Alabama High School Graduation Exam Outcomes: Agricultural Education and Its Impact

by

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Abstract

This study sought to determine if there is possible a relationship between agricultural education class credits obtained by students and their subsequent outcome on the Alabama High School Graduation Exam (AHSGE). Also, the perceptions of Alabama agricultural educators regarding 1) student test taking preparation 2) academic standard integration 3) perceived barriers to science integration and 4) science integration's impact on enrollment were investigated.

Test outcomes detailing pass or fail scores for each of the agriculture students were tabulated with the number of agricultural courses completed by each student. Logistic regression analysis was run to determine if there was a relationship between the number of agricultural classes that a student took and subsequent outcomes on the AHSGE.

The model generated for the reading, social studies, and biology portions was not statistically significant in predicting the pass/fail outcome on the AHSGE; however, probabilities indicated that students were more likely to pass each portion having taken more agricultural classes. The model did statistically significantly predict the outcomes on the language and mathematics portions of the exam.

In order to address the second part of this study, the researcher developed a survey instrument that was administered at the 2011 summer meeting of the Alabama Association of Agriscience Educators. The survey contained five questions for each of the following constructs:

1) student test taking preparation 2) academic standard integration 3) perceived barriers to science integration and 4) science integration's impact on enrollment.

A Likert type scale was used which indicated that 1=strongly disagree, 2=disagree, 3=agree, and 4= strongly agree. Scores were summated with the calculation of frequency of response, mean, and standard deviation.

One of the foremost responses was that 84.9% of agricultural teachers either agreed or strongly agreed that students are better prepared for the Alabama High School Graduation Exam after completing their class.

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List of Abbreviations

AAAE	Alabama Association of Agriscience Educators
AAPOR	American Association for Public Opinion Research
AHSGE	Alabama High School Graduation Exam
CTE	Career and Technical Education
FCAT	Florida Comprehensive Assessment Test
NAEP	National Assessment of Education Progress
NCES	National Center for Education Statistics
NCLB	No Child Left Behind Act of 2001
NRA	National Research Agenda: Agricultural Education and Communications
NRC	National Research Council
NRCCTE	National Research Center for Career and Technical Education
RPA	Research Priority Areas

Chapter 1

Introduction

Career and technical education (formally known as vocational education) is in a dynamic state. Sherri Key (2008), state career and technical education director, noted that career and technical education in Alabama has undergone significant changes in the last decade. "Many jobs require workers to know and apply math and science concepts to be able to properly fulfill the duties set before them" (Hamilton & Swortzel, 2007, p.2). Edwards and Ramsey (2004) posited, "society and the workplace are placing increasing demands on citizens and employees to be scientifically and technologically literate" (p. 87); however, laborer's skill sets have not stayed current with technical knowledge needed to be successful in industry. The National Research Council (1988) noted, "the vocational agricultural curriculum has failed to keep up with modern agriculture" (p. 31). Changes to curriculum and courses of study were needed to update programs and incorporate academic skills required to be successful in today's work place. A change in industry prompting change in education is not new. Such changes were apparent even a century ago when Snedden (1914) stated, "the world is changing and education must change with it" (p. 51). Crunkilton & Finch (1999) noted more than a decade ago, "Demands placed on workers in the new workplace include greater facility in mathematics, science, English, and communication" (p. 8). With new skill requirements, the nature of career and technical education has changed.

To understand the state of career and technical education today, one must consider its past. The roots of vocational education are said to be in Egypt over 4000 years ago (Crunkilton & Finch, 1999). During those times, young people practiced apprenticeships under master craftsmen. These young persons learned, over several years, the craft which subsequently became their occupation. No time was spent learning anything other than that which dealt directly with the craft (Snedden, 1914). This style of training persisted until well into the 19^{th} century. Gradually, thoughts about the education of young people changed (Crunkilton and Finch, 1999).

During the sixteenth century, philosophers began to rethink the apprenticeship and suggested that pupils should learn manual arts in formal school settings (Crunkilton & Finch, 1999). Crunkilton and Finch (1999) noted, "Rousseau's concern about the value of manual arts in education served as a model for other educators…" (p. 5). With emergences (in the late 1700s and early 1800s) of new technologies such as the cotton gin, (Croom, Talbert, and Vaughn, 2005), more emphasis was placed on the need for skilled labor. This thought process and the Industrial Revolution spurred on the movement to establish schools that would provide both skilled and unskilled labor for the factories. The high demand for labor could not wait on persons to complete long apprenticeships. Crunkilton & Finch (1999) noted, "This increased demand almost seemed to correspond with the rapid decline of formal apprenticeship programs in many skilled areas" (p. 5).

In the late 1800's and early 1900's, vocational schools were being established (Crunkilton and Finch, 1999). One of the first schools of agriculture [in the Unites States] was established in Mansfield, Connecticut (1881) on land donated by Augustus Storrs (Ball, Dyer, Osborne, & Phipps, 2008). This school provided instruction in the field of agriculture to boys 15 years of age and older. Following suit, other states appropriated funds for agricultural education including, Rhode Island 1888, New Hampshire 1895, and Alabama 1897 (The National Research Council, 1988). With the onset of funding and allocations for schools dedicated for the pursuit of agricultural education, educational thinkers developed their own responses to how they should be constructed.

Philosophers such as John Dewey and David Snedden weighed in on how they thought vocational schools or programs should be developed in this early era of American public schools. "John Dewey, drawing on Francis Parker's ideas, founded a laboratory school with a curriculum that progressed from practical experiences (planting a garden) to formal subjects (botany) to integrated studies (the place of botany in the natural sciences) (Berryman, 1991)." Larabee (2010) noted:

> On the one hand, the administrative progressives (Snedden's group) primarily focused on making education socially useful for the emerging social conditions in twentieth century America, which included a highly differentiated industrial economy and a large urban population stratified by class and ethnicity. (p. 6)

The first director of the Federal Board for Vocational Education, Charles Prosser, strongly supported David Snedden's ideas of "social efficiency." Social efficiency is described as an educational framework in which the school sees its role as that of preparing the students to become workers (Larabee, 1997). T. H. Sandrock (n.d.) detailed social efficiency in the terms that:

> Society has the responsibility of enhancing productivity in all phases of life. This means that schools must seriously prepare students of all levels, for all levels. However, some very interesting assumptions are taken for granted. It is implicit that all societal positions are not equitable. The objective of social efficiency is not to elevate or demote people socio-economically, or socially. It is the overall, collective benefit of the public that is being served. Hence, schools are induced to replicate, with unerring accuracy, society's

> hierarchical form and complete structure. Tasks in the society need to be done by everyone. So it is everybody's place to contribute and do what needs to be done for the public good. (para. 2)

Snedden's address entitled "The Schools of the Rank and File", which was delivered to the Stanford University alumni in 1900, was inundated with the social efficiency paradigm (Larabee, 2010).

> I want especially to consider that education as it affects the rank and file of society; for if we are right in thinking that training for leadership will largely become the function of the university, it still remains true that the most careful consideration must be given to those who will do duty in the ranks, who will follow, not lead. (Snedden, 1900, pp. 23-24)

Charles Prosser, Snedden's legislative right arm, was instrumental in developing the Smith–Hughes Act of 1917 and even wrote much of the legislation himself (Larabee, 2010, p. 9). The act established federal funding for vocational education in the United States. Due to the fact that the act provided federal funds for these schools, the federal government would now have a say in the curriculum development. This federal control led to the establishment of minimum curriculum offerings (Crunkilton & Finch, 1999). According to Gordon (1999), "The Constitution of the United States makes no provision for federal support or control of education; however, the federal government has considered vocational education in the national interest to provide federal legislation in support of vocational education" (p. 67). Many curriculum offerings developed from Federal approved criteria were devoid of opportunities for students to "*stretch*" [emphasis added] their brains and use critical thinking skills (Crunkilton & Finch, 1999).

With the advent of the micro-computer and other technologies in the 1970's and 1980's vocational schools could no longer afford to teach a static curriculum of job related skills only (Crunkilton & Finch, 1999). Warmbrod (1974) proposed that "if vocational education assumed its proper role in American education that vocational education must be concerned with the student's intellectual, social, and cultural development as well as their vocational development" (p. 5). Barkey and Kralovec (n.d) noted that, "the workplace of today makes very different demands on workers than did the workplaces our vocational education system was designed to address (p. 1). The shift in industry called for a shift in vocational school curriculum offerings. This paradigm was echoed later by Parr, Edwards, and Leising (2002) when they noted, "society is increasingly dependent on a myriad of complex technologies- ranging from the use of computers to the consumption of genetically modified foods" (p. 5).

In the 1980's and 1990's, more funding legislation was passed to provide money for the vocational schools to stay at pace with the machinery and technology in the industrial market place. The legislative act that provided the funding was, and is still known as, the Carl D. Perkins Act (Crunkilton & Finch, 1999).

Educational goals are associated with two areas: education for life and education for earning a living (Crunkilton & Finch, 1999). According to the Alliance for Excellent Education (2009), a reauthorization of federal legislation termed as the Elementary and Secondary Education Act (ESEA) or No Child Left Behind (NCLB) says, "The mission of the public education system must shift from educating *some* students and preparing them for the *twentieth-century American* economy to educating *all* students and preparing them for the *twenty-first-century global* economy" (p. 4). This reauthorization has within it a set of college readiness indicators that help assess how well students are being prepared for college.

This is the framework for current career and technical education. A prime example would be a student learning math skills in class and then transferring that learning into a job skills program. In the job skills program, the student is taught customer service skills. The student then gets a job at a supermarket where he uses the math to count money and customer service skills to deal with the public. Each kind of learning complements the other. To that end, one must pose the question: Are career and technical education programs achieving this goal of preparing students for both life and a career?

Statement of the Problem

The incorporation of academics into career and technical classes, while initially proposed in the comprehensive high schools of the early 20th century, has come about of late. "The model for agricultural education in the public schools has changed" (Myers & Dyer, 2004, p. 47). The old model for career and technical education only included job training skills while the new model is holistic in nature in that it should include all facets of a well rounded education. With mandates established by previous federal legislation, career and technical instructors are expected to present a rigorous and challenging curriculum for their students while preparing them for both work and secondary schooling. It is imperative that entry-level workers have academic skill sets that prepare them for college or a career (Achieve, 2004). Educators are now at a point when evaluation must take place. "Agricultural educators realize that their instructional programs and student learning activities must reflect the dynamic and ever-changing industry of agriculture" (Ball et al., 2008, p. 7). Efforts must be made to determine if integrating academics into career and technical classes is making a difference in student preparedness for meeting minimum requirements on high stakes standardized tests. Also, instructors should determine what content already exists within their curriculum and develop ways to enhance those lessons and bring out academic standards.

> The 1994 reauthorization of the Elementary and Secondary Education Act (ESEA) established a requirement that each state set standards defining what their students should know and be able to do in critical subjects and assess whether students were mastering those standards. (Unites States Department of Education, 2010a, p. 1)

Similarly, mandates established by the No Child Left Behind Act of 2001 (NCLB) dictate that students should be prepared to meet minimum competencies set forth by the state.

A major goal, according to NCLB (Title I, Sec 1001,(9)), is "promoting school wide reform and ensuring the access of children to effective, scientifically based instructional strategies and challenging academic content" (p. 1440). The reauthorization of NCLB will include three major goals.

> 1) Raising standards for all students in English, language arts, and mathematics;
>
> 2) Developing better assessments aligned with college-and career-ready standards;
>
> 3) Implementing a complete education through improved professional development and evidence-based instruction models and supports. (Unites States Department of Education, 2010b, p. 1)

States have several options in developing standards that ensure that students are ready for college and career. States may either:

> upgrade their existing standards, working with their four-year public university system to certify that mastery of the standards ensures that a student will not need to take remedial coursework upon admission to a postsecondary institution in the system; or work with

other states to create state-developed common standards that build toward college and career readiness. (Unites States Department of Education, 2010b, p. 1)

Purpose of the Study

The purpose of this study was two fold. First, the connection between academics and career and technical classes was examined. More specifically, the study sought to determine if there is a relationship between the number of agriscience classes a student takes and the subsequent outcomes on the Alabama High School Graduation Exam. Second, what are the perceptions of Alabama agricultural educators regarding 1) student test taking preparation 2) academic standard integration 3) perceived barriers to science integration and 4) science integration's impact on enrollment.

Competencies in core subjects such as: mathematics and sciences are assessed by the Alabama High School Graduation Exam. Edwards & Ramsey (2004) noted:

> if significant associations [between agricultural education and core subjects] exist that could be demonstrated with substantial empirical rigor, then it is more likely that stakeholders, including decision makers who set priorities and allocate resources, would be inclined to learn more about secondary agricultural education and its potential for positively enhancing student achievement in select core subjects.

Ball et al. (2008) noted, "Agricultural educators must participate in testing and school accountability imperatives to ensure that their programs remain viable and important to the overall objectives of the school" (pp. 14-15). As proposed by Edwards and Ramsey (2004), empirical research must be done to determine if career and technical teachers are being successful in making academic standards salient in their teaching, thereby increasing the likelihood that their students will pass high stakes tests such as the Alabama High School

Graduation Exam. The identification of positive relationships could make legislators and administrators realize that agricultural education programs could be viable options to traditional science classes or, at minimum, a substantial complement to traditional core academics. Such a substitute option would be a beneficial to kinesthetic learners or persons who learn by doing.

Research Questions

1) Can outcomes on the AHSGE be predicted by the number of agriscience classes that a student completes?
2) Do agricultural education teachers in Alabama feel it is their responsibility to prepare their students for standardized high-stakes tests?
3) Do agricultural education teachers in Alabama feel they should incorporate core academic standards in their instruction?
4) Do agricultural education teachers in Alabama feel there are outside influences that affect how and if science integration takes place in their classrooms?
5) What are the perceptions of Alabama agricultural education teachers regarding student enrollment and the impact science integration plays on it?

Definitions

<u>Career and Technical Education</u>- The term 'career and technical education' means organized educational activities that — "(A) offer a sequence of courses that ''(i) provides individuals with coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in current or emerging professions; ''(ii) provides technical skill proficiency, an industry-recognized credential, a certificate, or an associate degree; and ''(iii) may include prerequisite courses (other than a remedial course) that meet the

requirements of this subparagraph; and ‘‘(B) include competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of an industry, including entrepreneurship, of an individual (Carl D. Perkins Act of 2006).

Agricultural education- systematic instruction in agriculture and natural resources at the elementary, middle school, secondary, postsecondary, or adult levels for the purpose of (1) preparing people for entry or advancement in agricultural occupations and professions, (2) job creation and entrepreneurship, and (3) agricultural literacy. (Ball, Dyer, Osborne, & Phipps, 2008)

Alabama High School Graduation Exam (AHSGE) – Test given by the State of Alabama to assess students' mastery of content defined as "fundamental," a requirement for receipt of an Alabama high school diploma. (Alabama State Department of Education, 2010)

The Smith-Hughes Act (1917) – established Vocational Agriculture in public high schools as a means of teaching new methods of agriculture. (Herren, 2002)

Curriculum integration- The process of combining curriculum for the purpose of increased comprehension. (Bottoms & Sharp, n.d.)

Social Efficiency- an educational framework in which the school sees its role as that of preparing the students to become workers. (Larabee, 1997)

Limitations of the Study

There are several limitations to this study. First, a true random independent sample was not be used due to the inaccessibility of data from such a group. The study used three school districts that had data readily accessible to the researcher. Due to this limitation, no generalization may be made for populations other than the three described in this study. Clarke, Cobb, Coladarci, and Minium (2008) refer to this as a convenience sample (p. 202).

Second, some participants in the study may have taken the AHSGE more than once. For this reason, we must acknowledge, as Ball et al. (2008) pointed out with the Florida Comprehensive Assessment Test, that Testing in itself may pose a problem in validating the results of this study. Mertens (2010) defines Testing as, "A threat to validity that arises in studies that use a pre- and posttest and refers to [participants] becoming *test wise*…" In this instance the AHSGE is both the pre-test and the posttest. To that end, the researcher acknowledged that one or more of the following external variables could have led to students passing the AHSGE:

1) Tutoring/remediation classes
2) Learning more test related content in the subsequent agricultural class/science classes could have increased their likelihood of passing the exam.
3) Completing more course work in related curricular tested areas could have also increased students likelihood of passing the exam.

Delimitations

Findings of this study may be useful in guiding inquiry into similar research topics in other geographic locations. The scope of the findings of this study covers schools within the southeastern United States with socio-economic, ethnic, and gender demographics similar to the school systems within the study. No generalizations may be made other than that of the population described in this study.

Basic Assumptions of the Study

Basic assumptions of the study are as follows:

1. Only scores collected from participants described in the study were used in the analysis.

2. Students in each district were instructed using the same Alabama Course of Study.
3. Students in each district were given the same Alabama High School Graduation Exam, spring 2010.
4. Agricultural teachers know the definition of science integration.
5. Some of the agricultural educators have participated in academic integration.
6. All agricultural teachers in Alabama had equal opportunity to attend the Alabama Career and Technical Education Summer Conference 2011 in Birmingham, Alabama.

Chapter 2

Review of Literature

History of Vocational Education in the United States

Agriculture as a Field of Study

The discipline called agriculture education has its roots deep in the history of education and agriculture in the United States (Barrick, 1989); however, the idea of agriculture being a science is a *relatively* [emphasis added] new idea. Barrick (1989) notes, "Those who have been involved in agriculture throughout their lives often have difficulty with the realization that agriculture, as a science that could and should be studied, did not exist prior to the 19th century" (p. 24). The Morrill Acts of 1862 was the first legislation by Congress that provided a way for agriculture to be studied as a science. "When land-grant colleges were established by the 1862 Morrill Act, agricultural education was essentially nonexistent in the secondary public school (Ball et al., 2008, pp. 23-24). This legislation established land-grant universities in each state (The Morrill Act of 1862, S. 503, Sec. 4, (6)). With the passage of the act, each state was allotted 30,000 acres per congressional seat to build a university at which students would study manual arts involving agricultural, mechanics, and military studies (The Morrill Act of 1862). These land-grant universities were charged with developing better methods and techniques for raising crops and animals for human consumption. From that legislation, agricultural education was born, although it would not be known as such until well into the 20th century.

Prior to the passage of the Morrill Act, very little had changed in education and farming techniques. For centuries agriculture and its techniques were primarily taught and passed on from parent to child (National Research Council, 1988). Edwards and Herren (2002) noted that a university education in the 1850's was steeped in studies of the classics such as Latin, Greek, and ancient history. The main goal of university education was to expand the mind and thinking process. With the exception of law and theology, few occupations were studied at university with the exception of law and theology (Edwards & Herren, 2002). Many people believed that this education of only the upper-class must change for several reasons. First, education could be used as means of social stratification (Butts, 1978). A true democracy where every man is equal could only be achieved through education of the masses (Anderson, 1976; Campbell, 1995; Campbell, 1996; Edwards & Herren, 2002; Smith, 1998). At that point in time (1850's), several senators were pushing for legislation that would create the land-grant system. Ezra Cornell and Thomas Clemson, both namesakes of current land-grant universities, wanted the system in order to help fill the needs of the growing nation (Nevins, 1962). Jonathan Baldwin Turner, who was a professor at Illinois College in the 1840's, believed that the federal government should pay for the establishment of universities that would teach practical arts and science at low-cost to the masses (Croom et al., 2005). Turner took these arguments to the Illinois legislature which in turn sent a resolution to Congress asking for the development of land grant colleges (Cross, 1999). Justin Morrill (Vermont) took up the fight to establish these land-grant colleges. Morrill worked on legislation that would ultimately establish such schools (Croom et al., 2005).

Career and Technical Education: Precursors to the Smith-Hughes Act

Career and technical education has its "origins in the early part of the twentieth century" (Gordon, 1999, p. 1). If one looks at the history of vocational education, now termed Career and Technical Education (CTE), it is obvious that federal legislation has played a significant role in shaping the climate (Threeton, 2007). Numerous pieces of legislation passed by the federal government have had a profound influence on agricultural education and vocational education (Ball et al., 2008). Prior to the Smith-Hughes Act, four other legislative acts were passed that influenced agricultural education. Ball et al. (2008) noted the Morrill Act of 1862, Hatch Act of 1887, Morrill Act of 1890, and the Smith-Lever Act of 1914 as influential legislation.

Morrill Act of 1862

United States Congressman Justin Morrill (Vermont) was the man behind the passage of this act. According to Croom et al. (2005), the act did not pass with ease. It was held up in Congress for several years because southern states believed it to be threatening to states' rights (Croom et al., 2005). No progress would be made in passing the bill until the secession of the southern states. With this secession of the southern states and absence of the southern Democrat senators and congressmen that opposed the bill, conditions were favorable for the bill's return (Croom et al., 2005). After a wait of more than four years, Morrill was able to get the bill on President Abraham Lincoln's desk in the summer of 1862. With Lincoln's signing of the bill, an important step in creating schools where people of low socio-economic levels could be educated was taken. These universities were to be for educating the common people (Edwards & Herren, 2002). With the passage of the act, each state was allotted 30,000 acres per congressional seat to build a university at which students would study manual arts involving agricultural, mechanics, and military studies (The Morrell Act of 1862). The act also had a provision that permitted states that did not contain 30,000 acres of federal land within their borders to sell federal land in other states to raise revenue for the establishment of their land-grant universities. "These land-grant colleges enrolled a much wider range of students and set the stage for vocational and practical arts education in colleges across America" (Ball et al., 2008, pp. 22-23).

Hatch Act of 1887

The Hatch Act of 1887 was passed to provide funds for establishing research and experiment stations at land-grant colleges. The research stations would be and are sites where problems associated with the food and fiber industry are researched and solutions found. Solutions to these problems are then disseminated to the public (Ball et al., 2008).

Smith-Lever Act of 1914

The Smith-Lever Act of 1914 provided a way for research and innovations found at research stations to be disseminated to the public. This act established the Cooperative Extension System. Persons were hired to serve as extension agents. These agents had the job of "providing programs and demonstrations in agriculture and home economics to youth and adults not enrolled in college" (Ball et al., 2008, p. 28). In essence, the establishment of the Cooperative Extension System provided a vehicle for information and research to reach the masses. "This law established a partnership between the federal government and the land-grant colleges for the purpose of extending knowledge about the best practices in agriculture or rural communities" (Croom et al., 2005, pp. 74-75).

Smith-Hughes Act 1917

In the initial years of this sector of education, the most salient topic debated was how vocational schools would be set up and what curriculums they would offer. There were two predominant questions being asked. 1) Should vocational education students be exposed to traditional theories of philosophy (thereby developing their ability to think independently) while simultaneously receiving job training skills that will prepare them for the workforce? 2) Should vocational education students be exposed only to teachings that directly relate to their job training? (Labaree, 2010)

Prior to the adoption of any significant Federal legislation that would provide funding to establish secondary schools of agriculture education or help answer these questions, several influential persons in the field of education and educational research proposed their own framework for how the vocational education system should be set up. John Dewey, who is known as a pedagogical progressive educationalist, envisioned vocational education environment as one in which students had a mixture of traditional philosophy and job training skills. Dewey felt that pupils should have the cognitive ability to transform industry through the use of intellect. Dewey (1915) notes,

> I object to regarding as vocational education any training which does not have as its supreme regard the development of such intelligent initiative, ingenuity and executive capacity as shall make workers, as far as may be, the masters of their own industrial fate. (p. 411)

On the other side of the debate was David Snedden, whose ideals were promoted by the first Federal Board for Vocational Education director Charles Prosser, and his ideas of social efficiency. Snedden's vision of vocational education was a model in which students learned only skills that were pertinent to their specific field of work. Snedden notes (1915/1977), "Vocational education is, irreducibly and without unnecessary mystification, education for the pursuit of an occupation" (p. 34). In his 1900 address to the Stanford alumni, Snedden said he believed students should not be trained in liberal arts, for he felt such training to be beneficial to only a small population that he called utilizers. The rank and file were to be well trained workers that helped build the society and industrial might of the country in which they lived. "The demand is general for education more nearly related to the necessities of active life, and, as far as the ordinary ranks of society are concerned, I am unable to see that the demand is a mistaken one" (Snedden, 1900, p. 33).

Snedden's doctrine led to the thought process that students were preordained to a social level based on their cognitive abilities (Labaree, 2010, p. 12). Dewey was unequivocally opposed to this idea. "I am utterly opposed to giving power of social predestination, by means of narrow trade-training, to any group of fallible men no matter how well-intentioned they may be" (Dewey, 1915, p. 411). Snedden's views, however, would ultimately influence national policy. Congress would view vocational-technical education as an "integral element for building a strong workforce as part of an overall national defense strategy" (Hayward & Benson, 1993).

The idea of education as a tool for social stratification was a major fear of many contemporary thinkers. Like John Dewey, they feared that the establishment of purely vocational schools would produce one set of students being prepared for the workforce, the lower class, while another set was prepared for college, the upper class. Subsequently, the idea of establishing comprehensive high schools where students would learn vocational skills and academic content was agreed upon. "As it turns out, the comprehensive schools of the educational reformists dreams, with very few exceptions, were comprehensive in name only" (Benson & Hayward, 1993, p. 13). The schools became dual system schools where, under one roof, upper level students were taking college preparatory classes and a separate track of students, the vocational students, were being prepared for the workforce under one roof (Benson & Hayward, 1993). The stratification of society through education would take place and with it a negative stigma for vocational education (Raizen, 1989). The social stratification lends itself to the ideals of Snedden; henceforth, Snedden's model of social efficiency would ultimately win the debate (Labaree, 2010; Garrison, 1990).

The first director of the Federal Board for Vocational Education, Charles Prosser, strongly supported Snedden's ideas of social efficiency. Prosser was instrumental in helping develop the Smith–Hughes Act of 1917 (PL 64-347). The Smith-Hughes Act of 1917 was the first legislation that provided funds for the establishment of vocational curriculum. Cook noted, "the act was designed to encourage states to promote and further develop programs of certain kinds of vocational education which otherwise might not be adequately provided for in our state systems of education" (p. 22). However, the Act itself "contributed to the isolation of vocational education from other parts of the comprehensive high school" (Benson & Hayward, 1993, p. 14).

> Although the act was intended to promote vocational education in the public school, several elements of the act served to separate vocational education from academic education. The Smith-Hughes Act stated funds could be used for the salaries of vocational teachers but not for the salaries of academic teachers. The act required students who received instruction from teachers paid with Federal vocational education funds to receive no more than 50 percent academic instruction. Students were taught job-specific skills but not theoretical or academic skills. This resulted in difficulties for the students when new technologies were introduced in the workplace. While these requirements were intended to protect the interest of vocational education, they ultimately served to separate vocational education from academic education (Prentice, n.d.).

Over the subsequent decades following the Smith-Hughes Act, the Federal focus in vocational education turned from a war defense perspective to one of unemployment during the depression of the 1930's. Later the government's focus for vocational education would turn back to producing skilled workers for the war effort (Hayward & Benson, 1993). Post WWII, the government then began to focus its vocational efforts on new technologies such as the space race with the passage of the George-Barden Amendments of 1956 (PL 84-911). This amendment focused on the, "importance of science, mathematics, foreign language and technical competencies" (Gordon, 1999, pg. 70). The Smith-Hughes Act set the stage for a whirlwind of legislation that did little to change the makeup of vocational education.

Post Smith-Hughes Changes in Vocational Legislation

Ball et al. (2008) list subsequent legislation that followed the Smith-Hughes act. This legislation did little but extend the place and way that funds allocated by the Smith-Hughes Act could be spent (Croom et al., 2005). Subsequent legislative acts were:

- An Act to extend the benefits of the Smith-Hughes Act to Hawaii, 1923 (Ball et al., 2008, p. 27).
- George-Reed Act of 1929- This act made funds available for the "development of agricultural and home-economics education in addition to those made available by the Smith-Hughes Act" (Ball et al., 2008, p. 27; Cook, 1947; Croom et al. 2005).
- An Act to extend the benefits of the Smith-Hughes Act and supplementary acts to Puerto Rico, 1931 (Ball et al., 2008, p. 27).
- George-Ellzey Act of 1934- This act provided additional funds for vocational education and implemented funding for distributive education (Ball et al., 2008, p. 27; Cook, 1947; Croom et al. 2005).
- George-Deen Act of 1936- This act increased funding for: agricultural education, home economics, trade and industry education, and distributive education (Ball et al., 2008, p. 27; Cook, 1947; Croom et al. 2005).

- National Defense War Training Acts- created funds for vocational education for citizens engaged in war industries (Ball et al., 2008, p. 27; Cook, 1947; Croom et al. 2005).
    - Public Law 812, 1940
    - Public Law 647, 1941
    - Public Law 146, 1942
    - Public Law 135, 1943
    - Public Law 373, 1944
- George-Barden Act of 1946 which allowed for a more flexible use of federal moneys (Ball et al., 2008, p. 27; Cook, 1947; Croom et al., 2005, p. 77).
- Area Redevelopment Act of 1962- provided funds for alleviating unemployment and revitalizing depressed economic areas in the United States (Johnson, 1971).
- Manpower Development and Training Act of 1962- provided funds for training and retraining workers to meet industries' needs (Ball et al., 2008, p. 27; Croom et al., 2005, p. 77).

Through all of the focus changes of the decades, there was little change in regards to vocational core funding and allocations. Major change in policy eventually came in the form of The Vocational Education Act of 1963 (Hayward & Benson, 1993).

Vocational Education Act of 1963

Following the Smith-Hughes Act of 1917, an influential Representative from Kentucky named Carl D. Perkins became a strong advocate for vocational education (Gordon, 1999). "He served as the primary force in writing, introduction, and supporting legislation that became the Vocational Acts of 1963 and 1984" (Gordon, 1999, p.67). "The Vocational Education Act of

1963 (PL 88-210) was designed to provide access to everyone while addressing the economic and social demands of America" (Threeton, 2007, para. 3). According to Ball et al. (2008) funds from this act could be used to:

1. Maintain, extend, and improve existing programs;
2. Develop new vocational education programs; and
3. Provide part-time employment for youth who need earnings from such employment to continue their study in vocational education on a full-time basis. (p. 29)

New programs from this legislation grew from the agricultural sector. Programs not necessarily farm related such as horticulture, natural resources, agricultural mechanics and others were now supported by federal dollars (Ball et al, 2008). The act was amended in 1968 and again in 1977 (Threeton, 2007). The act and its amendments included major changes that affected the way money was allocated for Federal vocational education programs. According to Gordon (2003), the funds could be used for: (1) high school and postsecondary students, (2) students that had completed or left high school, (3) individuals in the labor market in need of retraining, (4) individuals with academic, socioeconomic, or other obstacles, (5) individuals that were considered mentally retarded, deaf, or otherwise disabled, (6) construction of area vocational school facilities, (7) vocational guidance, and (8) training and ancillary services such as program evaluations and teacher education.

Carl D. Perkins Vocational Education Act of 1984

President Ronald Reagan signed the Public Law 98-524 (Carl D. Perkins Act) in 1984. This law was written with nine purposes:

1. Assist states to expand, improve, modernize, and develop high quality vocational education programs in order to meet the needs of the nation's workforce and improve productivity and economic growth;
2. Ensure equal access to vocational education programs, especially for special student populations;
3. Promote greater cooperation between public and private sectors in providing high quality vocational education;
4. Improve the academic foundations of vocational students and assist in the application of newer technologies in occupational preparation;
5. Provide training, retraining, and upgrading of vocational education services for workers in new high demand skill areas;
6. Assist economically depressed areas in improving the employment skills of their citizens;
7. Assist states in providing counseling, placement, and other support services;
8. Improve consumer and homemaking education and reduce sex-role stereotyping in employment; and
9. Authorize national programs to strengthen research and meet the needs of vocational education. (Public Law 98-524)

Also, appropriated within this landmark legislation were monies for strengthening academic standards in mathematics and science, establishing a National Council for Vocational

Education, and establishing programs for special needs (Ball et al., 2008). Although this act would provide funds for the previously mentioned areas, there was still a lack of regard as to how students would transition when new technologies outdated their current jobs. The stage was being set to look back to earlier models where the integration of traditional academics with vocational skills was addressed, days when Dewey and Snedden first debated the topic of vocational education. The notion of preparing students to succeed in a dynamic job market by grounding them not only in content knowledge but also cognitive knowledge would not be addressed until next cycle of Federal legislation. The Carl D. Perkins Act revisions in 1990 and 1998 also failed in this aspect. It was not until the revision of 2006 that academic standards would make their way into the wording and requirements of Federal legislation for career and technical legislation.

The Carl D. Perkins Reauthorizing Act 2006

The reauthorizing of the Carl D. Perkins Act (Public Law 109-270) in 2006 led to the development of increased focus on academic standards within career and technical education. United States Department of Education (2006) noted:

> The President signed the Carl D. Perkins Vocational and Technical Education Act of 2006 into law on August 12, 2006. The new Act will provide an increased focus on the academic achievement of career and technical education students, strengthen the connections between secondary and postsecondary education, and improve state and local accountability. (para. 1)

With this legislation, states had to develop ways to achieve the mandates set forth. The Act also set the stage for states to develop ways to assess achievement by students in career and technical education programs and standard education programs in the form of standardized *high* *stakes* tests. Legislation mandating the integration of academics shifted career and technical education in a new direction. Research in the field of career and technical education, specifically agricultural education, had been prompting such change for decades.

New Directions in Career and Technical Education

In 1988 researchers working with the National Research Council (NRC) published a report entitled: *Understanding Agriculture: New Directions for Education*. This report marked a major change in agricultural education. The authors offered several purposes behind the study, the first being a sincere concern for “declining enrollment, instructional context, and quality of agricultural education programs” (National Research Council, p. V). The report focused on two areas: agricultural literacy and education in agriculture. The committee that penned the report started by positing that, “renewed commitment to and broadening of agricultural education will ensure skills and knowledge essential to the future vitality of American agriculture” (p. VII). The authors of the report stated that it is important that all persons become agriculturally literate. Agricultural literacy is defined broadly in that persons have some knowledge and appreciation of the food and fiber industry.

This report had a myriad of recommendations. Of those, one has particular interest to this study. The authors proposed that agriculture is an excellent context for teaching science principles, especially biology. “The most significant opportunity after junior high for teaching science through agriculture comes in biology” (National Research Council, p. 14). Through the use of real world examples and in class projects, science concepts could be more effectively taught. This could be accomplished in the agricultural classroom. The committee posited that by using curriculum integration, both agricultural literacy and science literacy could be enhanced.

In line with recommendations from The National Research Council (1988), researcher

Mark Balschweid (2002), Purdue University, conducted a case-study in which students in a high school biology class were taught using animal agriculture as a context. Balschweid (2002) noted, "The purpose of this study was to determine how high school students perceived science and agriculture after completing a traditional year-long biology class that used animal agriculture as the context" (p. 1). The study was conducted from 1993-1999. Students taught using animal agriculture as a context totaled 531. Three animal agricultural themes were used to teach biology. The themes revolved around dairy, poultry, and swine. Themes were rotated each year to the next. The teacher in the study had earned a bachelor's degree in Agricultural Education but had chosen to teach general science instead of agricultural education. His teaching of biology, using animal agriculture as a context, stemmed from a desire to teach students where their food comes from. The study had four goals:

1) Determine the selected demographic variables of students completing a traditional biology class that was taught using animal agriculture as the context
2) Determine perceptions of students concerning the relationship between science and agriculture after completing a traditional biology class that was taught using animal agriculture as the context
3) Determine student perceptions of agriculture after completing a traditional biology class that was taught using animal agriculture as the context
4) Determine what level of knowledge about agriculture that students of a traditional biology class retain after completing the course

Results from the study indicated that the majority of the students did well in the class (90% reported earning an A or B). Over 85% indicated that by taking an agricultural based biology class, they had a better understanding and appreciation of the food and fiber industry. Other conclusions of interest from the study were:

> students gained a better understanding of the role that science plays in the world of animal agriculture as a result of taking a biology course that taught science using animal agriculture as the context; subject matter taught in the context of animal agriculture, from a teacher experienced in modern animal agricultural practices, can have a positive effect upon student attitudes towards agriculture and those who work in the agriculture industry, even when taught within a school corporation located in a larger metropolitan city; finally, students instructed using animal agriculture as a context for teaching biology were able to transfer general information regarding health to related subject matter in animal health as taught during the class (Balschweid, 2002, pp. 64-65).

Perceptions of Agricultural Education on Academic Achievement

Agricultural education in the past has been considered strictly as vocational education; however, instructors must teach a curriculum with greater emphasis on academic content. Myers and Dyer (2004) noted, “Teachers of agriculture in the secondary schools are being called upon to integrate curriculum that addresses standards in science, mathematics, and other content areas” (p. 44). Newcomb (1995) noted with the nature of the world we live in, students must be prepared to use higher order thinking skills [analysis, synthesis, and evaluation] as defined by Bloom’s taxonomy. According to Thompson & Warnick (2007), “As graduation requirements and external pressures for accountability have increased over the past few years, greater attention has been given to the integration of academic subjects into career and technical education, including the agricultural education curriculum” (p. 75).

> A number of researchers (Balschweid & Thompson, 2002; Balschweid, Thompson & Cole, 2000; Conroy & Walker, 2000; Enderlin & Osborne, 1992; Mabie & Baker, 1996; Roegge & Russell, 1990) believe agricultural education, with its natural ties to the biological, chemical, and physical sciences is well-positioned to offer a rigorous and meaningful learning context for applied scientific principles. (Myers & Washburn, 2008, p. 27)

This rigorous and meaningful learning is often tied to what has been termed curriculum integration. Curriculum integration is the process of combining curriculum for the purpose of increased comprehension (Bottoms & Sharp, n.d.). According to No Child Left Behind legislation, students' progress in science will be assessed during their school career multiple times (Myers & Washburn, 2008). Due to this, standardized test performance [such as the AHSGE] will play a major role in school funding and student graduation (Hamilton, Stecher & Klein, 2002).

Studies have been done to assess the attitudes of both teachers and students that participate in programs incorporating science curriculum standards with agriscience standards. Thompson and Warnick completed several studies in 2007 to determine and compare perceptions of agricultural teachers and science teachers regarding the integration of science into agricultural education programs. Although the studies were similar in that the same population was used, the research questions were different. The first study (Thompson & Warnick, 2007a) had four goals.

> First, was to determine the demographic makeup of agricultural and science teachers in the study. Second, compare perceived barriers to integrating science in agricultural programs. Third, compare perceptions of agricultural and science teachers concerning support of agricultural education programs as science integration has progressed. Lastly,

describe and compare perceptions of collaboration between science and agriculture departments. (Thompson & Warnick, 2007, pp. 76-77)

The study concluded that there are three significant barriers to integration of science curriculum in the classroom. Those barriers included the science teacher's lack of agricultural content, lack of equipment, and lack of funding for cross-curricular training and projects. These barriers were also identified in a study done to determine perceptions of Indiana agricultural and business teachers (Balschweid & Thompson, 2002, p. 5). Teachers in both subject areas identified lack of cross-curricular knowledge on both the science teacher and agricultural teacher's part as a major barrier. The authors of the study recommended workshops as a way to educate each content teacher regarding the other's curriculum (Thompson & Warnick, p. 82).

The second study conducted by Thompson & Warnick (2007b) though similar, had several different research questions. First, as in the previous study, they wanted to determine the demographic makeup of the science and agricultural teachers in their population. Second, they wanted to compare the perceptions of both teacher groups regarding the integration of science in the agricultural classroom. Third, they gathered data from selected science and agricultural teachers regarding their perceptions of teacher education programs in agriculture. Finally, the researchers wanted to determine perceptions of both teacher groups regarding the use of science integration in agricultural classrooms as a vehicle for preparing students to meet state standards. The population of the study was made up of 360 science teachers and 121 agricultural education teachers from the state of Oregon.

Teachers were asked to respond to a series of statements related to each research question. Several themes of interest surfaced after results were tabulated. First, relating to research question two, 97% of the science teachers and 100% of agricultural teachers agreed or strongly agreed that agriculture was an applied science. The next highest percentage (54%) indicated that the science teachers marked a neutral response to the statement "integrating science into agriculture classes has increased ability to teach problem solving." Fifty percent of science teachers indicated that they felt the agricultural teacher at their particular school was competent enough to teach integrated science concepts, whereas 81% of surveyed agricultural teachers felt they were competent enough to teach integrated science concepts.

Regarding results from research question three, the majority of teachers from both disciplines (87% of science teachers and 90% of agricultural teachers) indicated that teacher education programs should provide instruction on how to successfully integrate science into the agricultural curriculum. The statements tied to research question four were particularly salient to this research project. Several of these statements were designed to assess teacher's perspectives on using integrated science concepts to help prepare students for meeting minimum state requirements on standardized tests and state standards. Statement one found in table four reads, "Integration will help Agriculture Programs align with educational standards" (Thompson & Warnick, 2007b, p. 8). The researcher found that this did reach statistical significance ($p = .057$). Science (80%) and agricultural (85%) teachers agreed that integration of science will "help agricultural programs align with educational standards" (Thompson & Warnick, 2007b, p.9). Statement two reads, "Integrating will help students meet requirements for State Initial Mastery." The study found that this did reach statistical significance ($p = .007$). Science (77%) and agricultural (89%) teachers agreed that integration will help meet the requirements for initial mastery of state standards. Statement three reads, "Integrating will help students meet requirements for State Advanced Mastery." The study found that this did reach statistical significance ($p = .005$). Science (73%) and agricultural (84%) teachers agreed that integration will help meet the requirements for advanced mastery of state standards. Statement six reads, “Students will be better prepared for standardized testing if they learn the application of science.” Although this did not reach statistical significance ($p < .001$), the majority of both science teachers (55%) and agricultural teachers (78%) did agree that students learning the application of science will be better prepared for standardized tests. Overall, the study concluded that both science and agricultural teachers expressed a positive attitude toward integration of science in the agricultural curriculum.

Analysis of Current Research Regarding Science and Math Integration

The field of agricultural education has undergone many changes in recent decades and subsequently the focus of agricultural education research has followed suit. In 2005, 27 influential professionals involved in agricultural education met to develop a National Research Agenda (NRA) for agricultural education. From that meeting, an agenda containing five areas of focus was developed. The broad areas of research were agricultural communications, agricultural leadership, extension and outreach education, agricultural education in university and postsecondary settings, and school-based agricultural education. Within each broad area lie sub-sections called Research Priority Areas (RPA). School-based Agricultural Education has within it RPA-2 which states: Provide a rigorous, relevant, standards-based curriculum in agricultural, food, and natural resources systems. The NRA (2005) noted, “Agricultural education programs are being held partially accountable for student achievement in the basic academic areas” (p. 19). One of the Priority Initiatives of NRA was to, “Determine the effects of a comprehensive agricultural education program on student academic performance and achievement” (p. 19). Several researchers suggest that academic performance and achievement is influenced by agricultural education. Ball et al. (2008) posited, “Agricultural education in secondary schools has played an important role in enhancing student achievement in the core subject areas…" (p. 4), while Leising and Whent (1988) & Enderlin and Osborn (1992) reported that agricultural students received higher test scores in biology than students in other science classes.

Subsequently, much research relying on perspectives of both students and teachers who have participated in science or math integrated agricultural classrooms has been done. Other research noted a marked difference in scores between standard education students and agricultural students on National Assessment of Education Progress (NAEP) science tests. The National Center for Education Statistics (NCES) identified in its 2010 document, *Science Achievement and Occupational Career/Technical Education Course taking in High School: The Class of 2005,* that concentrators in agricultural education outscored non- concentrators. The NCES noted:

> Among graduates earning 0.00–1.00 core science credit, concentrators in five occupational program areas (agriculture; business support and management; computer and information science; engineering technology; and manufacturing, repair, and transportation) scored higher on the NAEP science test than non-concentrators (scores of 130–142 vs. 123). (pp. 4-5)

In support of this research, Frazier (2009) noted, "Gains in student achievement were shown when students were taught academic subjects in the context of agriculture (Balschweid, 2002; Balschweid & Thompson, 2002; Boone, Gartin, Boone, Hughes, 2006; Chiasson & Burnett, 2001; Conroy & Walker, 2000; Dyer & Osborne, 1999; Enderlin & Osborne, 1992; Enderlin, Petrea, & Osborne, 1993; Flowers & Osborne, 1988; Hamilton & Swortzel, 2007; Layfield, Minor, & Waldvogel, 2001; Myers, Washburn & Dyer, 2004; Ricketts, Duncan, &

Peake, 2006; Roegge & Russell, 1990; Thompson & Schumacher, 1998; Leising & Whent , 1988)" (p. 24).

On the contrary, The National Assessment of Vocational Education (U.S. Department of Education, 2004, p. 24) noted that, "There is little evidence that vocational courses contribute to improving academic outcomes." The report also comments that, "vocational classes themselves do not 'add value' to academic achievement as measured by test scores." Such comments are confounding to government dictates. The federal government dictates that any state that receives federal money for career and technical education programs must have a plan for integrating academics into their programs in order to prepare students for high skilled and high wage occupations (Threeton, 2007). This focus on academics is intended, in part, to provide high school students with rigorous content needed to prepare for further education and careers in current or emerging professions (2006 Perkins Act, Section 3(5)(A)(i).

According to the amendment of the Carl D. Perkins Act of 2006 (S. 205, Sec. 122, (c)(7)(A), p. 37) each state will submit a plan that includes ways to:

> improve the academic and technical skills of students participating in career and technical education programs, including strengthening the academic and career and technical components of career and technical education programs through the integration of academics with career and technical education to ensure learning in—

Empirical studies have been done to assess agricultural students' achievement. A study conducted by Connors and Elliot (1995) was based around the theoretical framework that agriscience and natural resources courses had most of the same objectives as other science courses and that students that completed the agriscience and natural resources courses could perform as well on standardized tests as students who completed other science courses. The researchers backed the assertion by quoting a study by Anderson and Boddy (1985) that stated, "specific secondary vocational programs that contain significant components of chemistry, biology, and physics related skills are: production agriculture, and horticulture" (p 8). The study used a pre-experimental study that used a static-group comparison design. The independent variable was the number of science courses, both regular and agricultural, that were completed. The dependent variable was the science achievement by the students. Results indicated the group that had taken agriscience and natural resources had performed as well as the group that had taken regular science classes. There was no significant difference in the mean test scores between groups.

Later, Edwards, Leising, and Parr conducted a series of studies that had confounding results regarding the usefulness of agricultural education to improve academic achievement. Edwards, Leising and Parr (2009) hypothesized that students who were taught using conceptualized mathematics enhanced lessons using an aligned curriculum would develop a deeper understanding of certain math concepts. The researchers used a posttest only design and analyzed data using a one-way ANOVA. The unit of study was at the classroom level. 38 agricultural power and technology class rooms were used. 18 were randomly assigned to the experimental group and 20 were assigned to the control group. Agricultural teachers were partnered with mathematics teachers and collaborated over a five day period to develop math enhanced lessons from existing agricultural and power technology curriculum. Students from both groups were assessed to determine their level of equivalence using the Terra Nova CAT Basic Battery Examination. The groups were not significantly different ($p>.05$).

The experimental group was taught using the developed math enhanced lessons through the semester while the control group was taught using the standard curriculum. At the end of the semester each group took two tests. First, the students took the Terra Nova CAT Survey Edition examination to determine general mathematics ability. Students then took the WorkKeys Applied Mathematics Assessment. Results indicated that there was no significant difference in the control group and experimental group. Edwards et al. (2009) noted several reasons as possible deterrents for the experimental group not outperforming the control group.

> Perhaps the short time period over which this study was conducted (i.e., one semester) did not allow sufficient opportunity for significant differences in student math achievement to emerge as measured by the tests described. Because the average number of math-enhanced lessons taught per experimental teacher was slightly more than five (out of a possible nine), perhaps an increase in this number would result in improved student performance. (p. 66)

A similar study conducted previously (2006) by the same group of researchers (Edwards, Leising & Parr), however, also showed confounding results. This study was structured in much the same way using the same analysis and posttest design. Their research question was the same. They hypothesized that students who were taught using conceptualized mathematics enhanced lessons using an aligned curriculum would develop a deeper understanding of certain math concepts. The groups were tested using the Terra Nova CAT Basic Battery Examination. The groups were not significantly different ($p > .05$). The major difference between the studies was the posttest used and the manner in which it tested the hypothesis. The posttest used in this study was ACCUPLACER (Elementary Algebra test, The College Board; 35 items). This test evaluates a student's need for remediation before enrolling in postsecondary school. The results yielded that there was a significant difference in the experimental and the control group ($p < .05$). The research concluded that the use of enhanced mathematic lessons did affect the outcome of scores on the ACCUPLACER.

The National Research Center for Career and Technical Education (NRCCTE) is currently engaged in studies to evaluate integration of science and literacy curriculums in career and technical classes (B. A. Parr, personal communication, August 8, 2011). This research follows research by Alfeld, Jensen, Pearson, and Stone (2006) for the NRCCTE to determine if a math enhanced curriculum would benefit career and technical students on standardized tests. In this study, Alfeld et al. (2006) "hypothesized that students' mathematics learning in occupational contexts (CTE courses) can be enhanced and thereby improve math achievement among CTE students without the loss of technical skill achievement" (p. 3). Career and technical educators and math educators were recruited for this study. Teachers were paired between curriculum areas. Each teacher then met with his or her partner and identified embedded mathematics concepts. The teachers then developed lessons that enhanced the mathematics instruction within. The experimental group of teachers totaled 57 while there were 74 in the control group. Both groups of students were given a pre-test. The experimental group was then taught the enhanced lessons over the course of a year while the control group was taught normal career and technical lessons. The groups were then tested using two standardized assessments, the TerraNova and ACCUPLACER. The results yielded that the experimental group that was taught the enhanced lessons outscored the control group on the standardized tests. This group also experienced no loss of technical skill development due to the extra mathematics instruction replacing career and technical instruction. This is one example of how academics and career and technical classes can complement each other. The main point to derive from this study is that the academic content is already embedded in the career and technical curriculum; therefore, agricultural teachers must be trained to bring it out in their instruction.

High Stakes Testing

The basis behind testing is accountability (Edwards, Leising, & Parr, 2002). "In recent decades program accountability in education has come to mean assessment of student achievement, typically in the basic academic areas of mathematics, science, written and oral communications, and reading" (NRA, 2005, p. 19; Edwards, Leising, & Parr, 2002). Accountability in an educational context lies in the fact that, "agencies that receive public funds must demonstrate that those funds have been used efficiently and effectively" (Ball et al., 2008, P. 14). Incidentally, the way by which states have for determined efficiency and effectiveness has been by evaluation of scores on *high stakes tests* such as: Florida Comprehensive Assessment Test (FCAT), Alabama High School Graduation Exam (AHSGE), Alabama Reading and Mathematics Test (ARMT), Georgia's Criterion- Referenced Competency Test (CRCT), and Mississippi's Subject Area Testing Program (SATP). All states, including the District of Columbia and Puerto Rico, have *high stakes* tests associated with meeting requirements set forth by the federal government and NCLB (U. S. Department of Education, 2009). No Child Left Behind (2001) dictates that all public schools receiving federal funds must test students annually between grades 3-8 in reading and math and once more between grades 10-12.

Academic Achievement and Its Measures

Glaser (1963) defined achievement as "the determination of the characters of student performance with respect to specified standards" (p. 519). He posits later that "High Stakes" tests [such as the Alabama High School Graduation Exam] are often used to assess achievement in specific areas. Edwards, Leising, and Parr (2002) indicated that [student] achievement is the standard by which teachers, programs, schools, and organizational accountability is measured. "Moreover, an almost singular emphasis is being placed on student achievement in "core" academic areas such as science" (Edwards, Leising & Parr, 2002, p. 5). Austin & Mahlman (2002) noted, "Standardized tests, often in the form of "High Stakes Tests" [such as the Alabama High School Graduation Exam], are the vehicles for gathering evidence of student competencies. Ball et al. (2005) posited, "The testing movement took the public schools by storm in the 1990s and continues to dominate today's educational agenda" (p. 13). States such as Florida, with its Florida Comprehensive Assessment Test (FCAT), have been aggressive in testing students in core subjects to establish a reference for achievement (Ball et al., 2008). Schools in Florida are assigned a letter grade, A-F, based on student scores on the (FCAT). Although Florida reported a slight increase in state wide averages, no one knows if test preparation, more effective teaching or better tests taking skills on the student's part are to the cause of this improvement (Ball et al., 2008). The State of Alabama also uses such a High Stakes exam, as noted by Glaser (1963) and Austin & Mahlman (2002), to evaluate its set educational standards.

Describing the Alabama High School Graduation Exam

The Alabama High School Graduation Exam "is generally written on the eleventh-grade level. The first graduation exam, given in Alabama in 1983, tested basic knowledge and was on a sixth-grade level. It was later revised to an eighth-/ninth-grade level in 1991" (Alabama Department of Education, 2003, p. 4). The Alabama Department of Education (2003) describes the exam as an exam that:

> requires students to demonstrate what they have learned in required high school core course work and emphasizes logic, problem solving, and other thinking skills. The reading section requires students to read and comprehend articles, poems, editorials,

> manuals, and other similar materials. The language section focuses on grammar skills, punctuation, word choice, sentence structure, and organizational skills for writing. Most of the math section contains questions about basic Algebra I skills. It also covers some pre-geometry taught in grades seven and eight. Most of the science section includes biology questions. The rest is physical science taught in grades seven and eight. The Class of 2001 was required to pass the reading and language sections of the exam. The Class of 2002 was required to pass the reading, language, mathematics, and science sections. A social studies section, dealing with U.S. History, will be required beginning with the Class of 2004. (p. 6)

According to a memorandum sent by Joseph B. Morton (2007), Alabama State Superintendent of Education, the physical science portion of the exam was replaced by a biology section. Students were first required to pass the biology portion in 2009.

Summary

From the inception of vocational education, it has been important that students receive skills that will make them successful in the job market and successful in life. Upon reading the review of literature, one can see that integration of academic standards is essential in order to achieve the goal of producing a competent and skilled work force.

Federal mandates have stipulated that career and technical classes must have a rigorous curriculum that promotes academic excellence. Studies in the literature review both support and confound the assertion that there is a relationship between career and technical classes and student performance on standardized tests. Studies also reflect that career and technical education, particularly agricultural education, can be a vehicle for teaching scientific concepts. As noted by the report from the NRCCTE, academic standards are already in place in the career and technical curriculum. Authors suggest that educators should work to expose those standards in the current curriculum and work with non-career and technical teachers in developing cross-curricular exercise that will benefit students (B. A. Parr, personal communication, August 9, 2011).

Finally, the 1990's saw a whirlwind of testing in public schools (Ball et al., 2008). States have placed "an almost singular emphasis on student achievement in core subjects" (Edwards, Leising, & Parr, 2002, p.5). Through the use of standardized tests, states have been determining the merit of educational programs and charting achievement gains by students (Ball, et al., 2008). Edwards, Leising, & Parr (2002) labeled testing of student achievement, using standardized tests, as "the coin of the realm" in education today (p. 5). Test scores are an easy way for legislators and persons that make educational decisions to see evidence of achievement; therefore, programs, to demonstrate their continued *raison d'être*, must show progress in improving such scores.

Chapter 3

Methods

Quantitative methods were used in this research study. For this research a convenience sample was used to obtain data. This is an appropriate method when it is difficult to select a random or systematic non-random sample and has been used in previous studies (Fraenkel & Wallen, 2006; Jennings, Brashears, Burris, Davis, & Brashears, 2007; Smith, Park, & Sutton, 2007).

This study had two parts. First, with increases in accountability for academics, industry credentialing, and post secondary training, as mandated by Carl D. Perkins Act (2006), career and technical education must produce empirical evidence of compliance. This was accomplished by exploring the relationship between academics and career and technical classes. More specifically, the study sought to determine if there is a relationship between the number of agriscience classes a student takes and the subsequent outcomes on Alabama High School Graduation Exam scores. In order to achieve this goal with some degree of accuracy, a quantitative inferential approach was taken. The methodology for this portion of the study was to take an existing measure of academic ability, AHSGE, and attempt to predict group membership based on the number of agricultural classes that were taken by each student. Group membership in this context is defined as the passing group or the failing group. The dependent variable was outcomes on the AHSGE, pass/fail. The independent variable was the number of agricultural classes that each student had taken.

The second part of this study was based on three constructs from which research questions were derived. A survey was administered to agricultural teachers to try to determine relationships between outcomes on standardized tests and agricultural instructors' perceptions of teaching responsibilities as they relate to academic achievement. Several constructs were conceptualized to attempt to achieve this. The constructs were as follows 1) student test taking preparation 2) academic standard integration 3) perceived barriers to science integration and 4) science integration and its relationship to student enrollment. From these constructs the survey instrument was developed.

Research Questions

The following research questions were used in this study.

1) Can outcomes on the AHSGE be predicted by the number of agriscience classes that a student completes?
2) Do agricultural education teachers in Alabama feel it is their responsibility to prepare their students for standardized high-stakes tests?
3) Do agricultural education teachers in Alabama feel they should incorporate core academic standards into their instruction?
4) Do agricultural education teachers in Alabama feel there are outside influences that affect how and if science integration takes place in their classrooms?
5) What are the perceptions of Alabama agricultural education teachers regarding student enrollment and the impact science integration plays on it?

Research Design

To complete the first part of the study a quantitative research design was used. In order to answer research question one, this study collected data from three public school systems in central Alabama. Each of the systems offered agricultural education as an elective class. Data that was collected dealt with students who were enrolled in agricultural education classes in 2010. Test outcomes detailing pass or fail scores for each of the agriculture students were tabulated with the number of agricultural courses completed by each student. A binary logistic regression analysis was run to determine, with some degree of accuracy, if there was a relationship between the number of agricultural classes that a student took and subsequent outcomes on the Alabama High School Graduation Exam. "Logistic regression tests the ability of a model or group of variables to predict group membership as defined by some categorical dependent variable" (Mertler & Vannatta, p. 304). If group membership could be predicted based on the number of agricultural classes that students take, then one could infer whether agricultural classes help or do not help students pass the AHSGE. An alpha level of 0.1 was set *a priori*. This is appropriate for small sample sizes to avoid a Type II error (Alfeld et al., 2006).

To complete the second part of the study the researcher developed a survey based on four constructs related to agricultural education. The survey contained five questions for each construct. Upon getting approval from the Auburn University Institutional Review Board and representatives of the Alabama Association of Agriscience Educators (AAAE), the researcher distributed the survey at the 2011 annual meeting of Alabama Association of Agriscience Educators in Birmingham, Alabama. The surveys were collected and descriptive statistics, including frequencies, means, and standard deviations were used to summarize the data at the item level.

Participants

Population. Regarding research question one, the population for this study was made up of approximately 264 agricultural education students grades nine through twelve. Subjects were from three school districts in central Alabama. Data collected from this population was derived from the Alabama High School Graduation Exam given in the spring of 2010. Due to the Family

Education Rights and Privacy Act (FERPA) and the Auburn University Institutional Review Board requirements for minor anonymity, no other demographics were collected.

Regarding research questions two through five the population consisted of 161 middle-school and high-school agricultural educators (Alabama Teachers Directory, 2010-11) in Alabama. This number was determined by the number of teachers that filled out the registration sheet for the AAAE session.

Sampling. The sample population for question one consisted of 264 agricultural education students. The entire population was included in the study; therefore, no sampling procedure was necessary. Research questions two, three, four, and five were addressed by providing a questionnaire for each of the 310 agricultural educators in the 2010-2011 Alabama Agriscience Teacher Directory. A survey was provided for each agricultural teacher that could possibly attend the AAAE meeting though only 161 attended and 133 completed the survey. Each educator had equal opportunity to attend the session; therefore, each had a nonzero chance of being included in the sample population thereby mitigating survey coverage error. Next, sampling error was addressed. Sampling error is defined as, "the extent to which the precision of the survey estimates is limited because not every person in the population is sampled" (Christian, Dillman, & Smyth, 2009, p. 17). Sampling error does exist in this survey because not all agriculture teachers attended the workshop and filled out a survey. A standard confidence level of 95% was determined to be acceptable in this survey. Sample size calculators indicate that in order to have a margin of error of ± 5.35%, with a confidence level of 95%, 161 members of a population of 310 must be surveyed. This margin of error and confidence level was reached by surveying the 161 teachers that attended the Alabama Association of Agriscience Educators annual meeting at the Alabama Career and Technical Education Summer Conference, 2011. All session attendees were given the opportunity to complete the survey. Finally, non-response error was addressed. Non-response error is defined as, “error that results from those who do not return the survey differing in attitudes, beliefs, behaviors, and characteristics from those who do return the survey” (Christian, Dillman, & Smyth, 2009, p. 62). Of the 161 educators surveyed, 133 respondents completed the survey. According to the American Association for Public Opinion Research (AAPOR, 2011) the response rate is, “The number of complete interviews with reporting units divided by the number of eligible reporting units in the sample” (p.5). By this definition, this survey had a response rate of 82%. The AAPOR determined that response rates over 70% is acceptable.

Instrumentation

To answer research question one, the Alabama High School Graduation Exam was used as the instrument to record academic achievement. According to the Alabama State Department of Education (2003), “the test is given to assess students’ mastery of content defined as “fundamental,” a requirement for receipt of an Alabama high school diploma”. The exam tests mastery in five curriculum areas: Language, Mathematics, Social Studies, Biology, and Reading.

Validity of the Alabama High School Graduation Exam was assessed by a panel of experts. According to a report from the Alabama State Department of Education (2003), “Teachers from more than 100 school systems from across the state worked in various phases of test development and validity checks for more than four years to make certain this goal was met (p. 2).” After extensive and exhaustive research both through internet research and contacting Alabama State Board of Education personnel, no reliability coefficient was found for the AHSGE.

To answer research questions two through five, an instrument was developed using an instrument previously developed by other researchers in this field (Layfield, Minor, & Waldvogel, 2001; Balschweid & Thompson,1999; Thompson & Schumacher, 1998; Myers & Washburn, 2008). The instrument was modified to meet the requirements of this study. The instrument was reviewed by an agricultural education university professional for face and content validity. Previous researchers report the original instrument internal consistency using Cronbach's alpha of 0.88 (Thompson & Schumacher, 1998). Cronbach's alpha for the new instrument is reported at 0.84.

The instrument operationalized the constructs The first construct, student test taking preparation, fulfilled study objective two and measured the value that agricultural educators in Alabama place on preparing their students for *high stakes* standardized tests (see Table 6). This construct contained five items with response options noted as 1 (*strongly disagree)*, 2 (*disagree*), 3 (*agree*), 4 (*strongly agree*). The second construct, academic standard integration, fulfilled study objective three and measured the value that agricultural educators in Alabama place on integrating academic standards in biology, social studies, language arts, mathematics, and reading comprehension into their classroom instruction (see Table 7). This construct contained five items with response options noted as 1 (*strongly disagree)*, 2 (*disagree*), 3 (*agree*), 4 (*strongly agree*). The third construct, *perceived barriers to science integration,* fulfilled study objective four and measured the perspective of agricultural education teachers in Alabama on barriers that limit the amount of science they integrate into their classroom instruction (see Table 8). This construct contained five items with response options noted as 1 (*strongly disagree)*, 2 (*disagree*), 3 (*agree*), 4 (*strongly agree*). The fourth construct, perceived relationship of science integration on enrollment, fulfilled study objective five and measured the perspectives of agricultural education teachers in Alabama regarding relationships between science integration and student enrollment in agricultural programs (see Table 9). This construct contained five items with response options noted as 1 (*strongly disagree)*, 2 (*disagree*), 3 (*agree*), 4 (*strongly agree*). Descriptive statistics, including frequencies, means, and standard deviations were used to summarize the data at the item level. Internal consistency was determined using Cronbach's alpha.

Data Collection Procedures

After obtaining permission form Auburn University's Institutional Review Board (see Appendix B), the researcher began the data collection process. To answer research question one, the researcher sent a formal request asking for participation and information concerning this research project. The request was made to four school systems in Alabama. Of the four, three were willing to participate in the research project. The agricultural education teachers in each system were asked to secure a copy of the Final Status Report detailing pass/fail status on the AHSGE in the spring of 2010 for their system. From the Final Status Report, the teachers were asked to identify agriscience students that had participated in their respective programs. Teachers then assigned each of their students a code number. Using that code number, the student's test outcomes were recorded for each section of the AHSGE. The teachers then consulted their student records and determined how many agricultural classes each student had completed. The data was retrieved from the teachers by the researcher and entered into SPSS. Regression results are reported in Chapter Four.

For the second part of the study, the researcher again obtained permission from the Auburn University Institutional Review Board (see Appendix B). Next, a survey related to the research questions was developed. The Alabama State Department of Education, Career and

Technical Education, Agriscience section was contacted and an allotted time was given to the researcher to distribute the survey during the 2011 Alabama Career and Technical Education Conference in Birmingham, Alabama. The researcher attended the meeting which was held at the Birmingham Jefferson Civic Center. Many agricultural education teachers were in attendance. The survey was given to the session chair who distributed and collected the survey. The researcher then retrieved the collected surveys and used SPSS 18 for Windows to calculate descriptive statistics and percentages from the tallied survey responses.

Data Analysis Procedures

To address research question one the binary logistic regression is an appropriate tool to complete the analysis. Mertler and Vannatta (2010) indicate that it is more flexible than other types of analyses in that, "predictor groups do not have to be normally distributed, linearly related, or have equal variances within each group" (p. 290). "Logistic regression tests the ability of a model or group of variables to predict group membership as defined by some categorical dependent variable" (Mertler & Vannatta, p. 304). According to Mertler and Vannatta (2010), in order to meet the requirements of the binary logistic regression, the dependent variable must be recorded as dichotomous. The dependent variable for this study was pass/fail on each portion of the AHSGE. Logistic regression also allows for the use of both ordinal and continuous independent variables. The independent variable in this case was ordinal in that it was the number of classes taken by a student.

There are several issues related to the use of logistic regression. First, this type of regression is sensitive to high correlations among predictor variables. This is known as multicollinearity. If this occurs, one of the overlapping variables must be eliminated in the analysis. Second is the case of outliers. Extreme values on the predictor variables should be examined. According to Mertler and Vannatta (2010), “resultant logistic regression models are very sensitive to outliers” (p. 293).

To answer research questions two, three, four, and five, the researcher used descriptive statistics, frequency of response, and percentages. Data tabulation and explanations are detailed in the Findings section of this report.

Chapter 4

Findings

The purpose of this study was two fold. First, the connection between academics and career and technical classes was examined. More specifically, the study sought to determine if there is a relationship between the number of agriscience classes a student takes and the subsequent outcomes on the Alabama High School Graduation Exam. Second, the perceptions of Alabama agricultural educators regarding 1) student test taking preparation 2) academic standard integration 3) perceived barriers to science integration and 4) science integration's impact on enrollment were investigated.

In order to accomplish this goal, this study investigated if the independent variable (number of agricultural classes, 1, 2, or 3) was a predictor of group membership. The groups being predicted were the passing group and the failing group of students who took the AHSGE.

Data should be screened for outliers when using a continuous independent variable in logistic regression; however, the independent variable in this case was ordinal, therefore no outlier screening was done. Multicollinearity is not an issue in that none of the predictor variables overlap.

A binary logistic regression was conducted to determine if the independent variable was a predictor of pass/fail on each portion of the AHSGE. The exam contains five portions; therefore, five analyses were done. Results will be reported by section of the AHSGE.

Research Questions

1) Can outcomes on the AHSGE be predicted by the number of agriscience classes that a student completes?
2) Do agricultural education teachers in Alabama feel it is their responsibility to prepare their students for standardized high-stakes tests?
3) Do agricultural education teachers in Alabama feel they should incorporate core academic standards into their instruction?
4) Do agricultural education teachers in Alabama feel there are outside influences that affect how and if science integration takes place in their classrooms?
5) What are the perceptions of Alabama agricultural education teachers regarding student enrollment and the impact science integration plays on it?

Reading

Regression results indicated that the overall model of predictors was statistically significantly reliable in distinguishing between pass and fail on the AHSGE reading portion. A -2 Log Likelihood = 206.585 indicates a poor model fit whereas a $\chi^2(1) = 3.695$, $p = .055$ indicates that the generated model is not significantly better in predicting pass/fail than the constant model. The model correctly classified 74.7% of the cases. Regression coefficients are presented in Table 1. Wald statistic does not statistically significantly indicate that the variable predicts AHSGE outcomes in reading; however, results indicate that the probability that a student will pass the reading portion of the AHSGE does increase with the number of agricultural classes taken. The probability for passing given that a student takes 1 class = .71, 2 classes = .79, and 3 classes = .86. Number of agricultural classes is statistically significant ($p < 0.1$) predictor of pass/fail on the reading portion of the AHSGE.

Table 1

Regression Coefficients for Reading

	B	*Wald*	*df*	*p*	Odds Ratio
Number of Agricultural classes	.466	3.356	1	.067	1.594

Language

Regression results indicated that the overall model of predictors was statistically significantly reliable in distinguishing between pass and fail on the AHSGE language portion. A -2 Log Likelihood = 232.921 indicates a poor model fit whereas a $\chi^2(1) = 3.695$, $p = .014$ indicates that the generated model is significantly better in predicting pass/fail than the constant model. The model correctly classified 64.1% of the cases. Regression coefficients are presented in Table 2. Wald statistic indicated that the variable statistically significantly predicts AHSGE outcomes in language. Results indicate that the probability that a student will pass the language portion of the AHSGE does increase with the number of agricultural classes taken. The probability for passing given that a student takes 1 class = .59, 2 classes = .71, and 3 classes = .80. Number of agricultural classes is a statistically significant ($p < 0.1$) predictor of pass/fail on the language portion of the AHSGE.

Table 2

Regression Coefficients for Language

	B	*Wald*	*df*	*p*	Odds Ratio
Number of Agricultural classes	.529	5.545	1	.019	1.697

Mathematics

Regression results indicated that the overall model of predictors was statistically significantly reliable in distinguishing between pass and fail on the AHSGE math portion. A -2 Log Likelihood = 250.245 indicates a poor model fit whereas a $\chi^2(1) = 6.887$, $p = .009$ indicates that the generated model is significantly better in predicting pass/fail than the constant model. The model correctly classified 71.8% of the cases. Regression coefficients are presented in Table 3. Wald statistic indicated that the variable statistically significantly predicts AHSGE outcomes in math. Results indicate that the probability that a student will pass the mathematics portion of the AHSGE does increase with the number of agricultural classes taken. The probability for passing given that a student takes 1 class = .65, 2 classes = .76, and 3 classes = .85. Number of agricultural classes is a statistically significant ($p < 0.1$) predictor of pass/fail on the math portion of the AHSGE.

Table 3

Regression Coefficients for Mathematics

	B	*Wald*	*df*	*p*	Odds Ratio
Number of Agricultural classes	.534	6.276	1	.012	1.705

Social Studies

Regression results indicated that the overall model of predictors was not statistically significantly reliable in distinguishing between pass and fail on the AHSGE social studies portion A -2 Log Likelihood = 233.884 indicates a poor model fit whereas a $\chi^2(1) = 1.756$, $p = .185$ indicates that the generated model is not significantly better in predicting pass/fail than the constant model. The model correctly classified 70.8% of the cases. Regression coefficients are presented in Table 4. Wald statistic indicated that the variable does not statistically significantly predict AHSGE outcomes in social studies; however, results indicate that the probability that a student will pass the social studies portion of the AHSGE does increase with the number of agricultural classes taken. The probability for passing given that a student takes 1 class = .69, 2 classes = .73, and 3 classes = .79. Number of agricultural classes is not a statistically significant ($p > 0.1$) predictor of pass/fail on the social studies portion of the AHSGE.

Table 4

Regression Coefficients for Social Studies

	B	*Wald*	*df*	*p*	Odds Ratio
Number of Agricultural classes	.280	1.681	1	.195	1.323

Biology

Regression results indicated that the overall model of predictors was not statistically significantly reliable in distinguishing between pass and fail on the AHSGE biology portion. A -2 Log Likelihood = 157.558 indicates a poor model fit whereas a $\chi^2(1) = 2.389$, $p = .122$ indicates that the generated model is not significantly better in predicting pass/fail than the constant model. The model correctly classified 70.8% of the cases. Regression coefficients are presented in Table 4. Wald statistic indicated that the variable does not statistically significantly predict AHSGE outcomes in biology; however, results indicate that the probability that a student will pass the biology portion of the AHSGE does increase with the number of agricultural classes taken. The probability for passing given that a student takes 1 class = .87, 2 classes = .91, and 3 classes = .94. Number of agricultural classes is not a statistically significant ($p > 0.1$) predictor of pass/fail on the biology portion of the AHSGE.

Table 5

Regression Coefficients for Biology

	B	*Wald*	*df*	*p*	Odds Ratio
Number of Agricultural classes	.452	2.145	1	.143	1.571

Agriculture Teacher Survey

The second objective of this study was to describe the perceptions of agricultural education teachers toward preparing their students for standardized high-stakes tests. A majority of responding teachers (63.1 %) either agreed or strongly agreed that they felt it was their job to prepare students to pass the AHSGE (Table 6). Furthermore, 84.9% either agreed or strongly agreed that students are better prepared for the AHSGE after completing their classes. A majority (94.8%) of teachers either agreed or strongly agreed that it is important that their students pass the AHSGE. Most (85.7%) of the teachers either agreed or strongly agreed that agricultural classes have a place in preparing students for *high stakes* tests. Finally, 81.9% of teachers surveyed feel that students who take agricultural classes are better prepared for passing the AHSGE than students who have not completed an agricultural class.

Table 6

Preparing Students for Standardized Test

Statement	M (SD)	%SD	%D	%A	%SA
I feel it is my job to prepare students for the AHSGE.	2.7(.90)	10.5	26.3	43.6	19.5
I feel students are better prepared for the AHSGE after completing my class.	3.1(.77)	4.5	10.5	54.1	30.8
I feel it is important that my students pass the AHSGE.	3.5(.67)	2.3	3.0	34.6	60.2
I feel that Agriscience has a place in preparing students for *high stakes* tests.	3.1(.76)	3.8	10.5	51.9	33.8
I feel that students in Agriscience are better prepared for passing the AHSGE than students who have not completed an Agriscience class.	3.1(.74)	2.3	15.8	51.1	30.8

Note. *n* = 133. M= mean. SD= Std. Deviation. Scale: 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Agree (A), 4 = Strongly Agree (A).

The third objective of this study was to describe the perceptions of agricultural teachers regarding incorporation of core academic standards into the agricultural education curriculum. Over two-thirds (83.4%) of the respondents reported that integration of biology concepts into the agricultural curriculum was important (Table 7). Slightly more than half (53.4%) of the teachers either agreed or strongly agreed that it is important to integrate social studies in their instruction. Furthermore, most teachers agreed or strongly agreed with the notion that integrating language arts is important (66.2%). Finally, most teachers either agreed or strongly agreed that integration of mathematics (92.5%) and reading comprehension (87.9%) were important in the agricultural education curriculum.

Table 7

Integration of Academic Concepts

Statement	M (SD)	%SD	%D	%A	%SA
I feel it is important to integrate biology into my instruction.	3.1(.81)	6.8	9.8	54.1	29.3
I feel it is important to integrate social studies into my instruction.	2.6(.82)	9.0	37.6	41.4	12.0
I feel it is important to integrate language arts into my instruction.	2.7(.78)	7.5	26.3	53.4	12.8
I feel it is important to integrate mathematics into my instruction	3.4(.70)	2.3	5.3	45.1	47.4
I feel it is important to integrate reading comprehension activities into my instruction.	3.1(.74)	3.8	8.3	52.6	35.3

Note. *n* = 133. M= mean. SD= Std. Deviation. Scale: 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Agree (A), 4 = Strongly Agree (A).

The fourth objective of this study was to describe the perceptions of agricultural teachers regarding barriers to integrating science into the agricultural education curriculum (Table 8). Two-thirds (74.5%) of the teachers felt lack of appropriate equipment was a barrier to science integration. A majority of teachers felt insufficient funding (90.2%) and lack of appropriate workshops (65.4%) served as barriers. Conversely, the minority of teachers felt that the lack of having a cooperating science teacher (38.4%) and a lack science competence among agriculture teachers (39.1%) were barriers to science integration.

Table 8

Barriers to Science Integration

Statement	M (SD)	%SD	%D	%A	%SA
Lack of appropriate equipment is a barrier to integrating science into my agricultural education program.	3.0(.78)	3.0	22.6	48.9	25.6
Lack of adequate federal, state, or local funds is a barrier to integrating science into agricultural education programs.	3.2(.66)	1.5	8.3	55.6	34.6
Lack of agriscience workshops for agricultural education teachers is a barrier to integrating science in my class.	2.8(.80)	4.5	30.1	45.9	19.5
Lack of science competence among teachers in agricultural education is a barrier to integrating. science.	2.3(.87)	16.5	43.6	29.3	9.8
Lack of a science teacher who is willing to help me integrate science concepts has been a barrier to integrating science.	2.3(.80)	12.8	48.9	30.1	8.3

Note. *n* = 133. M= mean. SD= Std. Deviation. Scale: 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Agree (A), 4 = Strongly Agree (A).

The fifth objective of this study was to describe the perceptions of Alabama agricultural education teachers regarding student enrollment and the impact science integration plays on it (Table 9). A majority (68.4%) of the teachers felt that average ability students are more likely to enroll in agricultural education courses that integrate science. Furthermore, slightly more than half of teachers felt that both low ability students (51.8%) and advanced students (57.1%) were more likely to enroll in agricultural courses that integrated science. Likewise, more than half (54.2%) of the teachers felt integrating science into the agricultural education program more effectively meets the needs of special population students. Finally, the majority (63.2%) of teachers either strongly disagreed or disagreed that enrollment had gone up since they had integrated science.

Table 9

Perceptions on Enrollment in Agricultural Education

Statement	M (SD)	%SD	%D	%A	%SA
High ability students are more likely to enroll in agricultural education courses that integrate science.	2.6(.85)	10.5	32.3	43.6	13.5
Average ability students are more likely to enroll in agricultural education courses that integrate science	2.6(.8)	9.0	22.6	51.9	16.5
Total program enrollment in agricultural education has increased since I integrated science.	2.3(.78)	12.8	50.4	30.1	6.8
Integrating science into the agricultural education program more effectively meets the needs of special population students.	2.5(.80)	9.8	36.1	44.4	9.8
Low ability students are more likely to enroll in agricultural education courses that integrate science.	2.4(.88)	14.3	33.8	39.8	12.0

Note. *n* = 133. M= mean. SD= Std. Deviation. Scale: 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Agree (A), 4 = Strongly Agree (A).

Chapter 5

Conclusions, Implications, Recommendations, and Summary

Introduction

This chapter provides a summary of the study, research findings, and the conclusions drawn by the researcher about agricultural classes on outcomes of the Alabama High School Graduation Exam, barriers to science integration, perceptions of agricultural educators on preparing students for standardized tests, and integration of academic concepts.

Research Questions

1) Can outcomes on the AHSGE be predicted by the number of agriscience classes that a student completes?
2) Do agricultural education teachers in Alabama feel it is their responsibility to prepare their students for standardized high-stakes tests?
3) Do agricultural education teachers in Alabama feel they should incorporate core academic standards in their instruction?
4) Do agricultural education teachers in Alabama feel there are outside influences that affect how and if science integration takes place in their classrooms?
5) What are the perceptions of Alabama agricultural education teachers regarding student enrollment and the impact science integration plays on it?

Conclusions

Research Question One

In order to answer research question one, this study collected data from three school systems in Alabama. Data that was collected dealt with students who were enrolled in agricultural education classes in 2010. Test outcomes detailing pass or fail scores for each of the agriculture students were tabulated with the number of agricultural courses completed by each student. A binary logistic regression analysis was run to determine, with some degree of accuracy, if there was a relationship between the number of agricultural classes that a student took and subsequent outcomes on the Alabama High School Graduation Exam (AHSGE). Conclusions are noted for each portion of the AHSGE.

Results indicated that the model generated for the reading portion was statistically significant in predicting the pass/fail outcome on the AHSGE; however, probabilities indicated that students were more likely to pass the reading portion having taken more agricultural classes. One must interpret these results with caution. The result may be indicative of students having taken the exam multiple times, henceforth learning the exam itself, not necessarily more reading content in the subsequent agricultural classes. Students in the sample performed well compared to an overall average for all students in one of the school systems used in the study. The overall passing rate for the reading portion of the AHSGE was 52% in that particular system.

Results indicated that the model did statistically significantly predict the outcomes on the language portion of the exam. This result could be used to support findings in the current study being conducted by the National Research Center for Career and Technical Education (NRCCTE). If the results from the NRCCTE study and this study coincide, more validity could be given to the field of career and technical education as a vehicle for improving student performance as mandated by the No Child Left Behind Act of 2001. Students in the sample performed well compared to an overall average for all students in one of the school systems used in the study. The overall passing rate for the language portion of the AHSGE was 38% in that particular system.

Results from the regression analysis regarding the mathematics portion are comparable to a study done by the NRCCTE. The NRCCTE found that when agricultural classes were taught using math enhanced lessons, students preformed better on standardized tests. The students were taught using existing curriculum content. The results from this study support the conclusion by the NRCCTE that the mathematics content already in the curriculum is sufficient to achieve positive results. Also, Students in the sample performed well compared to an overall average for all students in one of the school systems used in the study. The overall passing rate for the mathematics portion of the AHSGE was 32% in that particular system.

Teachers whose students are represented in this study may be inadvertently teaching with math enhanced lessons as in the NRCCTE study, thereby increasing the chance their students will be successful on standardized tests such as the AHSGE.

The results from the social studies portion of the exam yielded that the model was not statistically significant in predicting outcomes on the exam. The result may be indicative of agricultural classes' curriculum not being laden with historical facts other that which relate to the field of agriculture itself. Students in the sample performed well compared to an overall average for all students in one of the school systems used in the study. The overall passing rate for the social studies portion of the AHSGE was 51% in that particular system.

Finally, the results form the biology portion yielded that the model was not a statistically significant predictor of outcomes. This result should be considered when the NRCCTE completes their study regarding science integration on career and technical classes. The result from this study could be attributed to the fact that biology is a new portion of the exam. It replaced the science portion in 2010. Test makers may be still in a refining stage on this portion of the exam, and teachers may be in a learning stage as to how best to teach standards for this portion of the exam. Students in the sample performed comparable to an overall average for all students in one of the school systems used in the study. The overall passing rate for the biology portion of the AHSGE was 72% in that particular system.

Research Question Two

In order to answer research question two, a series of five statements was developed. The teachers were asked to assign a numeric value as to how they felt about the statement using a Likert type scale. The scale indicated that 1=strongly disagree, 2=disagree, 3=agree, 4= strongly agree. Scores were summated. Frequency of response, mean, and standard deviation were calculated. Item six of the survey prompted teachers to indicate at what level they feel it is their responsibility to prepare students for standardized high-stakes tests. A majority of responding teachers (63.1 %) either agreed or strongly agreed that they felt it was their job to prepare students to pass the AHSGE (Table 6). The mean implies ($\bar{x}$=2.7) that only a small majority of teachers feel it is their job to prepare students for the AHSGE. Though the majority do agree test preparation is important, the minority must realize that *testing* is the paramount in current education agendas…per NCLB (2001). Without gains in standardized tests and relationships being identified between those gains and career and technical education classes, career and technical education is losing ground on the bureaucratic battle front.

Interestingly, 84.9% ($\bar{x}$=3.1) either agreed or strongly agreed students are better prepared for the AHSGE after completing their classes. A large majority (94.8%, $\bar{x}$=3.5) of teachers either agreed or strongly agreed that it is important that their students pass the AHSGE. Most (85.7%, $\bar{x}$=3.2) of the teachers either agreed or strongly agreed that agricultural classes have a place in preparing students for *high stakes* tests. After looking at these responses, the question must be posed, "If teachers feel it is important to pass the AHGE and they feel students are better prepared for passing by taking agricultural classes, why do many not feel it is their job to help prepare their students for passing the exam?" With increased scrutiny and waning budgets many teachers might soon realize improving test scores will help secure a place at the policy table for career and technical education. Finally, 81.9% ($\bar{x}$=3.1) of teachers surveyed feel that students who take agricultural classes are better prepared for passing the AHSGE than students who have not completed an agricultural class.

Research Question Three

In order to answer research question three, a series of five statements was developed. The teachers were asked to assign a numeric value as to how they felt about the statement using a Likert type scale. The scale indicated that 1=strongly disagree, 2=disagree, 3=agree, 4= strongly agree. Scores were summated. Frequency of response, mean, and standard deviation were calculated. For statement one of the survey, teachers were prompted to identify if they feel integration of biology was important in their instruction. The majority (83.4%) of the respondents reported that integration of biology concepts into the agricultural curriculum was important (Table 7). The mean implies ($\bar{x}$ = 3.1) that most teachers felt science was important in the agricultural curriculum, which is consistent with research done by Myers & Washburn (1998).

For statement two of the survey, teachers were prompted to identify if they feel integration of social studies was important in their instruction. Slightly more than half (53.4%) of teachers either agreed or strongly agreed that it is important to integrate social studies into their instruction. The mean implies ($\bar{x}$ = 2.6) that over half of the teachers felt social studies was important. A lower indicator of importance may be indicative of little social studies content in the course work of agricultural education classes.

Most teachers agreed or strongly agreed with the notion that integrating language arts is important (66.2%). The mean implies ($\bar{x}$ = 3.1) that most teachers felt language arts was important. This falls in line with one of the main topics of research for the National Research Agenda: Agricultural Education and Communications. Student literacy is a focus of research being conducted.

Finally, most teachers either agreed or strongly agreed that integration of mathematics (92.5%, $\bar{x}$ = 3.4) and reading comprehension (87.9%, $\bar{x}$ = 3.2) were important in the agricultural education curriculum.

Research Question Four

In order to determine what outside influences, if any, affect how and if science integration takes place in their classrooms, a series of five statements was developed. The teachers were asked to assign a numeric value as to how they felt about the statement using a Likert type scale. The scale indicated that 1=strongly disagree, 2=disagree, 3=agree, 4= strongly agree. Scores were summated. Frequency of response, mean, and standard deviation were calculated. Item eleven of the survey prompted teachers to indicate lack of appropriate equipment was a barrier to science integration (Table 8). Two-thirds (74.5%, $\bar{x}$=3.0) of the teachers felt lack of appropriate equipment was a barrier to science integration. A majority of teachers felt insufficient funding (90.2%, $\bar{x}$=3.2) and lack of appropriate workshops (65.4%, $\bar{x}$ =2.8) served as barriers. These findings are consistent with a study conducted by Balschweid, Cole, & Thompson (1998) that noted, "Teachers indicated the greatest barriers to implementing agriculture into existing lessons were the time necessary for curricula changes and access to necessary supplies/materials/information" (p. 8).

Conversely, the minority of teachers felt that the lack of having a cooperating science teacher (38.4%, $\bar{x}$=2.3) and a lack science competence among agriculture teachers (39.1%, $\bar{x}$ =2.3) were barriers to science integration. This is consistent with findings of Myers & Washburn (1998) where they reported only 33.5% of agricultural instructors felt they had insufficient background in science content to integrate it into their curriculum.

This could be attributed to the fact that many agricultural educators feel they are knowledgeable enough about science concepts such that no science curriculum specialist would be needed.

Research Question Five

In order for the perceptions of Alabama agricultural education teachers regarding student enrollment and the impact science integration plays on it to be addressed, a series of five statements was developed. The teachers were asked to assign a numeric value as to how they felt about the statement using a Likert type scale. The scale indicated that 1=strongly disagree, 2=disagree, 3=agree, 4= strongly agree. Scores were summated. Frequency of response, mean, and standard deviation were calculated (Table 9). A majority (68.4%) of the teachers felt that average ability students are more likely to enroll in agricultural education courses that integrate science. This is consistent with Myers & Washburn (1998) when they report that 61.8% of their surveyed population believed enrollment of average ability students would go up with science integration. Furthermore, slightly more than half of teachers felt that both low ability students (51.8%) and advanced students (57.1%) were more likely to enroll in agricultural courses that integrated science. These results both coincide with and confound Myers & Washburn's (1998) results. They indicated that only 30.4% of teachers felt low achieving student enrollment would increase, whereas 73.5% of teachers believed high achieving student enrollment would increase with science integration. More than half (54.2%) of the teachers felt integrating science into the agricultural education program more effectively meets the needs of special population students. Myers and Washburn report only 42.9% of teachers in their study believed science integration would benefit special needs populations. Finally, the majority (63.2%) of teachers either strongly disagreed or disagreed that enrollment had gone up since they had integrated science. This may be due to the fact that many teachers believe that agriculture is already latent with science; therefore, they do not believe enrollment would be increased if more science content was added.

Implications

With such weight being put on accountability of instruction and accountability being operationalized in the form of student performance on standardized tests, career and technical education must develop ways to enhance student scores while not losing sight of its raison d'etre. This study was done to explore the current conditions of agricultural education in preparing students for standardized high stakes tests. Also, this study sought to determine the barriers that agricultural teachers feel are present in preventing models of academic integration. Research cited in this study provides evidence that such integration models could help enhance scores on standardized tests; however, one must realize that a multitude of variables must be in place for such models to succeed. The most important of those variables is an agricultural instructor willing to break the mold of the old vocational agricultural class and learn how to enhance the curriculum and bring out concepts that are on standardized tests. Career and Technical education as a whole should grasp empirical research studies that suggest career and technical education has a place in preparing students for standardized tests. Edwards, Leising, & Parr (2002) stated, “Student achievement, using standardized tests, is “the coin of the realm” in education today” (p. 5).

Recommendations

Upon completion of this study several themes arose that might serve as background for further studies related to the topics in this project. Recommendations are broken down into two sections.

Recommendations regarding test outcomes

1) This study should be replicated using standardized tests in other states. If this were accomplished, generalizations as described in this study would not be so narrow in scope.
2) Limitations as described in this study should be addressed. Data detailing student variables such as other academic classes and remediation classes should be collected. Analysis such as an ANCOVA should be used. This could lead to more statistical power by accounting for variance of the other predictors (academic classes, diploma track, remediation classes).
3) Comparable data on standardized tests should be collected for students not enrolled in agriculture classes while collecting data on agricultural students, then the group mean scores can be compared.

Recommendations regarding curriculum integration and teacher perspectives

1) Efforts should be made to provide training for agricultural educators on how to better incorporate or bring out content that is already in the agricultural curriculum.
2) Administrators should allow for collaboration periods between core teachers and agriculture teachers so that common academic themes might be identified. Strategies could then be developed to reinforce those standards using agriculture as the context for teaching.

3) Professional development should be provided to administrators, state educational staff, core academic teachers and agricultural teachers regarding the benefit of curriculum integration.
4) Research should be done to assess agriculture teacher attitudes regarding preparing students for high stakes tests. Demographics such as age, years of teaching experience, and education level should be collected so that new inferences can be made about the makeup of teachers in the agricultural education profession.

Summary

This study's literature review detailed the evolution of career and technical education starting from its roots, the parent to child apprenticeship, and concluded with the complex minefield of federal and state legislation that defines career and technical education today. Also detailed were studies that provided empirical evidence of the value of career and technical education as a vehicle for better preparing students for standardized tests. Through all the struggles of funding, war, and amendments to legislation, career and technical education has remained viable. The need for career and technical education is poised to increase for the next decade as industries increasingly need technicians. According to a report by the National Association of Manufacturing (2005), technicians (persons with a skill or trade) will be in highest demand.

The purpose of this study was two fold. First, the connection between academics and career and technical classes was examined. More specifically, the study sought to determine if there is a relationship between the number of agriscience classes a student takes and the subsequent outcomes on the Alabama High School Graduation Exam. Second, what were the perceptions of Alabama agricultural educators regarding 1) student testing taking preparation 2) academic standard integration 3) barriers to science integration and 4) science integration's impact on enrollment in agricultural classes.

Several interesting findings were noted for the researcher with regards to the results of this study. First, the field of agricultural education is latent in the study of both plant and animal biology. Many agricultural class curriculums are largely composed of the study of plant and animal anatomy and environmental science. One would think that students who are enrolled in a curriculum so saturated in biology principles would fare well on a biology test such as the biology section of the AHSGE, however; the results indicated that there was no statistically significant relationship between passing the biology portion of the AHSGE and agriculture classes. This was admittedly a perplexing finding. To address this, a list of explanations are noted. Any of these or combination thereof could have led to these findings. 1) The biology portion of the AHSGE is not a reliable gauge of academic achievement in biology 2) Agriculture teachers students in the sample population are not being taught with rigorous biology standards 3) Biology standards taught in agricultural classes are not aligned with content tested by the biology portion of the AHSGE.

Secondly, the researcher was confounded that more agriculture teachers do not consider preparing students for standardized tests as part of their job. Several explanations are offered. 1) Respondents might feel that their only job is to teach the curriculum set forth by the state of Alabama. No agricultural class has within its standards any statute that dictates that agricultural teachers should teach to a test. 2) There may be a generation gap among agriculture teachers in the sample population which would inherently render different perspectives. Many older agricultural teachers (those with 30 + years of teaching) could have different opinions about students passing the AHSGE. This could be due to the fact that the AHSGE started in 1983.

Many older educators never experienced having to pass a high stakes test in order to graduate from high school; whereas agriculture teachers with fewer years of experience did. These younger teachers could have a better understanding of the necessity for passing the AHSGE since they had to accomplish that goal before continuing their education. This could lead to another topic of research study.

According to Joseph B. Morton, State Superintendent of Education, the State Department of Education voted unanimously on a resolution to approve the proposed Alabama Student Assessment Protocol. The proposal included phasing out the Alabama High School Exam, replacing it with end-of-course tests. The memorandum notes that,

> Since then [September 10, 2009], events have occurred on both the state level and the national level that necessitate a change to the expected implementation dates for these changes, not the least of which are the current financial situation and the uncertainty about the timing of the reauthorization of the Elementary and Secondary Education Act of 1965 (currently known as No Child Left Behind), which impacts our state's accountability system. (J. Morton, personal communication, , January 21, 2011)

The expectation is that ninth graders of 2011-2012 will be the last cohort to be required to pass the AHSGE in order to receive a diploma. According to an article in the Birmingham News (2009, September 11), the ACT will also be part of the new state testing package. The article noted,

> The state also will require all 11th-graders to take the ACT college entrance exam, along with a writing assessment. The state will pay the $75 fee for students to take the ACT once. If students are not satisfied with their scores, it will be their responsibility to pay to take it again. (The Birmingham News, 2009, para. 9)

The state of Alabama is apparently only changing the measure of achievement by using yet another standardized testing instrument, the ACT. St. Ambrose (387 A.D.) said, “When in Rome, do as the Romans do” (Christiansen, 2000, p. 1). It appears Rome believes the only way to measure achievement is through test scores. Regardless wether we agree or disagree with standardized testing as the form of determining student achievement in the United States, it is at the forefront of education today. Until other methods are developed that show clear and definitive ways to assess achievement it will continue to be the “coin of the realm” (Edwards, Leising, & Parr 2002, p. 5).

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Appendices

Appendix A

IRB Letter of Approval AHSGE

AUBURN

UNIVERSITY

Office of Research Compliance
307 Samford Hall
Auburn University, AL 36849

Telephone: 334-844-5966
Fax: 334-844-4391
hsubjec@auburn.edu

January 14, 2011

MEMORANDUM TO: Mr. Joshua Nolin
Department of Curriculum and Teaching

PROTOCOL TITLE: "Logistic Correlation Study Regarding Agriscience GPA and Alabama High School Graduation Exam Outcomes"

IRB FILE NO.: 10-361 EX 1101

APPROVAL DATE: January 4, 2011
EXPIRATION DATE: January 3, 2012

The referenced protocol was approved "Exempt" by the IRB under 45 CFR 46.101 (b) (4):

> Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

You should retain this letter in your files, along with a copy of the revised protocol and other pertinent information concerning your study. If you anticipate a change in any of the procedures authorized in this protocol, you must request and receive IRB approval prior to implementation of any revision. Please reference the above IRB file number in any correspondence regarding this project.

If you will be unable to file a Final Report on your project before January 3, 2012, you must submit a request for an extension of approval to the IRB no later than December 5, 2011. If your IRB authorization expires and/or you have not received written notice that a request for an extension has been approved prior to January 3, 2012 you must suspend the project immediately and contact the Office of Research Compliance.

A Final Report will be required to close your IRB project file.

If you have any questions concerning this Board action, please contact the Office of Research Compliance.

Sincerely,

Kathy Jo Ellison

Kathy Jo Ellison, RN, DSN, CIP
Chair of the Institutional Review Board
for the Use of Human Subjects in Research

cc: Dr. Sherida Downer
Dr. Brian Parr

Appendix B

IRB Letter of Approval Teacher Survey

AUBURN
UNIVERSITY

Office of Research Compliance
307 Samford Hall
Auburn University, AL 36849

Telephone: 334-844-5966
Fax: 334-844-4391
hsubjec@auburn.edu

June 17, 2011

MEMORANDUM TO: Mr. Joshua Nolin
Department of Curriculum and Teaching

PROTOCOL TITLE: "Agriscience Teachers Perceptions of Preparing Students for Standardized Tests"

IRB FILE NO.: 11-179 EX 1106

APPROVAL DATE: June 10, 2011
EXPIRATION DATE: June 9, 2012

The referenced protocol was approved "Exempt" by the IRB under federal regulation 45 CFR 46.101 (b) (2):

> "Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
> (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
> (ii) any disclosure of the human subjects' response outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation."

You should retain this letter in your files, along with a copy of the revised protocol and other pertinent information concerning your study. If you anticipate a change in any of the procedures authorized in this protocol, you must request and receive IRB approval prior to implementation of any revision. Please reference the above IRB file number in any correspondence regarding this project.

If you will be unable to file a Final Report on your project before June 9, 2012, you must submit a request for an extension of approval to the IRB in mid-May 2012. If your IRB authorization expires and/or you have not received written notice that a request for an extension has been approved prior to June 9, 2012you must suspend the project immediately and contact the Office of Research Compliance.

A Final Report will be required to close your IRB project file. Please keep a copy of the approved information letter to send in with the report.

If you have any questions concerning this Board action, please contact the Office of Research Compliance.

Sincerely,

Kathy Jo Ellison

Kathy Jo Ellison, RN, DSN, CIP
Chair of the Institutional Review Board
for the Use of Human Subjects in Research

cc: Dr. Nancy Barry
Dr. Brian Parr

Appendix C

Consent Letter

AUBURN UNIVERSITY

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS AN IRB APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)

INFORMATION LETTER
for a Research Study entitled
Agriscience Teachers Perceptions of Preparing Students for Standardized Test

You are invited to participate in a research study to determine Agriscience teacher's perceptions on preparing students for standardized test. Also, to collect perceptions regarding academic integration in the Agriscience Curriculum in Alabama. This information will be used in a dissertation and journal article. The study is being conducted by Joshua Brock Nolin, under the direction of Dr. Brian Parr, Career and Technical Professor in the Auburn University Department of Curriculum and Teaching. You were selected as a possible participant because you are an Agriscience Teacher attending 2011 Career and Technical Summer Conference and are age 19 or older.

What will be involved if you participate? If you decide to participate in this research study, you will be asked to complete a survey. Your total time commitment will be approximately 5 minutes.

Are there any risks or discomforts? There are no risks associated with participating in this study.

Are there any benefits to yourself or others? The Agriscience community in Alabama can benefit from this research in that attitudes will be known as to how teachers feel their students should be prepared for standardized test. Also, barriers will be identified as to how academic integration may take place in the Agriscience classroom.

There will be no compensation for participating. To thank you for your time.

There are no costs for participating in this survey.

If you change your mind about participating, you can withdraw at any time during the study. You participation is complete volunteer. If you chose not to participate, please do not fill out the survey when it is distributed. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Curriculum and Teaching.

Any data obtained in connection with this study will remain anonymous. We will protect your privacy and the data you provide by not collecting any identifiable information. All information collected will be kept locked in a filing cabinet. Information collected through your participation may be used to fulfill an educational requirement, published in a professional journal, and/or presented at a professional meeting.

If you have questions about this study, *please ask them now or* contact Joshua Brock Nolin at 334-558-6339 or Dr. Brian Parr at 423-470-3899.

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

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO. THIS LETTER IS YOURS TO KEEP.

[signature] 6/16/11

Investigator's signature Date

Joshua Brock Nolin

Print Name

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Co-Investigator Date

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Printed Name

The Auburn University Institutional Review Board has approved this document for use from 6/10/11 to 6/9/12

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Rev.6/07

Appendix D

Teacher Survey

Agriscience Teacher Survey: Alabama High School Graduation Exam

Please indicate your feelings on the following questions or statement by circling the answer that most closely matches your feelings on the topic.
---Definition: AHSGE= Alabama High School Graduation Exam.

1=strongly disagree, 2= disagree, 3= agree, 4= strongly agree

1	I feel it is important to integrate biology into my instruction.	1 2 3 4
2	I feel it is important to integrate social studies into my instruction.	1 2 3 4
3	I feel it is important to integrate language arts into my instruction.	1 2 3 4
4	I feel it is important to integrate mathematics into my instruction.	1 2 3 4
5	I feel it is important to integrate reading comprehension activities into my instruction.	1 2 3 4
6	I feel it is my job to prepare students for the AHSGE.	1 2 3 4
7	I feel students are better prepared for the AHSGE after completing my class.	1 2 3 4
8	I feel it is important that my students pass the AHSGE.	1 2 3 4
9	I feel that Agriscience has a place in preparing students for high stakes test.	1 2 3 4
10	I feel that students in Agriscience are better prepared for passing the AHSGE than students who have not completed an Agriscience class.	1 2 3 4
11	Lack of appropriate equipment is a barrier to integrating science into my agricultural education program.	1 2 3 4
12	Lack of adequate federal, state, or local funds is a barrier to integrating science into agricultural education programs.	1 2 3 4
13	Lack of agriscience workshops for agricultural education teachers is a barrier to integrating science in my class.	1 2 3 4
14	Lack of science competence among teachers in agricultural education is a barrier to integrating science.	1 2 3 4
15	Lack of a science teacher who is willing to help me integrate science concepts has been a barrier to integrating science	1 2 3 4
16	High ability students are more likely to enroll in agricultural education courses that integrate science.	1 2 3 4
17	Average ability students are more likely to enroll in agricultural education courses that integrate science	1 2 3 4
18	Total program enrollment in agricultural education has increased since I integrated science.	1 2 3 4
19	Integrating science into the agricultural education program more effectively meets the needs of special population students.	1 2 3 4
20	Low ability students are more likely to enroll in agricultural education courses that integrate science	1 2 3 4