times a week

How often do you ask students to produce multimedia projects using computer technology?

Never; once or twice a year; several times a year; several times a month; several times a week

How often do you ask students to produce Web pages, Web sites or other Web based publications?

Never; once or twice a year; several times a year; several times a month; several times a week

How often do you ask students to produce videos or movies using computer technology?

Never; once or twice a year; several times a year; several times a month; several times a week

How often do you make handouts for students using computer technology?

Never; once or twice a year; several times a year; several times a month; several times a week

How often do you create a test, quiz or assignment for students using computer technology?

Never; once or twice a year; several times a year; several times a month; several times a week

How often do you create web – based activities for students or build the Internet into a lesson?

Never; once or twice a year; several times a year; several times a month; several times a week

Demographic Information:

Gender:

- Male
- Female

Age _____

Years teaching _____

Describe your ethnicity:

- African-American
- Asian-American
- Latino/Hispanic American
- White (other than Latino)
- Other (please specify)

Open ended questions

Do you find integrating computers and related technology into your classroom difficult? Why or why not?

What, if any, do you see as the biggest barriers to using computers in the classroom and with your students?

Thank you for completing this survey!

APPENDIX D

STUDENT INSTRUMENT

The research project entitled, “Exploring Secondary Agriscience Teacher and Agriscience Student Use, Attitudes Towards and Perceptions of Computers and Technology Tools” is being conducted to better understand how agriscience teachers and their students are using computers, what each group’s attitude is towards computers and how they perceive computers in their academic lives. Participation is voluntary. I appreciate your willingness to participate.

- You will be asked to complete this paper (hard copy) survey one time only
- This survey should only take about 15 – 20 minutes to complete but you have as much time as you need
- NAME OF SCHOOL agriculture program was selected randomly to participate. Only students enrolled in the agriculture classes at NAME OF SCHOOL can complete this survey
- The information you share will remain confidential.
- Responses will be coded to ensure confidentiality.
- Your participation in this study is requested on a voluntary basis.

Thank you for participating!

Instructions: Please answer each question as accurately as possible.

General Computer Use

1. Do you have a computer at home? ❑ Yes ❑ No

2. If YES, is the computer at home your own computer or a family computer?

❑ My own computer ❑ Family computer

3. How many years have you been using a computer for any reason? _____

4. Approximately how many computer classes have you taken? _____

5. Which statement BEST describes how you learned to use a computer and computer technology?

❑ Formal computer classes
❑ Trained within another subject or class that required computer use
❑ Taught by a friend or sibling (brother or sister)
❑ Self – taught
❑ Trial and error

6. Rate your level of computer use and experience.

❑ Non-user
❑ Novice or beginner
❑ Intermediate
❑ Advanced

7. How comfortable are you with computers and computer technology?

❑ Very comfortable
❑ Comfortable
❑ Not comfortable

8. How often do you use the following Internet technologies for ***SCHOOL REASONS***?

	Every day	2-3 times a week	Once a week	Once a month	Never
Internet games	❑	❑	❑	❑	❑
E-mail	❑	❑	❑	❑	❑
Social networks (Facebook, MySpace)	❑	❑	❑	❑	❑
Blogs	❑	❑	❑	❑	❑
Twitter	❑	❑	❑	❑	❑
YouTube	❑	❑	❑	❑	❑
Other _____	❑	❑	❑	❑	❑

PLEASE CONTINUE TO THE NEXT PAGE

9. How often do you use the following Internet technologies for ***PERSONAL REASONS***?

	Every day	2-3 times a week	Once a week	Once a month	Never
Internet games	❑	❑	❑	❑	❑
E-mail	❑	❑	❑	❑	❑
Social networks (Facebook, MySpace)	❑	❑	❑	❑	❑
Blogs	❑	❑	❑	❑	❑
Twitter	❑	❑	❑	❑	❑
YouTube	❑	❑	❑	❑	❑
Other _____	❑	❑	❑	❑	❑

PLEASE CONTINUE TO THE NEXT PAGE

10. How often do you use the following <u>software/computer programs</u> for **SCHOOL REASONS**?

	Every day	2-3 times a week	Once a week	Once a month	Never
Power point	❑	❑	❑	❑	❑
Word	❑	❑	❑	❑	❑
Excel *(spreadsheets)*	❑	❑	❑	❑	❑
Image Editing *(e.g. Photoshop)*	❑	❑	❑	❑	❑
Drawing/Painting software *(e.g. Flash)*	❑	❑	❑	❑	❑
Video Production *(e.g. Adobe Premier Elements)*	❑	❑	❑	❑	❑
Adobe Acrobat *(includes reader)*	❑	❑	❑	❑	❑
Any web page/site creator *(Dreamweaver, MyWebs)*	❑	❑	❑	❑	❑
Purchased computer games *(not Internet games)*	❑	❑	❑	❑	❑
Other _____ ___	❑	❑	❑	❑	❑

PLEASE CONTINUE TO THE NEXT PAGE

11. How often do you use the following <u>software/computer programs</u> for **PERSONAL REASONS**?

	Every day	2-3 times a week	Once a week	Once a month	Never
Power point	❑	❑	❑	❑	❑
Word	❑	❑	❑	❑	❑
Excel *(spreadsheets)*	❑	❑	❑	❑	❑
Image Editing *(e.g. Photoshop)*	❑	❑	❑	❑	❑
Drawing/Painting software *(e.g. Flash)*	❑	❑	❑	❑	❑
Video Production *(e.g. Adobe Premier Elements)*	❑	❑	❑	❑	❑
Adobe Acrobat *(includes reader)*	❑	❑	❑	❑	❑
Any web page/site creator *(Dreamweaver, MyWebs)*	❑	❑	❑	❑	❑
Purchased computer games *(not Internet games)*	❑	❑	❑	❑	❑
Other _____ ___	❑	❑	❑	❑	❑

PLEASE CONTINUE TO THE NEXT PAGE

Below is a series of general statements about computers. There are no correct or incorrect answers to these statements. These statements are designed to permit you to indicate how much you agree or disagree with the ideas expressed in each statement. Place a checkmark in the space that best describes your level of agreement or disagreement with each statement.

General Computer Use Information

Please mark one of the following:

Strongly Agree (SA) Agree (A) Neutral (N) Disagree (D) Strongly Disagree (SD)

Questions 1 – 10 (40 total)	SA	A	N	D	SD
1. Computers intimidate and threaten me	❑	❑	❑	❑	❑
2. All computer people talk in a strange and technical language	❑	❑	❑	❑	❑
3.I learn new computer tasks by trial and error	❑	❑	❑	❑	❑
4. Working with a computer makes me feel tense and uncomfortable	❑	❑	❑	❑	❑
5. Computers are difficult to understand	❑	❑	❑	❑	❑
6. Other students look to me for help when using a computer	❑	❑	❑	❑	❑
7. I feel helpless when asked to perform a new task on a computer	❑	❑	❑	❑	❑
8. Boys like computers more than girls do	❑	❑	❑	❑	❑
9. When I have a problem with a computer, I usually solve it on my own	❑	❑	❑	❑	❑
10. I feel important when others ask me for information about computers	❑	❑	❑	❑	❑

Please mark one of the following:

Strongly Agree (SA) Agree (A) Neutral (N) Disagree (D) Strongly Disagree (SD)

Questions 11 - 20 (40 total)	SA	A	N	D	SD
11. Learning about computers is a waste of time	❑	❑	❑	❑	❑
12. Using the computer has increased my interaction with other students	❑	❑	❑	❑	❑
13. Computers bore me	❑	❑	❑	❑	❑
14. Anything that a computer can be used for, I can do just as well another way	❑	❑	❑	❑	❑
15. I develop shortcuts and more efficient ways to use computers	❑	❑	❑	❑	❑
16. Working with computers makes me feel isolated from other people	❑	❑	❑	❑	❑
17. Working with computers will not be important to me in my career	❑	❑	❑	❑	❑
18. I would like to spend more time using a computer	❑	❑	❑	❑	❑
19. I don’t feel I have control over what I do when I use a computer	❑	❑	❑	❑	❑
20. People that use computers regularly are seen as being more important than those who don’t use computers regularly	❑	❑	❑	❑	❑

Please mark one of the following:

Strongly Agree (SA) Agree (A) Neutral (N) Disagree (D) Strongly Disagree (SD)

Questions 21 - 30 (40 total)	SA	A	N	D	SD
21. If I can, I will take subjects (classes) that teach me to use computers	❑	❑	❑	❑	❑
22. Computers sometimes scare me	❑	❑	❑	❑	❑
23. People who work with computers sit in front of a computer screen all day	❑	❑	❑	❑	❑
24. I would like to learn more about computers	❑	❑	❑	❑	❑
25. I feel unhappy walking into a room full of computers	❑	❑	❑	❑	❑
26. Working with computers means working on your own, without contact with others	❑	❑	❑	❑	❑
27. If I need computer skills for my career choice, I will develop them	❑	❑	❑	❑	❑
28. I'm not good with computers	❑	❑	❑	❑	❑
29. To use computers you have to be highly qualified	❑	❑	❑	❑	❑
30. If my school offered a computer camp, I would attend it	❑	❑	❑	❑	❑

Please mark one of the following:

Strongly Agree (SA) Agree (A) Neutral (N) Disagree (D) Strongly Disagree (SD)

Questions 31 - 40 (40 total)	SA	A	N	D	SD
31. Working with a computer makes me feel very nervous	❑	❑	❑	❑	❑
32. Using computers prevents me from being creative	❑	❑	❑	❑	❑
33. I feel threatened when others talk about computers	❑	❑	❑	❑	❑
34. Computers are confusing	❑	❑	❑	❑	❑
35. Computers make me feel uncomfortable	❑	❑	❑	❑	❑
36. You have to be a real “brain” to work with computers	❑	❑	❑	❑	❑
37. I get a sinking feeling when I think of trying to use a computer	❑	❑	❑	❑	❑
38. Not many people can use computers	❑	❑	❑	❑	❑
39. Computers frustrate me	❑	❑	❑	❑	❑
40. People that work with computers make really good money	❑	❑	❑	❑	❑

On the next page is a series of general statements about the Internet. There are no correct or incorrect answers to these statements. These statements are designed to permit you to indicate the extent to which you agree or disagree with the ideas expressed. Place a checkmark in the space that best describes your level of agreement or disagreement with the statement.

Internet Attitude Scale

Please mark one of the following: Strongly Agree (SA) Agree (A) Neutral (N) Disagree (D) Strongly Disagree (SD)

Questions 1 – 18 (18 total)	SA	A	N	D	SD
1. I could probably teach myself most of the things I should know about the Internet	❑	❑	❑	❑	❑
2. I hesitate to use the Internet in case I look stupid	❑	❑	❑	❑	❑
3. I only use the Internet at school when I am told to	❑	❑	❑	❑	❑
4. The Internet allows me to do more interesting and imaginative work	❑	❑	❑	❑	❑
5. I need an experienced person nearby when I use the Internet	❑	❑	❑	❑	❑
6. I use the Internet regularly throughout the school year	❑	❑	❑	❑	❑
7. If given the opportunity to use the Internet I am afraid that I might damage it or my computer in some way	❑	❑	❑	❑	❑
8. If I have problems using the Internet, I can usually solve them one way or another	❑	❑	❑	❑	❑

9. I spend much of my time using the Internet	❑	❑	❑	❑	❑
10. The Internet makes me uncomfortable	❑	❑	❑	❑	❑
11. The Internet gives me a bigger scope of available information	❑	❑	❑	❑	❑
12. I do not need someone to tell me the best way to use the Internet	❑	❑	❑	❑	❑
13. I feel bored toward using the Internet	❑	❑	❑	❑	❑
14. The Internet makes a great contribution to human life	❑	❑	❑	❑	❑
15. I can use the Internet independently, without the assistance of others	❑	❑	❑	❑	❑
16. When using the Internet, I am not quite confident about what I am doing	❑	❑	❑	❑	❑
17. The Internet helps me get the relevant information I need	❑	❑	❑	❑	❑
18. The Internet makes society more advanced	❑	❑	❑	❑	❑

Demographic Information

Gender:

- ❑ Male
- ❑ Female

Grade in School:

- ❑ 9
- ❑ 10
- ❑ 11
- ❑ 12

Describe your ethnicity:

- ❑ African-American
- ❑ Asian-American
- ❑ Latino/Hispanic American
- ❑ White (other than Latino)
- ❑ Other (please specify)

_____

Thank you for completing this survey!

APPENDIX E

STUDENT INFORMATION SHEET

INFORMATION SHEET TO STUDENTS

Exploring Secondary Agriscience Teachers' and Students' Use, Attitude Toward, Knowledge and Perceptions of Computers and Technology Tools

Introduction

You are being asked to complete a short survey to help discover what you know about computers, how you use computers, how much you do or do not like using computers for school work and how much you do or do not use the computer for out of school activities and communication (online games, chatting with friends, etc.) We are doing this study to help Agriscience teachers understand better what their students can do with computers and what they think of computer use for their classes, either at school or at home. We hope that the information gathered from you and your fellow students will help your teachers create more interesting or exciting lessons and assignments for classes.

What will I be asked to do?

If you agree to participate in this study, you will be asked to complete a paper survey that will take approximately 15 – 20 minutes. This study will take place during a school class period.

Do I have to participate?

No. Your participation is voluntary.

Who will know about my participation in this research study?

This study is confidential and the records of this study will be kept private.

Participation

If you would like to participate please complete the survey when NAME OF TEACHER makes it available to you.

By answering the questions in the survey, you are volunteering your participation. You keep this information sheet.

If you would like additional information concerning this study before or after it is completed, please contact the investigator by e-mail or phone at: Kimberley Miller, Graduate student, Texas A&M/Texas Tech Universities and Mission Viejo High School Agriscience teacher; Phone: 949-218-6766; email: kim.miller.dissertation@gmail.com

This research study has been reviewed by the Human Subjects' Protection Program and/or the Institutional Review Board at Texas A&M University. For research-related problems or questions regarding your rights as a research participant, you can contact these offices at (979)458-4067 or irb@tamu.edu.

APPENDIX F

PARENT PERMISSION SIGNATURE FORM

PARENT PERMISSION FORM
Exploring Secondary Agriscience Teachers' and Students' Use, Attitude Toward, Knowledge and Perceptions of Computers and Technology Tools

To: Parents/Guardians of NAME OF SCHOOL Agriculture/FFA program students

From: Kimberley Miller (graduate researcher and Mission Viejo High School Agriscience teacher

RE: Student participation completing a paper survey

Introduction

The purpose of this form is to provide you (as the parent of a prospective student participant) information regarding allowing your student to complete a paper survey about computer use. Also, if you decide to let your student complete the survey, this form will be used to record your consent.

If you agree, your student will be asked to complete a survey about high school students and their use and attitudes towards computers. The purpose of the study that data is being collected for is to better understand how high school students use computers in school and socially, their opinions about school work assignments that require computer use and how much they use the computer for school work and for entertainment. He/she was selected to be a possible participant because he/she is a member of the NAME OF SCHOOL Agriculture program. Agriculture programs were chosen at random to participate in this research study from all the Agriculture programs in the Southern Region of the California FFA.

What will my student be asked to do?

If you allow your child to participate, they will be asked to complete a short survey. This survey will be completed at school under the direction of NAME OF TEACHER. The survey is a hardcopy (paper) survey.

What are the risks involved in this study?

The risks associated to completing this survey are no greater than risks your child ordinarily encounters in daily life.

What are the possible benefits of this study?

Your student will receive no direct benefit from participating in completing this survey; however, the data and general information collected from all students participating will contribute to the general knowledge of Agriculture Educators. The completed work will aid instructors in more effectively preparing lessons, activities and out of classroom work. Instructors will gain a better understanding of how their students can utilize computers and computer technology to learn more thoroughly and efficiently.

Does my student have to participate?

No, your child does not have to participate in this research study. This research study will take place during regular classroom activities.

What if my student does not want to participate?

In addition to your permission, your student needs to also agree to complete the survey. If you student does not want to participate they will not be included in and there will be no penalty.

Who will know about my students' participation in this research study?
This study is anonymous. The student will not be asked their name or any personal information beyond their gender (male or female), race, grade in school and age.

The records of this study will be kept private. Paper surveys will be collected by NAME OF TEACHER personally. No identifiers linking your student to the survey will be included. Research records will be stored securely and only Kimberley Miller (researcher and MVHS agriculture teacher) will have access to the records.

Whom do I contact with questions about the research?
If you have questions regarding this study, you may contact Kimberley Miller, Home: 949-218-6766; Cell: 714-742-4976; e-mail: kim.miller.dissertation@gmail.com

What are my student's rights as a research participant?
This research study has been reviewed by the Human Subjects' Protection Program and/or the Institutional Review Board at Texas A&M University (graduate school of Kimberley Miller, graduate student and researcher). For research-related questions regarding your rights as a research participant, you can contact these offices at (979)458-4067 or irb@tamu.edu.

Signature
Please be sure you have read the above information. By signing this document, you consent to allow your student to complete a paper survey about using computers at home and at school.

Signature of Parent/Guardian: _____ Date: _____

Printed Name: _____

Signature of Student: _____ Date: _____

Printed Name: _____

Please note: signature of parent not required for students 18 and over.

If 18 or over, birth date: _____

VITA

KIMBERLEY ANN MILLER
25025 Chrisanta Drive, Mission Viejo, Calfornia 92691
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EDUCATION

Ed.D., Texas A&M/Texas Tech Doc@Distance, May 2011
Texas A&M University, College Station, Texas and **Texas Tech University**, Lubbock, Texas

M.S., Agriculture Education
Graduated June 2001 - California State Polytechnic University, Pomona, California

Professional Clear Single Subject Teaching Credential in Agriculture Science; Cross-cultural, Language and Academic Development Emphasis
Granted 2001 - California Polytechnic State University, Pomona

B.S., Agriculture Science
Graduated June 1995 - California State Polytechnic University, Pomona, California

PROFESSIONAL EXPERIENCE

Mission Viejo High School, Agriscience Instructor, FFA Advisor
Saddleback Valley Unified School District, Mission Viejo, CA 2001 – present
Courses Taught – Agriculture Science, Agriculture Biology, Agriculture Economics, Veterinary Science, Floral Design
Grade Level – 9th, 10th, 11th and 12th

California Polytechnic State University, Pomona, Lecturer
School of Agriculture Science and Education, Pomona, CA 2003 – 2007
Courses Taught – Agriculture Skills and Facilities, Program Planning Development
Grade Level – Undergraduate and Graduate Level students

REFEREED PAPERS

Murphrey, T. P., **Miller, K. A.**, & Roberts, T. G. (2009). Examining iPod use by Texas agricultural science and technology teachers. *Journal of Agricultural Education, 50*(4), 98-109. doi: 10.5032/jae.2009.04098

Murphrey, T. P., **Miller, K. A.**, & Roberts, T. G. (2009). Agricultural Science and Technology Teachers' Perceptions of iPod and MP3 Technology Integration into Curricular and Cocurricular Activities. *Journal of Agricultural Education, 50*(4), 110-119. doi: 10.5032/jae.2009.04110