THE RIPPLE EFFECT:

THE ECONOMIC IMPACT OF ARIZONA SUPERVISED AGRICULTURAL EXPERIENCES

by

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ABSTRACT

The purpose of this study was to describe the economic impact of entrepreneurial and placement Supervised Agricultural Experiences on the Arizona economy. The study's research design was quantitative and descriptive. High school agricultural education students who kept records in the Agricultural Experience Tracker (AET) during 2012-2013 became the study's population. The unit of measurement was defined as the state of Arizona. Analysis of the 1,721 qualifying project records took the form of descriptive statistical calculations and economic modeling in IMPLAN, an economic input-output examination tool. Modeling in IMPLAN for entrepreneurial and placement SAEs involved manipulating the data set, aligning assigned AET codes to North American Industry Classification System (NAICS) codes, and aggregating the resulting sectors into IMPLAN sectors. Three scenarios of placement income, entrepreneurial spending, and entrepreneurial profit were used to shock the defined regional economy of Arizona. In the end, the total study output effect from these three scenarios was summed and Type II multipliers were extracted to describe the ripple effect of student investments on the Arizona economy.

The study provided documentation to support the experiential learning mission of agricultural education. The real-world learning opportunities that occur through SAE participation are applications of Dewey's experiential learning theory. Input-output modeling in IMPLAN analyzed the monetary changes and tracked the flow of spending on products and services fueled by student spending and income. As a result of the $1,442,870 of entrepreneurial gross income, $721,566 of entrepreneurial project spending, and $353,108 in placement wages, an estimated total economic output effect for the study equaled $22,249,135. It is important to

note that the majority of the study's impact came from the employment effect of a placement income impact run and the assumptions made about student-worker productivity.

The placement project Type II employment multiplier was 1.53 and revealed that for every eight placement projects, an additional job was created annually in Arizona. Entrepreneurial project spending revealed a 1.79 Type II output multiplier that meant for every new dollar spent by students, $0.79 of additional monetary impact was created. The findings are consistent with related economic impact research and demonstrate that SAEs do have an economic impact on a region's economy.

Implications suggest a need for increased support of SAEs and other work-based learning programs within Career and Technical Education (CTE). A number of practices, including stronger emphasis on building economic acumen of teachers and greater accuracy of recordkeeping through matching AET codes with NAICS industry sectors, could be instituted. Recommendations for further research included examination of student-worker productivity and discovery of additional CTE areas that could benefit from economic input-output modeling through IMPLAN analysis. Following study recommendations could result in increased student participation in work-based learning and additional economic impact for a regional economy. Students with these opportunities are more likely to possess 21st century workforce skills, ready to meet the food and fiber demands of a growing global economy.

CHAPTER 1: INTRODUCTION

Background of Supervised Agricultural Experiences

Supervised Agricultural Experiences (SAEs), in one form or another, have been part of balanced secondary agricultural education programs since the beginning of vocational education in America. SAEs are essential experiential learning tools and practical applications of agricultural education classroom curriculum.

> [SAE is…] the actual, planned application of concepts and principles learned in agricultural education. Students are supervised by agriculture teachers in cooperation with parents, employers and other adults who assist in the development and achievement of their educational goals. The purpose is to help students develop skills and abilities leading toward a career. (Barrick et al., 1992, p. 1)

Since inception, agriculture education was linked to the economic success of the local community. Vocational training, embodied in today's Career and Technical Education (CTE) programs, is vital to the future of America's food and fiber industry. Americans working in agriculture and the agriculture-related sectors, despite the latest economic challenges experienced since 2008, represented one in 12 jobs in the United States in 2012. Direct on-farm work employed less than one percent of the U.S. workforce (Bureau of Labor, 2013); however, a number of other sectors are accounted for within the food and fiber industry. People directly engaged in farming activities produced $114 billion of net farm income in 2012, up $85 billion from 2008 (Vilsack, 2013). U.S. employment from agriculture and agriculture-related jobs is defined as jobs in the agriculture sector and ten manufacturing sectors related to agriculture. Agriculture jobs include crop and livestock production, veterinary services, landscape and horticultural services, and agricultural services. The ten manufacturing sectors related to agriculture include lumber and wood products, farm machinery and equipment, food and kindred projects, and forestry and fishing (Zahniser, 2002).

Nonetheless, there is a shortage of skilled workers in the United States to fill positions within manufacturing, technology, the green industry, and health occupations -- all industries considered agriculture-related and all courses taught by CTE teachers. Agriculture, food, and renewable natural resources sectors of the United States economy are projected to produce about 54,000 related jobs between 2010-2015, creating a 5% deficit in needed college graduates (USDA, 2010). There is also a national demand for agriculture teachers with more than 50% of states reporting a shortage (NAAE, 2014).

The Arizona Department of Education has adopted a modified CTE model from the National 16 Career Clusters Model. Agricultural education is one of 36 approved CTE programs in Arizona (Arizona Department of Education, 2013). The first component of agricultural education consists of classroom education in agriculture topics such as animal and plant science, agrimarketing, technology management, and horticulture. The second component is voluntary student participation in the National FFA Organization, a Career and Technical Student Organization (CTSO). FFA members have an opportunity to expand their leadership and interpersonal communication skills, earn awards, and strengthen their career skills. The final component is the SAE, an experiential learning experience where students participate in the world of work by starting a business or working in an established company with the goal of earning a profit (The AET, 2013).

SAEs are comprised are three main components – planned activities outside the scope of the classroom and normal school day hours; documented projects where time and money resources are invested and aligned with approved curriculum; and experiences supervised and assessed by the teacher (The AET, 2013). Agricultural education receives Carl D. Perkins funding in Arizona, meeting the requirements through its approved course sequencing. According to the Arizona Department of Education, the mission of Arizona CTE "is to ensure a dynamic workforce by fully developing every student's career and academic potential; the Mission is to prepare Arizona students for workforce success and continuous learning" (Arizona Department of Education, 2013, section 1). Collegiate teacher-preparation programs must rise to the challenge and offer relevant business and economic training to future educational professionals. These teachers are then in the position to equip students with science, math, technology, and leadership skills learned through a balanced program and needed to enter college and the workforce (NAAE, 2014).

Before gaining statehood, the territory of Arizona exhibited early interest in education and its school districts received an organizational boost with the passage of the Morrill Act of 1862. The 1917 Smith-Hughes Act further stimulated secondary education after Arizona's statehood in 1912. Vocational agriculture and homemaking, the first types of Arizona vocational education, directly benefitted from the federal aid. Many high schools housed commercial workshops that increased students' interest in the value of vocational training (University of Arizona, 1936). The Smith-Hughes Act supported education so that teenage boys would be "fit for useful employment", particularly in farming (1917, Section 10 of the Act; as cited in Stimson, 1919, p. 19). Stimson, a pioneer in agricultural education and developer of the *project-method* of teaching (Moore, 1988), believed that book learning in combination with training courses created a program on equal footing with other branches of education. Moreover, vocational training was meant to teach students to turn a profit in the agriculture industry for the advancement of the individual and the betterment of the community as it "relies heavily on the activities and actualities of the economic world" (Stimson, 1919, p. 16).

Modern day SAEs first appeared as farming experiences and were required by federal law until 1967. Inclusion of supervised farm practice in federal legislation, drafted by Charles Prosser in the Smith-Hughes Act of 1917, was credited to Rufus Stimson's creation of the agricultural project method of teaching (Moore, 1988). Supervised Occupational Experience Programs (SOEPs) emerged in the 1970s out of supervised farming experiences and evolved into SAEs in the 1990s to reflect widening opportunities under the agricultural career banner (Gordon, 2008).

Practical skill and career development is a key part of experiential learning, championed by John Dewey in the 1930s, and a clear part of the National FFA Organization (FFA) motto of "Learning to Do, Doing to Learn, Earning to Live, Living to Serve" (National FFA, 2013, p. 21). Dewey (1963) postulated that meaningful education connected to equally meaningful and cumulative experiences would create educational maturity in the future. SAEs allow for practical application of classroom learning and, driven by student interest, produce numerous relevant experiences throughout the project. Students are required to keep detailed project goals, accurate financial and business records, and are accountable for outcomes. Thus, SAEs align with Dewey's vision of experiential education. Classroom learning and the career-focused experiences of SAEs provide guidance for future success (Dewey, 1990).

The practical nature of experiential learning, inherent in SAEs, can provide students with career and life skills, income, FFA awards, and community recognition. Student income and spending from entrepreneurial projects and income from placement SAEs can directly support the local economy. Input-output models are mathematical calculations of the interrelationships between all parts of an economy of interest (Coughlin & Mandelbaum, 1991). Changes in spending fueled by students' SAE projects revealed a ripple effect through the defined study area of Arizona. The ripple effect of these economic changes was estimated through IMPLAN, an economic impact modeling software. IMPLAN is a snapshot in time and useful to SAE stakeholders because it is a picture of the economic relationships between industries (Day, n.d.). Stakeholders can use this study to demonstrate the potential monetary contributions from SAE projects to the state economy.

Although SAEs remain an integral part of agricultural education's three-component program of classroom instruction, FFA participation, and SAE programs, SAE participation numbers have declined (Wilson & Moore, 2007). When a teacher lacks resources or adequate pre-service training on SAE best practices, the SAE may be the agricultural education component that suffers most. Barriers exist to SAE implementations that, according to Wilson and Moore (2007), include the lack of time, too many students, and the complication of recordkeeping. Single teacher programs (80.2%) were the norm in Arizona in 2012 (Arizona Department of Education, 2013). A similar statistic was also supported by a national study that reported 80% of agricultural education programs were managed by one teacher (TeamAgEd, 2007). These teachers must juggle all three agricultural education components.

Traditional pen and paper record keeping, a noted barrier to SAE implementation (Wilson & Moore, 2007), was simplified by recordkeeping software, the Agricultural Experience Tracker (The AET, 2013). Freely accessible to all Arizona agricultural education programs since 2009, the AET was used by over 90 percent of Arizona students participating in a SAE during 2011-2012. The chapter fee for AET use is paid for by the Arizona Association FFA (Arizona Association FFA, 2012). By contrast, Arizona agricultural education teachers use AET electronic records in varying degrees. However, comprehensive understanding and complete, accurate SAE record keeping remain a challenge (Wilson & Moore, 2007).

Students enrolled in agriculture courses choose from eight SAE categories -- Entrepreneurship, Placement, Research and Experimentation, Exploratory, Improvement, Agricultural Service Learning, Supplemental, and Directed School Laboratory. The School-to-Work Opportunities Act of 1994 supported these eight SAE categories (Camp, Clarke & Fallon, 2000). Entrepreneurial SAE, where students own and operate an agribusiness with the goal of making a profit, and placement SAE, an opportunity for students to work for an agribusiness, both involve exchanges of money or unpaid hourly equivalents. As a result, entrepreneurial and placement SAEs are the best types of projects to examine economic impact.

Although past research showed SAE programs remain vital to agriculture education, Camp et al. (2000) concluded that more needed to be done to ensure the survival of the SAE. Providing documented SAE economic impact for the state of Arizona was important.
Because of the lack of SAE economic impact research in Arizona, the researcher sought to discover the economic impact of Arizona SAE projects for the school year 2012-2013, keeping both the experiential learning foundation and appropriate input-output economic models in mind. For purposes of this study, entrepreneurship and placement SAEs will be the focus as they involve exchanges of goods and services resulting in financial data.

Statement of the problem

What is the economic impact of Supervised Agricultural Experiences on the Arizona economy?

Purpose Statement

The purpose of this study was to describe the economic impact of entrepreneurial and placement Supervised Agricultural Experiences on the Arizona economy.

Objectives

1. Describe the characteristics of Arizona agricultural education programs in which students have kept SAE records in AET in terms of:
    a. Student demographic characteristics – sex, grade level, and ethnicity.
    b. School location - rural, suburban, or urban.
    c. Total enrollment in agricultural education programs and total student participation numbers for entrepreneurial and placement SAEs.
2. Describe the average spending on inputs for each agricultural industry related to entrepreneurial and placement supervised agricultural experience projects.
3. Describe the average income from entrepreneurial SAE sales and placement SAE paid and unpaid hourly pay equivalents for each agricultural industry.
4. Describe the economic impact of entrepreneurial and placement SAEs on the Arizona economy in terms of direct effects, indirect effects, induced effects, and total effects.

Terms

To add greater clarity and to better understand the significance of SAE economic impact on Arizona communities, the following terms were defined.

Supervised Agricultural Experience: SAE is a *learning by doing* tool and one of three core areas of a balanced high school agriculture program consisting of classroom instruction, FFA and the SAE. Students, guided by their agriculture teachers, develop a SAE project based on one or more SAE categories. According to the 2013 Official FFA Manual, the eight categories of the

SAE program include Entrepreneurship, Placement, Research and Experimentation, Exploratory, Improvement, Agricultural Service Learning, Supplemental, and Directed School Laboratory (National FFA, 2013).

Entrepreneurship SAE: A student owns and operates a farming or agricultural business assuming financial responsibility for all investment and expenditures. The student owns the capital investments and goods bought. They also pay for daily operational requirements, keeping or reinvesting any income earned. A student keeps accurate financial and business records in AET to determine return on investment. Examples include: buy, raise, and sell a calf for market; raise a goat and sell its milk; grow an acre of cotton; provide horse training services; and own and operate a lawn care business (National FFA, 2013).

Placement SAE: Students are placed in a local agricultural business, gaining "learning by doing" experience while receiving wages or unpaid hours credit outside the classroom (National FFA, 2013). Students keep accurate income and expense records in AET to determine hourly income and non-paid hourly equivalent totals for their projects. Examples include working at a feed store or kennel, interning with an agribusiness sales representative for a farm equipment company, working in a florist shop, or teaching horseback riding lessons.

Agricultural Experience Tracker (AET): The AET is the "premiere personalized online system for tracking experiences in agricultural education. The AET summarizes experiences into standard FFA award applications. The AET can also aggregate those experiences across programs to produce local reports for school administrators and overall economic impact reports for interested stakeholders and legislative representatives" (The AET, online). During the 2012-2013 school year, the AET was used in 42 states, by 3,174 chapters and 158,673 students nationwide (The AET, 2013).

IMPLAN: Common economic modeling software developed by the Minnesota IMPLAN Group, Inc. in 1993 and currently owned by IMPLAN Group LLC, Inc. The software's name is derived from its purpose as an Impact Analysis for Planning tool, providing robust and finely tuned economic modeling systems used to create Social Accounting Matrices (SAMs) and Multiplier Models for economies from statewide to detailed zip code levels. SAMs are an extension of input-output models and thus appropriate for this study (IMPLAN Group, 2013).

Economic Impact Analysis: The study of macroeconomic effects of "the shocks to the system" by a change in commerce, employment, or income. Mathematical models are used to recreate these 'shocks' to an economy being studied to "show linkages among various industries" (WebFinance, Inc., 2013).

Input-Output Model: Emerging from research by Wassily Leontief in the 1930s, standard variables of resource inputs and wastes generated appear in a standardized table for a given period and are manipulated by mathematical equations to produce a picture of hundreds of economic sectors and their interacting transactions (Duchin & Steenage, 2007).

Multiplier: Economic multipliers are generated from input-output models (CBRE Consulting, Inc., 2008). "The ratio of the total economic effect on a regional economy to the initial change is called a regional multiplier" (Coughlin & Mandelbaum, 1991, p. 20). Regional multipliers are calculated to estimate the ripple effect of each new dollar of agricultural industry spending. This new money is a direct result of a SAE project investment and increases the spending or income capacity of Arizona community members.

Larger multiplier effects are created in a more closed, self-supporting economy where most of the needs of the community are met by that community's industries which keep many of the sales, earning and jobs generated by the region. On the other hand, smaller multiplier effects occur when a community, perhaps small in size, has a more open economy containing limited industries that quickly lose spending ripple effects and "leak" sales to economies outside their region (CBRE Consulting, Inc., 2008).

Leakage: When the effects of indirect spending ripple out of a local or regional Arizona economy, leakage occurs. Some economic impact originally resulting from the SAE project spending is lost to out-of-region, out-of-state, or out-of-country end manufacturers or suppliers (Beattie, 2004).

Direct Effect: Original spending within an industry creates direct effects (CBRE Consulting, Inc., 2008) that are also known as direct input or direct spending. Direct effects, for the purposes of this study, will be monies invested by students to conduct an entrepreneurial SAE or monies spent by students as a result of income received from entrepreneurial sales or monies received from placement wages.

Indirect Effect: Secondary or ripple effect spending resulting from direct spending (CBRE Consulting, Inc., 2008); also known as backward-linked ripples or impacts (Beattie, 2004). Indirect effects, for the purposes of this study, will refer to the secondary effect that occurred when local agribusiness sales increased as a result of direct SAE project spending. Agribusiness agents were then able to buy more from their suppliers who, in turn, bought more from their suppliers, and so on up the supply chain (Beattie, 2004).

Induced Effect: Also known as consumption effect, employees of local industries and all industries up the supply chain are both producers and consumers. When an employee's company was affected by spending in the region, they correspondingly had more or less income to spend (Beattie, 2004). Multipliers that take both indirect and induced effects into account are known as Type II multipliers (Beattie, 2004) and were the type used in this study.

Limitations of the Study

There existed a limited amount of resources to conduct this scholarly research. Limited time reduced the ability of this study to perform a trend study to analyze the economic impact of Arizona SAEs over several years. Since the adaption of the AET in 2009 by the Arizona Department of Education, Arizona agricultural education programs have integrated AET software in the classroom to varying degrees. Some programs adapted the software quickly and a few programs lagged behind. As a result, the effectiveness of a trend study from 2009 to present was not deemed useful.

Another limitation existed because data entry by students was not always accurate or complete. Even though the AET is provided free to 100 percent of Arizona agricultural education programs that maintain current FFA chapter membership, not all FFA chapters choose to require electronic recordkeeping. Therefore, AET data records analyses and resulting IMPLAN findings cannot be extrapolated to 100 percent of Arizona agricultural education programs. The study's data were gathered from July 1, 2012 to June 30, 2013 and were a snapshot of economic impact that resulted from project financials entered during this timeframe. An unknown percentage of projects started prior to and extended beyond the 365-day window examined in this study. Thus, the findings cannot be projected to past or future years.

Using IMPLAN as the economic impact analysis software tool provided a sound economic impact picture. However, IMPLAN results are projections of economic impact and inherently lack 100 percent reliability considering estimates, multipliers and leakage effects. Given better teacher training and program support, entered AET student data may become increasingly complete over time and result in a more accurate picture of the economic impact of SAEs in Arizona.

Delimitations of the Study

Delimitations by the researcher were purposeful and created focus on a single unit of measurement, the statewide impact of Arizona SAEs. Analyzing data on a micro-level was unnecessary and not realistic given aforementioned limitations. Besides the decision to protect individual student contribution, naming individual FFA chapter contributions was not deemed beneficial for goodwill among Arizona agricultural education programs. Therefore, the demarcation of the study by election of a macro unit of measurement aided the effectiveness of data analysis and was a practical decision for the researcher who operated within the limits of the research and within the process of IMPLAN model construction.

Basic Assumptions

- Schools provided teachers and students with adequate teaching and learning environments.
- Agriculture teachers taught students how to accurately use AET recordkeeping software.
- Data entered by students were accurate and truthful.
- Data provided by students for each SAE project were as complete as possible.
- Programs without current AET accounts or without any student data were not represented in this study.

Significance of the Problem

Implications

The study is aligned with the Association of American Agricultural Education (AAAE) National Research Agenda #4 - *Efficient & Effective Agricultural Education Programs*. There is a need to "provide evidence of program effectiveness [and] determine the means to effectively and efficiently document the outcomes and impact of agricultural education programs on individual, community, industry, and societal levels" (AAAE, 2012, section 4, p. 2).

Recordkeeping by students who used the AET enabled electronic documentation of SAE projects. The analyses of that data with IMPLAN provided a tool for the researcher to study the impact of one aspect of Arizona agricultural education programs.

To date, no SAE economic impact study has been conducted in Arizona. This study was influenced by agricultural education, agribusiness, and CTE studies that implemented IMPLAN as an economic analysis tool. Research that provided direction for this study included agricultural education impact studies performed in Texas (Hanagriff, Murphy, Roberts, Briers, & Lindner, 2010; Hanagriff, 2010), an economic impact study of CTE programs in Tennessee (Harrison, Earnest, Grehan, & Wallace, 2006), and an economic impact study of SAEs in Iowa (Retallick & Martin, 2005).

Similar studies in other states examined the economic impact of SAEs and related CTE programs through economic analysis tools such as IMPLAN and return on investment (ROI) analysis. The economic impact of SAEs in Texas was analyzed through IMPLAN to provide estimates of additional economic benefits from direct SAE spending (Hanagriff, 2010; Hanagriff, Murphy, Roberts, Briers, & Lindner, 2010). A discussion about the importance of communicating economic returns from CTE programming was published using ROI analysis (Whetstone, 2011).

An economic impact of Georgia's agricultural education programs was determined through a study that used descriptive statistics (West & Iverson, 1999). Direct economic impact was sought in an Oregon study through examination of the influence agricultural education programs had on students through teacher salaries, money spent and earned by students, and subsequent future salaries earned by college attendance. Earned income, growth of unpaid SAE student hours, and average SAE income per student and program was determined for a trend study in Iowa (Retallick & Martin, 2005). Examination of related literature by the researcher and research outcomes of this study were aimed at adding to the understanding of the stated problem.

Given the skills gap and continued importance of American agriculture jobs, research, education, and training, the researcher perceived a need to document the economic value of agricultural education and share the impact with agricultural education stakeholders. Stakeholders include school administrators, teachers, parents, students, school board members, local and state representatives, and agriculture-related business owners in Arizona communities who can provide greater funding and community support for SAEs. In turn, increased funding and stakeholder buy-in may increase SAE participation, generate more revenue for the local economy and prepare students for successful integration into the technologically advanced 21st century work place and higher education environment.

Applications

The results of this study can provide evidence of the economic impact of SAEs and help stakeholders counteract funding decreases for CTE in Arizona. In 2011, the Arizona State Legislature passed a budget measure that cut 52 percent of the Joint Technical Education District (JTED) funding in Pima County. This meant that 9th graders were no longer funded for JTED enrollment, which had a direct, negative impact on agricultural education (Arizona Education Network, 2011). As a result, Arizona received $24,305,238 from Perkins Funding in 2012, half a million dollars less than received in fiscal year 2011, and $2.6 million less than in 2010 (Association of Career & Technical Education, 2013).

Nationally, there are shortfalls in agricultural education and in SAE participation. The economic impact applications of this study can provide practical data for Arizona agricultural education stakeholders. However, economic impact analysis was not designed for the researcher to pass judgment about the effect of Arizona SAEs on the region's economy. Arizona, reflecting national trends, has experienced a shortage of qualified agricultural teachers and a declining numbers of teacher education programs qualifying agricultural educators (Camp, Broyles, & Skelton, 2002). Although there are 7,737 agriculture programs in schools across the country, 22 closed in 2013 because no qualified teacher could be found. Agriculture teachers are needed to continue to reach the almost 1 million students through more than 8,000 agricultural programs in all 50 states and Puerto Rico (NAAE, 2014).

During a 2005 Distinguished Lecture to the AAAE, teachers in attendance were asked to state opinions about their state's agricultural education program. Results showed that 95 percent of teachers indicated that the SAE was the smallest program among the three components of their school's agricultural education program (Moore, 2006). A study in New York revealed SAE participation experienced a 10 percent decline from 1983-1996 and only 29 percent of New York agriculture students had an SAE in 1996 (Camp et al., 2002). In the Hanagriff et al. study (2010), SAE investment costs rose over 2005-2008 while SAE participation numbers declined by 6 percent over the same period. Survey respondents reported that 96% of their schools did not have a formal agricultural education program. Among the sample of agricultural educators who responded, only 9% reported having SAEs. Ninety-one percent of respondents stated their school did not have "a program or activity that provides hands-on application of concepts and principles learned in an agricultural education classroom" (NAAE, 2014, p. 15).

The AET is available at no cost to all Arizona agricultural education teachers through Arizona Association FFA. In May 2013 the National FFA Organization and the AET developers partnered to offer the AET on a larger scale. The AET will improve the functionality of the

Agricultural Career Network (AgCN). The AET will also offer comprehensive technical support. National FFA Organization Chief Operating Officer Joshua Bledsoe stated, “Our partnership with AET is another way we are enhancing AgCN to help our members pursue more than 300 careers in agriculture” (National FFA, 2013, May 3 press release).

Questions concerning shortages in qualified agricultural workers need to be addressed by stakeholders in agricultural education. According to the 2010-2011 Official FFA Manual, “More than 500,000 student members are engaged in a wide range of agricultural education activities, leading to over 300 career opportunities in the agricultural science, food, fiber and natural resources industry” (p. 7). “There are approximately [23] million people who work in agriculture-related fields” (Agriculture Council of America, 2012) who comprise about 17% of the civilian workforce (FFA.org, 2014). In *Fields of Learning: The Student Farm Movement in North America* (2011), Richard Heinberg estimated that “we will need 40-50 million people engaged in producing our food within the next half century” (Sayre & Clark, p. v.). The economic relevance of SAEs as a component of agricultural education needs to be examined to determine if programs adequately prepare students to obtain jobs in agriculture. As a result, this process will meet the demand for a larger and more skilled agricultural workforce.

Economic Imperative for Improving Education (2003) was a policy and practice brief authored by the U.S. Department of Education that appealed to American State Departments of Education to prepare students for new global and technological market challenges. The report stated, “In a world where fiscal capital and technology flow freely from country to country, a nation’s human capital - the knowledge and skills of its workforce - is the key to its well being” (U.S. Department of Education, 2003, p. 1). CTE, agricultural education, and the SAE model are keys to facilitating globally competitive workforce integration for Arizona high school students.

Describing the economic impact of SAEs on Arizona communities through IMPLAN analyses is significant considering the historical importance of American agriculture. Current national deficiencies in skilled workers, decreased SAE participation within agricultural education, and a wealth of available careers within agriculture-related industries add additional significance to the topic.

CHAPTER 2: THEORETICAL FOUNDATION & CONCEPTUAL FRAMEWORK

Introduction

Agricultural education, from inception, had supervised, experiential learning opportunities for students now known as the Supervised Agricultural Experience. SAE is a "learning by doing tool" (National FFA, 2011, p. 8) that prepares students to make informed career decisions, develop career skills, and pursue careers in agriculture (Appendix A). Shortages in the American agriculture workforce, declines in SAE participation, and SAE record keeping barriers of traditional pen-and-paper methods are trends career and technical educators need to address with SAE stakeholders. A need exists to explore the economic effect of SAEs to determine the financial impact these programs have on students as well as local and state economies. The study examined the economic impact of SAEs whose participants kept electronic records through the AET software. The researcher was motivated to better understand the implications of these trends in entrepreneurial and placement SAEs on the economy of Arizona, where literature showed no previous study existed.

Purpose Statement

The purpose of this study was to describe the economic impact of entrepreneurial and placement Supervised Agricultural Experiences on Arizona.

Objectives

1. Describe the characteristics of Arizona agricultural education programs in which students have kept SAE records in AET in terms of:
    a. Student demographic characteristics – sex, grade level, and ethnicity.
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   c. Total enrollment in agricultural education programs and total student participation numbers for entrepreneurial and placement SAEs.
2. Describe the average spending on inputs for each agricultural industry related to entrepreneurial and placement supervised agricultural experience projects.
3. Describe the average income from entrepreneurial SAE sales and placement SAE paid and unpaid hourly pay equivalents for each agricultural industry.
4. Describe the economic impact of entrepreneurial and placement SAEs on Arizona in terms of direct effects, indirect effects, induced effects, and total effects.

History

Education to prepare a student for the world of work is at the core of agricultural and career and technical education and was greatly influenced by family training and later by apprenticeship programs. Families modeled the role of vocational education by teaching their sons to carry on traditional production jobs and their daughters to fulfill food, fiber, and health needs. Skills learned for survival became personal assets and could be used as bartering tools for more efficient survival of the individual and regional economy (Gordon, 2008; Prosser & Quigley, 1950). Youth have long held the key for community success, being traditionally viewed as defensive, hunting and gathering, and economic assets (Prosser & Quigley, 1950). Although early vocational education was more instinctual and informal, it nevertheless furthered the concept of career and technical education.

Through a closer examination of the history of vocational education from the 1800s to the present day, lessons can be learned about the value of vocational education and what occurred in the economy when the American education system devalued the integration of academics and job-skill training. During the 1800s, the American educational system became more formalized and early agricultural and home economics training gained acceptance (Prosser & Quigley, 1950). Gordon (2008) explained that formal education was separate from manual, trade and industrial science, and agriculture training. Early vocational training was widely considered as a path for the lower classes. Traditional education in 1800s America was reserved for the elite. Events such as the Industrial Revolution in the early 1800s and the Manual Training Movement later that century ushered in educational reform. Though the large-scale production output of the Industrial Revolution created eager investors and many jobs, the apprenticeship programs simply could not meet the demand for skilled workers. New ways to educate the American workforce emerged, teaching skills to fulfill machine technology job requirements and readying students for jobs immediately out of school (Castellano, Stringfield & Stone, 2003; Gordon, 2008).

During this time, the needs of industrialized America were met through mechanization and mass production and were furthered in the 1900s by automation, miniaturization, and the global technological explosion (Gordon, 2008). Many workers gained these specialized skills through secondary vocational education. However, Williams (1977) stated that during the early 1900s the main goal of vocational education was to equip students with the knowledge and job readiness skills needed to pursue agricultural careers. Career-focused agriculture education was formally initiated into the educational system by the 1917 Smith-Hughes Act, which mandated practical education through a more organized vocational system (Prosser & Quigley, 1950). Supervised Agricultural Experience programs first existed in farming projects. To better reflect changes in 20th century agriculture and to meet the technological needs of the advancing American economy, farming projects became supervised occupational experiences, revised to include farm and non-farm agricultural experiences. The authentic learning mission of agricultural education to prepare students for the world of work was bolstered by the formation of the Future Farmers of America in 1928, now known as the National FFA Organization (FFA).

At first, the emphasis on specialized training in vocational education successfully met the recovering market of the 1930s and 1940s after years of world wars and economic depression. However, World War I and II exposed vocational education's inability to adequately prepare workers with basic competencies, as the supply of qualified workers did not keep up with the overwhelming demand (Elliot, 2006; Gordon, 2008). Young adults needed ways to earn a living yet complete school with an academic foundation.

The effectiveness of career and technical education to prepare a qualified workforce based on specialization backfired because programs devalued academics. After record enrollment of students during the 1940s and 1950s in programs like agricultural education and the student organization, FFA, vocational education became U.S. secondary education's "dumping ground" (Elliot, 2007, p. 5) for lower achieving students over the next three decades. Disconnect between hands-on training and scholarship in the 1960s through 1980s and the resulting negative connotations of vocational education are still being overcome today (Castellano et al., 2003; Elliot, 2006). When vocational educators of the 1990s realized the seriousness of the failure to graduate students who could not compete in the workforce, they began to initiate reform. Reform led to the formation of a system where all students were supported in their efforts to become educated, technically skilled workers. No longer a secondary education afterthought, vocational programs gained respect as they educated "through, about, and for work" (Castellano et al., 2003, p. 245).

Career and Technical Education in the 21st century

By the beginning of the 21st century, vocational educators revived their methods by building on comprehensive models from earlier occupational teaching and learning. After several program name revisions, the present program name was articulated in 2006, updating vocational education to career and technical education. Previous vocational programs were organized to serve specific students, who were separately tracked and trained for one occupational skill set within limited program areas, often at the expense of scholarship. The reformed 21st century CTE system was more appropriate for the new century and reflected the shift from job specific training to broader, industrial training (Elliot, 2006).

Stronger linkages between school learning and job training experiences mirror Dewey's belief (1963) that all students should have the opportunity to learn school subjects with work as the learning context. Ensuring an economic future in the workplace for all citizens is best met by formal education (Castellano et al., 2003). To meet demands from the unpredictable and global economy, the broad selection of programs in modern day CTE has effectively provided diverse student choice and is built into high school graduation requirements. Most American secondary schools provide career training and students earn CTE credits to fulfill graduation requirements (Gordon, 2008). For example, taking an AgriScience class can fulfill a biology credit requirement. About 94 percent of public high school graduates earned CTE credits across the major study areas of agricultural, business, marketing, family and consumer sciences, trade and industrial, health occupations, technology, and technical education (U.S. Department of Education, 2009).

The needs of the economy, to provide skill-based training to equip students to obtain financial independence, form the philosophical and pedagogical core of CTE. "Vocational education becomes that part of the total experience of the individual whereby he learns successfully to carry on a gainful occupation" (Prosser & Quigley, 1950, p. 2). Today, a broader array of agriculture-related career opportunities is reflected in the diversity of SAEs eight program categories. CTE programs merge classroom instruction and practical learning to "...prepare students to enter the workforce with the academic and vocational skills needed to compete successfully in the job market" (Arizona Department of Education, 2013).

Theoretical Foundation and Literature Review

The dual nature of this study, encompassing both agriculture education and economic modeling, framed the conceptual roadmap for the research process. The theoretical foundation was developed from an extensive literature review that revealed the lenses through which agriculture education and economic modeling were viewed. The conceptual framework combined theories, experiential learning and input-output modeling, creating a cohesive guide for an economic impact study of Arizona SAEs.

Agricultural Education

Career-oriented experiences in agriculture were a natural part of the traditional farming framework in the United States and continue to provide hands-on learning for students through SAE programs within secondary agricultural education. The philosophy of experiential learning is commonly associated with SAEs in agricultural education (Knobloch, 2003). "Career and technical education is learning by doing" (National FFA Organization, 2003, p. 46). Career skills are central to the practical application of CTE classroom content and among key components of experiential learning championed by John Dewey in the 1930s (1963).

Dewey and Experiential Learning Theory

Dewey (1963) posited that educational maturity could be fostered as long as meaningful education is connected to equally meaningful and cumulative experiences. Experiential learning without practice is meaningless (Eyler, 2009). The FFA manual states, “we tend to remember things we care about” (2003, p. 46). Secondary education experiences employing experiential learning foster student independence as students have opportunities to select classes of interest and often have direct input into project and school to work choices. This fluidity of student opportunity is available to Arizona agriculture education students as they select their SAE, take financial risks, and reflect on the business process during record keeping.

CTE classes are taken by 94% of U.S. high school students and are a part of most graduation requirements as reported in CTE TODAY! (ACTE, 2013a). With 16 Career Clusters®, students have a wide range of choices helping to increase chances that CTE classes coincide with personal interests. Experiential learning involves an “organic connection between education and personal experience” stated Dewey (1963, p. 25). This connection is built into the structure of CTE course selection and pathways. Balanced CTE prepares students to be “college and career ready” (ACTE, 2013c), through linking core academic with job readiness and technical skills.

Dewey purported that these experiences throughout the project process were the real fuel toward educational growth (1990). At the heart of the SAE is the practice of experiential learning. Instructors best serve their students when they allow this authentic practice to unfold. Reinforcing the SAE experience for the student is like planting a seed knowing the fruit is borne in the future, as Dewey explained in his *The Child and the Curriculum* (1990).

Dewey composed three keys to his experiential learning theory. Continuity of experience, the first hallmark of experiential learning theory in education, is the belief that education and experience are related (Dewey, 1963). The second key component of Dewey's experiential learning theory, interaction co-efficient, is also evidenced in the entrepreneurial and placement SAE. Dewey's interaction coefficient shows that educational objectives and personal conditions interact through an experience to create a learning situation (1963). Such interaction occurs in an entrepreneurial SAE when students learn about animal husbandry in class, meeting animal science course objectives, and then raise a goat and sell the milk for profit. Third, experiential learning theory culminates in collateral learning which Dewey stated is the "formation of enduring attitudes...fundamentally what counts in the future … [is the] desire to go on learning" (1963, p.48). Students engaged in agricultural coursework have more favorable beliefs about agriculture which "helps pave the way for students' decisions to study agriculture in college and/or pursue a career in agriculture" (Thompson & Russell, 1993, p. 61).

Dewey pushed for integrated vocational education to be made available to all students. If done correctly, Dewey thought, this kind of reform could result in educational and systemic change effectively overcoming the threat of Prosser's Social Darwinism, the existing system of duality. Proponents of Social Darwinism believed that education was for the elite few and that academic knowledge should be distanced from work training. Dewey further believed that intelligent legislation could assist in the process of changing the system from narrow, utilitarian technical training seen in the early 1900s to a broad, integrated educational system. The narrow, specialized vocational training system was no longer effective at meeting demands of a post Depression and World War I economy. Cries for a better-prepared workforce in America prompted the educational reform Dewey envisioned (Gordon, 2008).

Life long learners are those who pursue new connections based on past meaningful experiences, which serve as platforms to the formation of new ideas. CTE educators have the responsibility of beginning their planning with student interests in mind. When teachers make this a priority, classrooms become full of purposeful educational experiences where real learning can take place (Baker, Robinson & Kolb, 2012; Dewey, 1990). Real-world CTE programs create responsible, life long learners who seek post secondary training and employment.

The value and ability of CTE programs to encourage a continual learning cycle has support from a number of national statistical reports. U.S. Department of Education reports stated that 2007-2008 high school graduation rates for CTE concentrators were about 15 points higher than national freshman graduation rates and 70% of these same students continued on to postsecondary education. Silverberg et al. showed postsecondary students enrolled in at least some CTE courses earned higher yearly salaries than their non-CTE enrolled peers who had also achieved high school graduation (as cited in ACTE, 2013a). SAEs can provide the spark for mental growth by connection of classroom studies the *map* that Dewey described provides direction for future experience, and project-based learning, the *actual journey* (Dewey, 1990).

Specifically, classroom learning becomes real for students when they transfer previous knowledge to new experiences while participating in enterprising activities and on-the-job tasks in entrepreneurship and placement SAEs. Experiential learning as the practical application of classroom learning leading to skill development and educational maturity is a valuable tool for CTE teachers. SAE programs are the conceptualization of experiential learning theory because they combine classroom instruction with practical experiences.

Related Literature, Dewey and Agricultural Education

Experiential learning theory appears in a number of studies about agricultural education. According to an Iowa SAE longitudinal economic impact study (Retallick & Martin, 2005), SAE is the embodiment of experiential learning as it is the application of classroom learning. SAEs present opportunities for real world experiences, according to West and Iverson in their economic impact study in Georgia (1999). Experiential learning was touted as one of the founding elements of secondary agricultural education (Stewart & Birkenholz, 1991). Even before the Smith-Hughes Act of 1917, Stimson's project-learning methods, a precursor to today's SAE, were essential to the framework of agricultural education (Moore, 1985). Stewart and Birkenholz (1991) conducted research about SAE project participation in Missouri and concluded that agricultural education teachers should continue to focus on SAE participation. Findings from the Missouri study demonstrated that 86 percent of students completed projects in 1988. The researchers concluded, "continued emphasis on enhancing education through student involvement in experience programs should remain a strong and viable component of agricultural education" (Stewart & Birkenholz, 1991, p. 39).

Assuming Dewey's experiential learning theory is at the core of agricultural education, the learner must purposefully cycle through the four stages of experiencing, reflecting, thinking, and acting for meaningful learning to occur (Baker et al., 2012). The phases of experiencing, thinking, and acting are directly related to career preparation and are activities within entrepreneurship and placement SAEs. AET software has a reflection component built into its record keeping which ensures students are cycling through all four experiential learning stages.

Specifically, students practice the entire process of experiential learning by owning and operating an agriculture-related enterprise within an entrepreneurship SAE. Raising a horse or producing a corn crop requires acquiring equipment and supplies, managing daily operations, and recording monetary records, all with the goal of earning a profit. Gaining experience within an agriculture-related career and keeping track of hours worked, job responsibilities, and income earned occurs within the context of a placement SAE. A job at the school greenhouse and an internship at a local veterinary clinic are examples of a placement SAE. An opportunity to learn skills may be coupled with earning an income in a paid placement SAE or earning volunteer hours through an unpaid placement SAE (National FFA, 2013). To adequately value placement SAE contributions to the total SAE economic impact on Arizona communities, both paid and unpaid placement SAE hours were incorporated into the study's analysis.

To further support Dewey's theory of experiential learning, the researcher reviewed world philosophies based on authentic learning. The philosophy behind career and technical education practices allows educators to create a framework that guides teaching and learning goals, curriculum choices, and classroom methods. These philosophies also enable them to meet ongoing challenges presented by students, emerging technology, and socioeconomic changes. Progressivists, like Dewey, helped shape CTE by focusing on teaching and learning through experimentation where the learner is actively involved in the learning process through problem solving, projects, and interactions with the real environment. Progressivism is rooted in the world philosophy of pragmatism that links democratic education with preparation for life, blending subjectivity of the arts and humanities with objectivity of science and math. The emphasis on social responsibility in CTE curriculum is traced to the philosophy of Reconstructionism, which held that education was ever changing, and inquiry-based teaching by self-directed learners developed independence and critical thinking in students (McNergney & Herbert, 2001). Addressing social issues through community-based learning and integrating the real world into the classroom are CTE strategies also based on Reconstructionism (HCC, 2013; Miller, 2006).

Other learning practices sprang out of Dewey's experiential learning theory that plays key roles in CTE. Active learning is defined as thinking about a subject and learning through discussion. Problem-based learning presents challenging but solvable problems to students for motivation and retention of subject matter. Finally, discovery learning is a teacher-guided learning style encouraging student ownership in the inquiry process, (McKeachie, 2006; Wang & King, 2009). The simple belief that students can solve problems taps into a teacher's ability to increase student motivation and parallels cognitive theory. Retention is augmented when past knowledge is connected to relevant problem solving (McKeachie, 2006).

Entrepreneurship and placement SAEs are education vehicles created to challenge students. Becoming contributors to the learner process under an experiential learning environment, SAE participants set goals, constantly problem-solve to keep animals and plants healthy, and balance finances to turn a profit. Thus, teachers and students have the opportunity to collaborate towards "greater capacity both to carry out complex analysis of field situations and to form plans that are realistic and well grounded in the academic discipline" (McKeachie, 2006, p. 286). As evidenced in the literature review, agricultural education SAEs remain closely aligned with Dewey's educational philosophy that focused on the achievements of the individual in preparation for life. Vocational education integrates classroom learning and experimental methods to form a popular and career-oriented teaching climate in the 21st century.

Input-Output Economic Model

The input-output economic model forms the second theoretical pillar for this study, supporting documentation of effective outcomes from entrepreneurial and placement SAEs.

Dewey (1990) referred to the economizing of the mind as memory is less taxed when knowledge is grouped together through purposeful planning, and where the curriculum serves as a guide for future association where more learning occurs. Agriculture education curriculum allows efficient, organized grouping of principles that provide that guidance for a more meaningful, personal experience in an SAE. Thus, the SAE is economically sound, providing *economy* in learning.

The purpose of an economic impact analysis of SAEs was to document agricultural education outcomes using input-output assessment. Input-output economic models, which are comparisons among interrelationships of all aspects of an economy, can be calculated using the analysis tool of IMPLAN. IMPLAN calculations were employed to determine the SAE economic impact created by students on Arizona. Documenting these outcomes met AAAE's National Research Objective #4 by showing evidence of program effectiveness and to "efficiently document the outcomes and impact of agricultural education programs on an individual, community, industry, and societal levels" (AAAE, 2013). Knowledge of a monetary value of entrepreneurial and placement SAE programs can raise awareness of the importance of SAE to agricultural education stakeholders through demonstration of the economic impact of SAEs across Arizona.

According to a 1914 Presidential Commission on National Aid to Vocational Education, vocational training was essential to national welfare. It was the responsibility of the federal government to provide states with funds so that the expansion of vocational education met economic, social and educational needs (Prosser & Quigley, 1950; Wang & King, 2009). Information about the economic impact of CTE programs, in particular, the ripple effect of student income and spending as a result of entrepreneurial and placement SAE projects, can provide agricultural education stakeholders the means to communicate student and program needs to policymakers.

Although Gittinger (1972) felt cost-benefit ratio was the best framework to assess the overall value of agricultural projects as it combined financial and economic analysis, input-output model economic analysis better suited this study. Leontief developed input-output analysis in the 1930s and 1940s in response to a need for more consistent, scientific methods of economic modeling. Traditional deductive and intuitive methods in the 1930s could not keep pace the changing global economy. The mathematical description of an economy created by Leontief tracked flows of products and services between industries, households, and governments. Input-output models account for indirect and direct effects of spending and income in a particular sector of the economy. In the 1940s, Leontief's model helped inform decision makers to mobilize the economy for World War II, meeting the demands of a complex, industrialized nation (Day, n.d.). The model also features multiplier effects and avoids double counting through the value-added concept (Mortensen, 2004).

Related Literature, Input-Output Economic Model

Using various means of economic analysis, SAE economic impact studies have been performed in Texas (Hanagriff, Murphy, Roberts, & Briers, 2010), Georgia (West & Iverson, 1999), Oregon (Cole & Connell, 1993), Iowa (Retallick & Martin, 2005), and Missouri (Stewart & Birkenholz, 1991).

The Economic Impact of Supervised Agricultural Experience Programs in Georgia was presented at the 26th Annual National Agricultural Education Research Conference in 1999. Authors David West and Maynard Iverson provided information about the economic impact of SAEs in their state, as no such study existed. Their efforts utilized the descriptive statistics of frequencies, percentages, means, standard deviations, ranges, and totals. The study revealed the typical Georgia agricultural education program contained an average of 97 students who created 50 SAE Programs. On average, each Georgia agricultural education program contributed $71,344 to the local community from the sample of 55 programs. West and Iverson extrapolated their calculated economic impact to the state of Georgia, estimating the annual economic impact of SAEPs was over $12 million. Although the study provided valuable data and demonstrated that SAEs contributed to local economies, an accurate economic impact was not assessed because no economic multipliers were applied nor were factors such as direct and indirect effects and leakage discussed.

In 1993, *The Economic Impact of Oregon Agricultural Science and Technology Programs* by Cole and Connell was published. Cole and Connell did not find existing economic studies on the impact of SAEs in Oregon despite a 1985 emphasis on impact studies by the American Association of Teacher Educators in Agriculture. Between 1985 and 1990 a number of research studies were conducted in the western region to meet this research objective. However, the meaning of impact was not clearly defined as economic. Thus, the resulting research did not fulfill a need to show economic outcomes from SAE participation.

The Oregon study used sound economic modeling, defining direct impact data as teachers' salaries and grant monies unique to the existence of agricultural education programs. Programmatic impact data was defined as monies earned and spent by students directly resulting from their SAE project. Lastly, SAE participants explained indirect impact data as college enrollment and the impact of additional monies earned by college enrollees was compared to non-college attenders. In particular, this impact data highlighted the economic modeling methods of gross income data and estimates of activity used in the Oregon state input-output model. Economic contributions from Ag-Science and Technology (AST) FFA events were calculated using the Oregon input-output state model that resulted in an agricultural economic multiplier of 2.87 (Cole & Connell, 1993).

Cole and Connell applied the economic multiplier to AST situations where new money was infused into the community. In this case, not all money considered was new money and it was difficult to determine if dollars spent met the criteria. The authors concluded that the median calculated value of program activities to the community of $45,920, with SAE program economic impact at $97,843 and total programmatic impact for sampled schools totaling $143,763, was a liberal estimate. Cole and Connell recommended that all Oregon AST programs should regularly gather economic data and that programmatic data should be transformed into a cost benefit analysis with the addition of corresponding teacher salaries and travel expenses.

The Oregon study used economic input-output modeling for salary and unique monies added but recommended transforming the data into cost benefit analysis without providing a reason. While including such direct data can be beneficial for economic impact studies, this study will not consider teacher salaries or travel expenses. The ex post facto research design inhibited acquisition of salaries and travel expenses for 2012-2013. Estimates of these expenditures would reduce the reliability and application of results. Potential misrepresentation of total teacher travel estimates would only compound when state multipliers were applied to Arizona SAE figures.

Retallick and Martin (2005) imposed a longitudinal approach spanning 11 years, 1991-2001, in their Iowa based SAE economic impact study. The study yielded moderate annual earned income growth of 4.41 percent for students participating in all types of Iowa SAEs over the 11-year period. The value of unpaid SAE hours grew at a relatively high annual value of

14.24 percent while total SAE income grew 6.05 percent annually. Growth of SAE program hours and average SAE income per student and per program were examined. A return on investment economic model was applied to determine if there were financial opportunities for students resulting from SAE participation. Retallick and Martin acknowledged, "the entire SAE dollar amount cannot be attributed solely and directly to the agricultural education program...it does provide some insight into the economic impact of such programs and student experiences" (2005, p. 48). The decision by the researcher to include earned income and values of unpaid SAE hours was due, in part, to the influence of the Iowa research.

Two economic studies about SAE programming have been conducted in Texas (Hanagriff, 2010; Hanagriff, Murphy, Roberts, Briers, & Lindner, 2010), which concluded more monetary assessments of SAE programs are needed to guide policymaking decisions. Policymakers need to be provided with SAE economic impact data on local communities when making program funding decisions to "show the total value picture of CTE educational programs by involving the measurement of economic impacts in program evaluation, especially important when involving experiential learning" (Hanagriff, 2010, p. 55). IMPLAN was used in the Hanagriff et al. study (2010) to calculate the economic impact of SAE programs to the Texas economy.

Results from the Texas study indicated total SAE per chapter investment value was $93,222. Average SAE investment value to the Texas economy in 975 agricultural education programs was $90,891,709. Using IMPLAN Type II multipliers, the total impact on the Texas economy from SAEs was $163,605,076. Hanagriff et al. (2010) concluded that these findings, along with other publications, provide a chance for agricultural education stakeholders to tout the "positive economic contributions of SAEs" and suggested additional research be conducted in this subject area (p. 79).

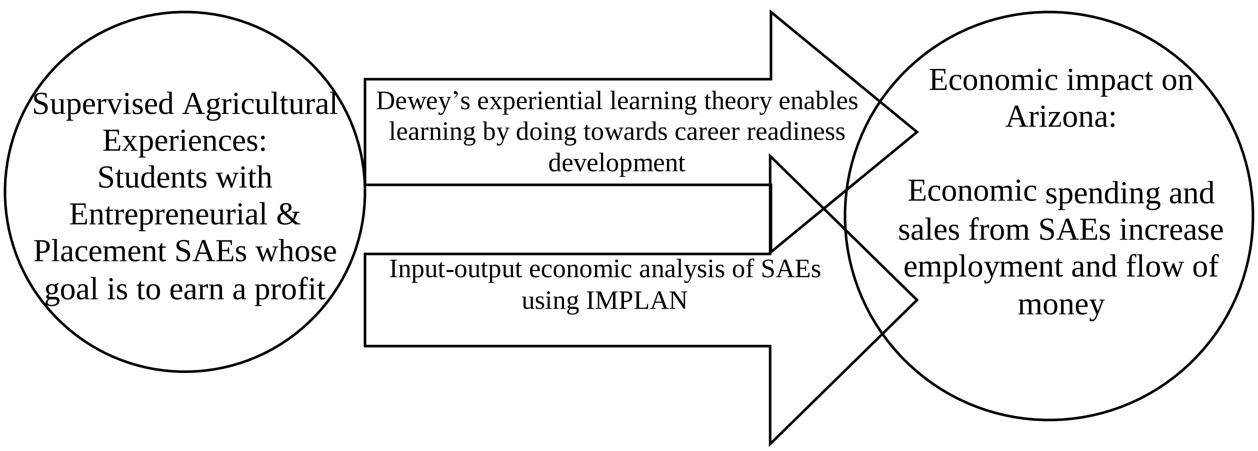
The Texas study by Hanagriff et al. (2010) used travel expense estimates by teachers, weaving the total chapter value, SAE investment value, and IMPLAN calculated value into the findings. In contrast, this study will not include teacher travel expenses because Arizona schools do not report expenses in the same manner as Texas schools. While the value of gathered research about experiential learning theory and existing economic input-output models was beneficial, the conceptual framework was modified to fit the nature of Arizona SAE programs, school reporting methods, and best practices according to IMPLAN tools.

Conceptual Framework

The conceptual framework was guided by the literature review and theoretical foundation hinged on Dewey's experiential learning theory components. The researcher was motivated to discover the economic impact of Arizona SAEs on students, local economies, and the state's economy because no similar study existed in Arizona. For purposes of simplification and to provide a sound map for the research, the economic impact focused on analysis of a state level impact of Arizona student SAE projects. And, the researcher answered the national call by the AAAE to provide documented economic outcomes of agricultural education.

The theoretical foundation of this study was developed from Dewey's concept of experiential learning that is closely aligned with CTE and found in the *doing to learn* philosophy of agricultural education's SAEs. Input-output economic modeling which focused on income and spending by students who recorded financial data in the AET, was the second mechanism used in development of the study's theoretical foundation. Figure 1 illustrates the conceptual framework that guided the study's process. The two circles form the bookends for the study and mirror the input-output economic model because the left circle shows the profit potential for students whose participate in SAE projects, and the right circle shows the outcomes or resulting impact of the economic analysis. The two arrows in the middle form the theoretical vehicles that keep the data on track, allowing proper movement from SAEs inherent authentic learning experience to numerical economic outcomes for the study's unit of measurement, the statewide economy of Arizona. The SAEs are catalysts for an economic ripple effect that can trigger increased employment and money flow into a region's economy that results from student investments and spending from earned wages.

Figure 1. Conceptual Framework



Summary

Throughout the history of CTE and the development of SAEs in agricultural education, practical teaching methods prepared students to enter agricultural-related careers in support of a healthy economy. Relevant and rigorous academics with 21st century career-skills training is incorporated into the CTE curriculum that leads to a variety of employment pathways or higher educational studies (ACTE, 2013c). Agricultural education programs and the entrepreneurial and placement SAE projects satisfy demands of today's fast-paced, highly competitive economy by educating students for the global, technological workplace without sacrificing academic excellence. To adequately address the economic impact of SAEs on Arizona, the researcher determined the theoretical foundation of the study rested on the two pillars of experiential learning theory and input-output modeling.

Dewey's experiential learning theory supported agricultural education's SAE component in this study. Input-output modeling, employed by the IMPLAN economic modeling tool, guided the economic process. Students who participated in entrepreneurial and placement SAEs put classroom learning to the test by creating a business or working in a career of interest. The resulting spending and income from students' entrepreneurial and placement SAE projects generated additional income and spending in local economies throughout Arizona. Desire to accurately calculate the economic impact statewide led to an extensive literature review. Lack of similar SAE economic impact research in Arizona motivated the researcher to create a conceptual framework based on the dual theories that produced the operational flow of the study.

CHAPTER 3: METHODS

Purpose Statement

The purpose of this study was to describe the economic impact of entrepreneurial and placement Supervised Agricultural Experiences on the Arizona economy.

Objectives

1. Describe the characteristics of Arizona agricultural education programs in which students have kept SAE records in AET in terms of:
    a. Student demographic characteristics – sex, grade level, and ethnicity.
    b. School location - rural, suburban, or urban.
    c. Total enrollment in agricultural education programs and total student participation numbers for entrepreneurial and placement SAEs.
2. Describe the average spending on inputs, for each agricultural industry related to entrepreneurial and placement supervised agricultural experience projects.
3. Describe the average income from entrepreneurial SAE sales and placement SAE paid and unpaid hourly pay equivalents for each agricultural industry.
4. Describe the economic impact of entrepreneurial and placement SAEs on the Arizona economy in terms of direct effects, indirect effects, induced effects, and total effects.

Research Design

The research conducted for the study was quantitative, descriptive, and non-experimental in nature. The study analyzed the economic impact of SAEs on Arizona through examination of entrepreneurial and placement SAE data entered by students in the AET. Sorting and filtering of AET data in Excel, basic mathematical calculations such as averages and sums, and IMPLAN modeling were used to meet the study objectives.

The quantitative nature of the study aligned with the model because the researcher questioned how much impact SAE projects had on the Arizona economy versus asking about the benefit or other qualitative questions. Economic impacts are often modeled through IMPLAN. Selection of the input-output modeling software tool of IMPLAN was deliberate. IMPLAN simplifies the complex economic impact analysis procedure so a user can access, use, and create reliable, consistent, and industry accepted impact numbers. Additionally, the software was an accessible tool for the researcher who possessed basic knowledge of economic analysis.

The economic impacts of placement and entrepreneurship SAE projects in the Arizona state economy were modeled using IMPLAN, an economic database and modeling program that creates input-output tables and constructs regional accounts. The simplest IMPLAN analysis is Industry Development. Industry Development entails examination of the increases or decreases in current production by existing industries or the impact of a new firm (Day, n.d.). In this study, the model was shocked with the creation of new industries based on SAE projects.

The USDA Forest Service together with the Federal Energy Management Agency and the University of Minnesota developed IMPLAN in the 1970s to estimate regional economic impacts of the National Forests management plans. IMPLAN relies on a number of data sources that include U.S. Bureau of Labor Statistics (BLS), U.S. Bureau of Economic Analysis (BEA), and a variety of U.S. Census Bureau reports (Day, n.d.). Two sets of data in particular were key to the creation of economic impact numbers for this study. IMPLAN relies on a 528 national industry sector input-output table that is based on BEA national input-output tables. Impact figures calculated for the regional economy were derived from IMPLANs pre-loaded 2011 Arizona figures.

To better understand entrepreneurial and placement SAE project characteristics, project categories and subtypes were defined. Online AET resources provided for teachers and students define the types of SAEs and project examples. A list of the nine entrepreneurship and placement SAE project categories and corresponding subcategories used by accredited Arizona FFA chapters can be referenced in Appendix C. Placement SAEs are the experiential learning activities that connect school-based learning about the world of work with the real-life situation of working in a chosen career. Students experience the work climate in both paid and unpaid situations. Money can be earned and paycheck figures entered in student records. Alternatively, students invest time, do not receive a paycheck, and record unpaid hours in their electronic record book. Examples of placement projects include work in a veterinary office, feed store, or employment at a family agricultural operation. Managing a placement SAE involves correctly setting up the activity in a student's online record book. Paid and unpaid time is entered following a detailed step-by-step process that is repeated throughout the life of the project (The AET, 2013).

Since both money and time are considered resources in the placement SAE project, the value of paid and unpaid wages or internships must be examined as both impact the regional economy. Productivity data for youth workers in Arizona could not be discovered. Therefore, adult volunteer contributions to the Arizona economy were reviewed. Arizona averages for the estimated value of an adult volunteer were $22.52 an hour in 2012 and paralleled the national average of $22.55 an hour. Although not an exact equivalent to student work-based learning experiences or unpaid SAE placement projects, the estimated 64.5 million adult Americans (26.5%) supplied $7.9 billion in volunteer service worth $175 billion to the economy

(Corporation for National & Community Service, 2012). This data supports the use of logged unpaid hours as equivalent to paid wages for the purposes of the study.

Entrepreneurial SAE projects are intended to teach students to make a profit by having revenues exceed spending and define resources as both money and time. Projects also must incorporate a financial risk. Many types of agricultural-related businesses are in this category including cotton production, landscape services, swine and cattle breeding, Buffelgrass removal, and a farm equipment repair business. Financial records are kept in the AET and students are instructed to set up their SAE by describing the project, entering starting inventory, and purchasing and recording capital items. Capital items are mainly applicable to breeding and show animal operations. As the project progresses, students manage finances by entering cash operating expenses and recording income, simulating a real-world enterprise (The AET, 2013).

Population

For the purposes of economic analysis, data were gathered from a defined population. The target population was described as Arizona high school agriculture students, males and females in grades 9-12, enrolled in a state accredited agricultural education program (N = 4,352). State accredited agricultural education programs are also referred to as FFA chapters in Arizona. FFA chapter membership dues must be paid and other requirements met to maintain active membership and receive benefits such as free access to the AET. Identified students participated in one or more entrepreneurial or placement SAE projects and kept records in the AET. Of students declaring an ethnic affiliation, seven groups were represented: whites, blacks, Hispanics, Asians, Native Americans, Pacific Islander, and Other. All Arizona secondary schools whose students used the AET for electronic record keeping were selected in a query performed by AET employees and shared with the researcher. Those schools that had either unaccredited agricultural education programs and were not recognized FFA chapters or were accredited FFA chapters but elected not to use the AET software were omitted from the study population. There is a third program scenario worth noting for the purposes of this study. If an accredited FFA chapter had students who conducted SAEs other than entrepreneurship and placement, that data was not captured for this study. The reason such data were not analyzed was that the other types of SAEs do not contain monetary spending or income and thus were irrelevant for this economic impact study. A census approach of these AET user schools was more robust than sampling and used direct route inference to the selected population.

To understand the study's population, it is valuable to note the number of students in Arizona who participated in CTE during the study year and the number of programs available in the state. Arizona had 553 public secondary schools, of which 228 offered CTE classes. Thirteen regional CTE programs known as Joint Technical Education Districts (JTED) operated during the study year. In 2010-2011, the most recent numbers publicly available, 82,650 secondary students or 26% of Arizona high school students, were enrolled in CTE classes. In the same school year period, 98 percent of CTE students graduated. Of the 62,535 high school graduates, 1,861 students were enrolled in an agricultural education program (Arizona Department of Education, 2013).

Agricultural education programs that are recognized by the Arizona Association FFA are organized into eight districts. In 2012-2013, there were 77 active chapters with 4,352 seventh through twelfth grade students enrolled in an approved agricultural education program. Of these students, 3,861 chose at least one SAE project from eight categories within agricultural education. Details follow in Table 1.

Table 1

2012-2013 Arizona SAE Category Enrollments by Program

SAE program	9-12th grade enrollment
Animal Science	2,664
Power, Structural and Technical Systems	1,308
Agribusiness Systems	1,108
Plant Systems	660
Natural Resource Systems	574
Food Product and Processing Systems	351
Environmental Systems	287
Biotechnology Systems	0
Total	3,861

Note. Table adapted from charts appearing in the "2012-2013 Arizona State FFA Association Annual Report". Copyright 2013. C-Leadership, Education, and Communication category was not captured in cited report.

From an AET program query for school year 2012-2013 (September 1, 2012 - August 30, 2013) there were 7,929 unduplicated student logins and 6,099 unique SAE projects having recorded journal or financial transactions. These represented 77 chapters across Arizona. To be considered an active chapter in Arizona, each school's agricultural education teacher must sign up for the AET and keep the program's AET membership current. All Arizona agricultural education programs are in public schools and the state used active *FFA chapter* interchangeably with active *agricultural education programs* (Arizona FFA Association, 2013; The AET, 2013).

Subject Selection

The study's population was chosen from Arizona agricultural education programs that had valid AET data for entrepreneurial and placement SAE projects during the 2012-2013 school year. Thus, 57 of 77 programs, 74.03%, of active programs whose students self-selected the AET software, were analyzed. Out of the 6,099 unique projects captured by the AET during the study year, 1,721 projects (28.22%) were entrepreneurial and placement SAEs and contained financial data. The study focused on these two SAE categories because both project types contain financial data entered in the AET, the electronic record keeping software available at no cost to all Arizona agricultural education programs every year since 2009. However, programs that did not have students participating in entrepreneurial or placement projects were taught by teachers who either opted out of student AET record keeping or did not keep their AET account current and were not considered in this study.

A random sample was not used because, although not all Arizona programs elected to use the AET software for entrepreneurial and placement SAE record keeping, all programs were given free access to AET software. Cost, therefore, was not perceived as a barrier.

Unit of Measurement

While it was important to gather information about the state's SAE programs, including student demographics and details of the selected population, the numbers of programs and student projects should not be confused with the study's unit of measurement. The unit of measurement was defined as the statewide economic impact, N = 1. Constructed by a statewide aggregated total of financial data from 1,721 student projects, the unit of measurement created a simplified focus for the study. Since the assumption was that the economic impact was a gross measure of how SAE projects affected the state economy, the counter factual was if students did not participate in these work-based learning SAE projects, they would not be productive, and no economic benefit would occur. Defining the study area was an important decision for the researcher and followed a general rule of IMPLAN creators where bigger is better in terms of defining a functional economy (Day, n.d. p. 25).

IMPLAN modeling was applicable for this study because it was framed on capturing monetary market changes, measured in dollars, for a given time period. The singular unit of measurement, defined as the state of Arizona, was logical as IMPLAN operates more effectively when leakages are reduced and the defined geographical region is inclusive of as many indirect effects as possible. The economic model was created using IMPLAN's internal 2011 Arizona statewide data for sectors related to the AET entry ID. Industry sectors related to the study and the frequency of student projects recorded in the AET are shown in Table 2. As described in Chapter 1, the study was narrowed to facilitate focus.

Table 2

IMPLAN Sectors

IMPLAN sector	Industry description	Frequency *n*	Frequency %
1	Oilseed farming	11	.006
3	Vegetable and melon farming	43	.025
4	Fruit farming	8	.004
6	Greenhouse, nursery, and floriculture production	14	.008
8	Cotton farming	5	.002
10	All other crop farming	24	.014
11	Cattle ranching and farming	56	.032
12	Dairy cattle and milk production	10	.005
13	Poultry and egg production	126	.073
14	Animal production, except cattle and poultry and eggs	573	.330
15	Forest nurseries, forest products, and timber tracts	1	.001
18	Hunting and trapping	4	.002
19	Support activities for agriculture and forestry	337	.196
31	Electric power generation, transmission, distribution	4	.002
186	Plate work and fabricated structural product manufacturing	43	.025
323	Retail-Building material and garden supply	74	.043
376	Scientific research and development services	62	.036
377	Advertising and related services	2	.001
379	Veterinary services	9	.005
388	Services to buildings and dwellings	115	.066
391	Elementary and secondary schools	22	.012

(continued)

Table 2. IMPLAN sectors (continued)

IMPLAN sector	Industry description	Frequency *n*	Frequency %
401	Community food, housing, and other relief services	60	.034
410	Other amusement and recreation industries	7	.004
417	Commercial and industrial machinery and equipment	62	.037
424	Grant-making, giving, and social advocacy organization	49	.028
Total		1,721	100

Note: IMPLAN industry sectors listed are those utilized directly by projects in the study. The table shows the distribution of projects by industry.

Three questions, driven by IMPLAN author guidelines, were answered before selecting IMPLAN as the system of choice for economic modeling. First, was the region large enough to encompass economic change? Arizona students conducted SAEs throughout the state. Second, did the economic region contain enough major suppliers of the industries in question? Focusing on the entire state fit this consideration better than narrowing focus to a particular FFA District or Arizona county. Third, did the intended audience of the impact report coincide with the economic changes measured in the selected region? Stakeholders concerned with SAE outcomes originated at the state level with the Arizona State Department of Education, State FFA Association, Arizona legislators, and universities across the state. The study was backward looking in design as data being analyzed was from a past school year. Future project analysis remains outside the scope of IMPLAN's purpose (Day, n.d.). The researcher generated an impact number that was more easily compared to similar studies and could be clearer to stakeholders.

Data Collection

The study was conducted from May 2013 to July 2014. Analyzed data were gathered from AET records entered during the 2012-2013 school year and information published in the 2012-2013 Arizona State FFA Association Annual Report. The time frame for the study was based on data availability from the AET and the Arizona State FFA Association for the 2012-2013 school year. Although accredited Arizona agricultural education programs have had free access to the AET since 2009, the researcher discovered many teachers were slow adopters. A more accurate picture of the economic impact for entrepreneurial and placement SAEs on Arizona communities was taken from examination of recent program data.

The researcher used data collected from the Arizona State FFA Annual Report (2012-2013) and queries requested by the researcher and fulfilled by the AET personnel for school year 2012-2013. AET personnel at the request of the researcher provided an Excel spreadsheet of study year data. The AET queries included chapter ID, chapter name, chapter number, state, area, student zip, school zip, and student account number (known as student ID). Project related information was captured in an entry number (unique project number), SAE type - entrepreneurial or placement, entry type ID, entry type name, unit ID, unit name, capital purchase amount, capital sales amount, all types of income, all types of expenses, salaried hours, unpaid hours, and date ranges for individual projects.

Income categories captured in the AET included market sales, research, premium sale, rental, scholarships, and paid work. Within the income categories, students also kept records of noncash equivalents of the following: labor, home, and transactions. Total income completed this section. Spending categories included feed, vet, supplies, maintenance, seed, fertilizer and chemicals, other, inventory resale, rent, paid work, commercial fees, fuel, contractor fees.

Noncash equivalent categories included feed, other, transactions, veterinary medicine, supplies, repair and maintenance, seed, fertilizer and chemicals, rent, commercial fees, inventory resale, fuel, and contractor fees. Depreciation expenses and total expenses complete the values for expenditures columns captured by the AET. Minimum and maximum dates or start and end dates if applicable within the study year, and total number of project days were also captured for each student's project.

Data Analysis

Data were analyzed using descriptive statistics and economic modeling tools in IMPLAN. To perform relevant calculations, AET data was meticulously sorted and filtered to align with North American Industry Classification System codes (NAICS). Results of data translation from AET syntax to one of the 528 IMPLAN sectors through NAICS code assignment can be found in Appendix B. Data from the original data set were preserved in an Excel worksheet. Each new group of filtered project data was then copied in to a new Excel worksheet and labeled appropriately, EN41 or PL28 to indicate either Entrepreneurial projects (EN) or Placement projects (PL). The number that followed represented the SAE sector assigned by AET creators.

The sorting and filtering resulted in the addition of 43 entrepreneurial project tabs and 40 placement project tabs in an Excel file. Each group of projects fit within a particular IMPLAN industry sector, based on the unique SAE projects whose activities contributed to a common economic change. An economic model was created in IMPLAN and industry gross sales and income totals were entered. State FFA Association Annual Report figures were examined and manipulated through standard mathematical computations such as sums and averages. Economic values for entrepreneurial and placement SAEs were generated from financial data entered for project investments, sales, and earned income.

Within these parameters, spending for economic modeling included the initial project investment, capital expenditures, and expenditures over the life of a project. Sales for the analysis included student income per project unit and value of paid and unpaid income. Resulting economic values for entrepreneurial and placement SAE projects extended beyond direct spending and were viewed in light of their impact on the entire state, by industry.

To meet research objective one, descriptive statistics of averages, sums, and basic examination of the data from the Arizona Association FFA Annual Report (2012-2013) were used to describe the population’s sex, grade level, ethnicity, agriculture education program enrollment, SAE project participation numbers, and student’s geographic location. Demographic information was not available to the researcher in the Excel spreadsheet provided by the AET due to student privacy issues. To satisfy objectives two and three the AET entrepreneurial and placement SAE entry headings were examined to determine parameters for sales and wages. Spending habits and income figures per industry were studied to ensure accurate assignment of financial data in order to perform work necessary for the economic modeling to meet objective four.

In meeting objective four for placement projects, special attention was paid to how IMPLAN defines employees. Paid and unpaid equivalents were combined to form total income figures for placement projects across Arizona agriculture industries. IMPLAN analyzed employment numbers as a head count of workers in that industry and took into account that there was a normal yet unknown mixture of full-time and part-time employees. The assumption made by the researcher was that students operated their ownership SAE or worked in their placement

SAE on a part-time basis. This part-time status was estimated to be 10 hours per week on average for the 12-month study period. The conversion from student workers completing placement SAEs to full-time workers, a four to one ratio, must be viewed in this light. The resulting jobs created by conducting the economic model do not indicate a one to one ratio of full-time workers. MIG, Inc.'s IMPLAN resource and support website contains a link to an Excel worksheet that details IMPLANs per sector FTE conversion table. Because students worked an unknown amount of reduced hours per week over the study year, these additional IMPLAN conversions were not applied to the labor effects.

To meet objective four, steps were performed prior to setting up the SAE IMPLAN model. Before entering financials totals from spending and income in to the IMPLAN system, SAE project types and subtypes were aligned with the nationally accepted North American Industry Classification System (NAICS). To complete this key step, analysis was conducted for each SAE type ID, entry type ID, unit ID, and unit name sums and averages for income and expenditures. Each AET code assigned to these subcategory projects was examined and placed under a NAICS coded column. NAICS codes contain job descriptions that were referenced to make the most appropriate decision about NAICS and AET code translation. These descriptions as well as a search function were available online through the official NAICS website, http://www.naics.com/search/. Some overlap resulted as multiple AET subcategories ended up in the same NAICS code. For example, dogs, cats, and other small animals, all sub-projects under Small Animals in the Animal Systems group, fell under the NAICS code 112990 - All Other Animal Production.

Each AET project type was first sorted by general category, then by AET subcategory. For example, the category of Animal Systems contained beef, poultry, sheep, and horse projects among others. Within the entrepreneurial SAE category, types of projects included breeding animal, show animal, pet animal, plants, and crops. Agriculture-related jobs of various kinds were found within the placement SAE category. Results of these sorting efforts are found in Appendix B. Newly created categories emerged from this process.

Once the new categories, resulting from NAICS and AET industry code translations, were produced in an Excel spreadsheet, the researcher returned to the data set and filtered each NAICS code under the two umbrella SAE categories, entrepreneurial and placement projects. The corresponding data rows were copied into new worksheets and labeled accordingly. Within each new worksheet, the project financials were subjected to descriptive statistic calculations. Sum and average formulas were inserted per sales and income column. Project data now met the fourth objective and were ready for injection into an IMPLAN model.

Finally, to finish meeting the fourth objective conditions and describe the economic impact of entrepreneurial and placement SAEs on Arizona in terms of direct, indirect, and induced effects, the researcher entered the following data into IMPLAN. For placement projects, a scenario with new events was created and named *Placement projects*. Employment per sector and associated income was entered to build the placement scenario. For entrepreneurship projects, a set of scenarios was created with a new event for each of the seven entrepreneurship categories of Crops, Animals, Food technology, Agribusiness, Natural resources and environmental systems, Power, structural and technical systems, and Leadership, education, and communications. Within the seven categories, spending in each of the reported intra-industry sectors was totaled and entered into IMPLAN to build the entrepreneurship scenario. Finally, a new scenario to analyze the impact of the aggregated net income was created and corresponding total entered into IMPLAN. Analyzing the impact of net income from entrepreneurial endeavors was another way to gain insight into the economic picture of Arizona due to the infusion of new earnings by students.

Local and state economic data were applied from the IMPLAN software program and used to generate appropriate Type II multipliers. Multipliers are measurements of the change in the local economy due to the change in expenditures in a local economy. The local economy was defined as the entire state of Arizona. To calculate the multiplier, the following formula was applied to modeling results.

$$M = (\text{direct} + \text{indirect} + \text{induced effects})/\text{direct effects}$$

Past research used IMPLAN multipliers of $1.80 for agriculture and $2.09 for other related expenditures (Hanagriff et al., 2010). This study's Type II multiplier for placement projects was calculated as 1.53, for entrepreneurship spending as 1.79. Results from data analysis to meet the fourth research objective are reported in Chapter 4.

Modeling Entrepreneurship SAE categories in IMPLAN

Shocking the system with SAE project data created new modeling in IMPLAN. For entrepreneurship projects, new activities were created for each sector containing AET data to generate a proxy estimate of likely economic impact of a new industry's production on the defined economy. Large-scale production assumptions were not applicable for small-scale SAE projects. Because student expenditures were captured for SAE projects, spending categories such as category feed, vet, seed, fertilizer/chemicals, other, and maintenance were carefully matched with NCAIS codes and then IMPLAN sectors that best paralleled the expense. Expenditures per sector vary. Crop projects, for example, have different supply needs than animal projects. However, assumptions were made about spending habits that parallel large-scale production, such as the nutrients and general feed types necessary for healthy cattle care.

In other words, the nutritional needs for feeding five cattle were assumed to be the same as feeding five hundred head of cattle.

Events were created in IMPLAN under Setup Activities with each new activity containing multiple events because each new SAE sector contributes additional spending monies to a multitude of other sectors. Entrepreneurship project data were combined to create six new activities in IMPLAN and followed the established SAE categories of A-Animal Science, F-Food Product and Processing Systems (combined with T-Technology), B-Agribusiness systems, P-Plant systems, N-Natural Resource systems (combined with E-Environmental Service systems), M-Power, structural, and technical systems, and C-Leadership, Education, and Communications. For each new IMPLAN activity, a number of new events were created that reflected project spending for corresponding IMPLAN sectors.

Modeling Placement SAE categories in IMPLAN

For placement projects, new employment activities were created. Industry Development analysis was used in IMPLAN because annual employment and employee income were known numbers per industry. New events in the model were created for each sector containing AET data that were in turn used to picture the impacts of local agriculture-related student employment on the regional economy. The level was left at the default of 1.00. Employment and wages were entered to generate a proxy estimate of likely economic impact of a new industry's production on the defined economy. The new industry was defined as the addition of SAE workers in the economy. Paid and unpaid equivalent income was grouped together per category. The researcher assumed that unpaid income earned by workers reflected similar productivity as compared with paid student workers. The unpaid income reported in the AET was treated like internships. Company productivity and proprietor income increased as a result of unpaid student interns employed in a sector. Students participating in a SAE were not full-time workers but were assumed to have comparable productivity to adult workers. In order to compensate for fewer hours worked by student workers, it was assumed that each student worked ten hours per week on average throughout the study year. Thus, four student workers participating in placement SAEs equaled one full-time worker in the economy. Before employment numbers were entered, the simple calculation to create the full-time equivalent (FTE) was performed by taking the total number of placement projects per sector and dividing by four.

Budget

Although IMPLAN and AET software used in the study had associated expenses which are detailed below in Table 3, the final cost to the researcher was minimized through relationships built within the University of Arizona's Agricultural Economics Resource (AREC) Department, Arizona State FFA office, and key personnel at the AET. The University of Arizona's AREC Department supplied access to their IMPLAN license. Hands-on practice to familiarize the researcher with the AET was gained through a 90-day trial available at www.theaet.com. The Arizona Association FFA secretary shared information about Arizona FFA chapter enrollment and SAE projects.

Table 3

Budget

Item	Cost
AET, Agricultural Experience Tracker = $135/year	$0
IMPLAN: 2012 Arizona Plus State Package = $4,770	$0
Printing for study	$50
Total	$50

CHAPTER 4: RESULTS

This chapter will describe the results per objective, stating findings derived from analyzing sources obtained by the researcher or calculations performed during the study.

Purpose Statement

The purpose of this study was to describe the economic impact of entrepreneurial and placement Supervised Agricultural Experiences on Arizona.

Results by Objectives

Objective 1

Describe the demographic characteristics of Arizona agricultural education programs in which students have kept SAE records in AET in terms of student demographic characteristics – sex, grade level, ethnicity, school location, total enrollment in agricultural education programs, and total student participation numbers for entrepreneurial and placement SAEs.

Although AET records made available to the researcher did not contain sex, grade level, and ethnicity data due to privacy reasons, overall agricultural education enrollment reports from the Arizona Association FFA office were obtained and showed the following results. The Arizona Association FFA Annual Report (2012-2013) indicated 6,862 males and females in Arizona public schools, grades 9-12, participated in a SAE during the 2012-2013 school year. The top three SAE participation categories were Animal systems with 2,500 students, Power, Structural, and Technical systems with 1,308 students, and Agribusiness systems with 1,018 students. Statewide enrollment in agricultural education courses per grade was recorded in the annual report as 2,831 9th grade, 1,951 10th grade, 1,401 11th grade, and 950 12th grade participants during the study year. A breakdown of SAE project categories by sex and grade are found in Table 4.

Table 4

SAE Project Enrollment

		9th Grade		10th Grade		11th Grade		12th Grade	
SAE category	*n*	Female	Male	Female	Male	Female	Male	Female	Male
Animal Systems	2,500	12	492	551	656	210	356	263	124
Power, structural and Technical systems	1,308	82	388	51	308	42	264	19	154
Agribusiness Systems	1,018	193	244	103	116	95	107	79	81
Plant Systems	660	162	138	85	93	53	58	33	38
Natural resource systems	574	105	115	90	99	43	58	27	37
Food product and processing systems	351	82	56	52	49	29	37	23	23
Environmental Systems	287	62	56	43	28	22	27	20	29
Biotechnology Systems	0	0	0	0	0	0	0	0	0
Total	6,698	2,187		2,160		1,401		950	

Note: Enrollment is extrapolated from the 2012-2013 Arizona FFA Association Annual and is shown by SAE category in descending order by sex and grade.

Enrollment data for statewide participation by ethnicity in agricultural education showed that students identifying themselves as white, Hispanic, and Native American had the highest participation rates in Arizona agricultural education while black and Asian students had lower enrollment. White students made up 64.71% (3,608), Hispanic students comprised 21.95% (1,224), and Native Americans had 8.05% (449) of total enrollment in statewide agricultural education programs across grades 7-12 as seen in Table 5. Ethnic enrollment data by grade was not reported in the Arizona Department of Education Annual Report for Agricultural Education. Thus 9th through 12th grade ethnic enrollment could not be isolated to match the study.

Table 5

Agricultural Education Enrollment by Ethnicity and Sex

	Total		Males		Females	
Ethnicity	*n*	%	*n*	%	*n*	%
White	3,608	64.7	1,802	49.9	1,806	50.1
Hispanic	1,224	22.0	602	49.2	622	50.8
Native American	449	8.0	202	45.0	247	55.0
Black	127	2.3	60	47.2	67	52.8
Other	97	1.7	48	49.5	49	50.5
Asian	66	1.2	38	57.6	28	42.4
Pacific Islander	5	.1	1	20.0	4	80.0
Total	5,576	100.0	2,753	49.4	2,823	50.6

Student demographic characteristics and school location questions of the first objective were met by analyzing towns and their corresponding zip codes for students entering financial data in entrepreneurial and placement SAEs in the AET. Urban areas had the fewest projects at 1.27% (22 projects) and were found in one Tucson high school. Suburban areas, defined as those students living in zip codes within the metro areas of Phoenix, Tucson, Flagstaff, and Yuma, had 39.02% or 675 completed projects. Rural areas were the most populace geographic category identified by students. Defined as smaller towns and remote areas, rural students represented 59.71% or 1,033 projects. A visual representation of these findings is found in Table 6.

Table 6

Statewide School Location Breakdown for Students Conducting SAE Projects

Location	n^a	%
Rural	1,024	59.50
Suburban	675	39.22
Urban	22	1.28
Total	1,721	100.00

[a]Number of SAE projects per student location

Total enrollment in agricultural education programs and total student participation numbers for entrepreneurial and placement SAEs captured in the AET for the study year are reported in Table 8. Overall, entrepreneurship projects outpaced placement projects in terms of statewide enrollment with 1,287 entrepreneurial SAEs and 434 placement SAEs as seen in the final column of Appendix B. The highest participation in entrepreneurship projects was in the IMPLAN sectors numbered 14-Animal production except cattle and poultry and eggs at 533 projects, 19-Support activities for agriculture and forestry at 287, and 13-Poultry and egg production at 118 projects. Placement projects had a different disbursement as 19-Support activities for agriculture and forestry contained 50 projects. IMPLAN sector 376-Scientific research and development services followed closely behind at 47 projects while 388-Services to buildings and dwellings had 42 projects in the AET data set. Illustration of the top five project enrollments for each type of SAE study category follows in Table 7.

Table 7

Top Five Entrepreneurship and Placement Projects

Entrepreneurship		Placement	
IMPLAN sector	*n*	IMPLAN sector	*n*
14-Animal production except cattle and poultry and eggs	533	19-Support activities for agriculture and forestry	50
19-Support activities for agriculture and forestry	287	376-Scientific research and development services	47
13-Poultry and egg production	118	388-Services to buildings and dwelling	42
388-Services to buildings and dwellings	73	14-Animal production except cattle and poultry and eggs	40
11-Cattle ranching and farming – Beef	50	323-Retail-building material and garden supply	35

Note: Top five statewide programs listed from highest to lowest in terms of projects with data entered in the AET from 2012-2013. Preceding numbers in each listing represent the IMPLAN sector code.

Objective 2

Describe the average spending on inputs for each agricultural industry related to entrepreneurial and placement supervised agricultural experience projects.

For the purposes of this study, spending for placement projects was computed and totaled $35,840 across 434 projects. However, placement project expenditures did not affect the statewide economy as established in the IMPLAN economic model. While spending within an employment project may have occurred, inclusion of the data into the economic model was beyond the scope of this study. Employee expenditures were not a part of the economic impact model because the researcher did not want to complicate the economic software tool and delve into the implications of tax write-offs. Additionally, the researcher entered employment figures and total wages per sector into the IMPLAN model and relied on the software to drive direct, indirect, and induced effects with the embedded, statewide sector averages.

Spending by students while participating in entrepreneurship projects resulted in total spending of $721,566 over the study year. Seven aggregated groups of IMPLAN sectors were formed to encompass the 1,287 entrepreneurship projects. Subsequently, entrepreneurship purchases across all recorded projects were grouped into these seven industry sectors according to their logical similarity and according to research conducted in the IMPLAN guidebook and through online NAICS websites.

Established AET entrepreneurial spending categories, although similar in name from project to project varied in terms of actual spending patterns across industry sectors. For example, supply purchases for swine breeding entrepreneurial projects could include pen building material while supply purchases for equine entrepreneurial projects might include tack and grooming equipment. As a result, once AET categories were aggregated (Appendix B), IMPLAN sector spending categories were analyzed and assigned a corresponding industry code where the spending occurred. Students were informed that cash operating expenses were considered actual expenses required to complete the SAE project. Operating expenses also differed from capital investments and were relatively inexpensive. Non-cash transactions were also captured in the AET and included labor exchange, defined as working in exchange for rent. For example, cleaning a neighbor’s barn in exchange for pen rent for a goat-breeding project would constitute a non-cash labor exchange.

Spending categories where students recorded expenditures in the AET included feed, vet, supplies, maintenance, seed, fertilizer/chemicals, other, inventory resale, rent, paid work experience, commission fees, fuel, contract fees, and depreciation expenses. Non-cash expenses included feed, vet/medicine, supplies, repair/maintenance, seed, fertilizer/chemicals, other, inventory resale, rent, commission fees, fuel, contract fees, and a general non-cash transaction category.

The first aggregated group of entrepreneurship projects was named Crops and covered the IMPLAN industries of 1-Oilseed farming, 3-Vegetable and melon farming, 4-Fruit farming, 6-Greenhouse, nursery, and floriculture production, 8-Cotton farming, 10-All other crop farming, and 15-Forest nurseries, forest products, and timber tracts. SAE categories of Grain crops, Vegetable, Fruit, Nursery operations, Floriculture, Fiber/oilseed crops, Forage crops, Turf grass, Specialty crop, Forestry, and Landscape were analyzed and an Excel worksheet created to capture combined spending for the related IMPLAN industry sectors. As stated above, each input category within the Crops category was examined and a corresponding expense sector assigned. Total spending on inputs for the Crops sector was $73,817. Spending in the Other category constituted the largest portion of total expenditures at $37,234 while spending on Fertilizer/Chemicals followed at $15,533. Table 8 shows the distribution of spending among crop-related industries.

Table 8

Statewide Spending in the Crops Industry

IMPLAN sector	Seed[a] 1,2	Feed[b] 19	Fert/ chem[b] 19	Other[b] 19	Comm fees[b] 19	Supplies[c] 323	Maint.[d] 417	Inv. resale[e] 69	Rent[f] 360	Fuel[g] 115	Total
1-Oilseed	$5,993	$0	$15,146	$36,900	$50	$15	$1,567	$0	$9,065	$0	$68,676
3-Vegetable	$187	$8	$310	$225	$0	$331	$0	$31	$0	$0	$1,092
4-Fruit	$0	$0	$22	$10	$0	$4	$0	$0	$0	$0	$14
6-Nursery	$72	$5	$10	$88	$0	$131	$0	$0	$0	$0	$328
8-Cotton	$0	$0	$0	$11	$0	$46	$0	$0	$0	$0	$57
10-Other crop	$929	$0	$0	$0	$0	$25	$0	$0	$0	$0	$954
15-Forestry	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
388-Services to buildings	$12	$10	$65	$0	$0	$629	$86	$0	$0	$71	$873
Total	$7,133	$23	$15,553	$37,234	$50	$1,181	$1,653	$31	$9,065	$71	$71,994

Note: Each IMPLAN sector contains one or more AET SAE categories.

[a]Spending on seed fell under IMPLAN sectors 1-Oilseed farming and 2-Grain farming. [b] Spending on Feed and Other & Commercial Fees fell under IMPLAN sector 19-Support activities for agriculture and forestry. [c]Spending on Supplies fell under IMPLAN sector 323-Retail-Building materials and garden supply. [d]Spending on Maintenance fell under IMPLAN sector 417-Commercial and industrial machinery and equipment repair and maintenance. [e]Spending on Inventory Resale fell under IMPLAN sector 69-All other food manufacturing. [f]Spending on Rent fell under IMPLAN sector 360-Real estate. [g]Spending on Fuel fell under IMPLAN sector 115-Petroleum refineries

Animal-related project expenditures are illustrated in Table 10. Animal-related projects were aggregated to form a category that covered the following seven IMPLAN industry sectors: 11-Cattle ranching and farming, 12-Dairy cattle and milk production, 13-Poultry and egg production, 14-Animal production, except cattle and poultry and eggs, 18-Hunting and trapping, 19-Support activities for agriculture and forestry, and 379-Veterinary services. SAE projects within this animal category included entrepreneurial activities in beef, poultry, dairy, swine, goats, aquaculture, specialty animals, small animals, wildlife, equine, and veterinary. Total spending for the Animal sector was $619,750. The most spending by students who participated in animal related projects occurred in the sectors of Feed at $300,673 and Inventory Resale at $113,947. Table 9 illustrates purchases for animal-related industries.

Table 9

Statewide Spending in Animal-related Industries

IMPLAN sector	Feed[a] 41,42	Vet[b] 379	Supplies[c] 323	Maint.[d] 417	Seed[e] 2	Fert/ chem[f] 19	Other[g] 69	Inv.resale[h,f] 11,19	Rent[i] 360	Comm fees[f] 19	Fuel[j] 115	Total
11-Cattle	$41,923	$206	$5,447	$125	$0	$0	$13,909	$29,380	$150	$393	$0	$91,533
12-Dairy	$4,430	$60	$126	$236	$0	$14	$523	$155	$50	$72	$0	$5,666
13-Poultry and egg	$6,488	$40	$1,599	$129	$78	$25	$843	$367	$120	$194	$0	$9,883
14-Animal production	$92,915	$4,099	$20,552	$2,125	$0	$10	$30,754	$52,078	$1,616	$4,207	$470	$324,737
18-Hunting	$60	$0	$280	$0	$0	$108	$0	$0	$0	$0	$0	$448
19-Ag Support activities	$154,696	$4,312	$21,033	$2,071	$5	$13	$41,346	$61,347	$6,305	$10,513	$1,621	$239,969
379-Vet	$161	$0	$225	$0	$0	$0	$500	$0	$0	$0	$5	$891
Total	$300,673	$8,717	$49,261	$4,686	$83	$170	$87,874	$143,327	$8,241	$15,379	$2,096	$619,750

Note: Each IMPLAN sector contains one or more AET SAE categories.

[a]Spending on Feed fell under IMPLAN sectors 41-Dog and cat food manufacturing and 42-Other animal food manufacturing. [b]Spending on Vet fell under IMPLAN sector 379-Veterinary services. [c]Spending on Supplies fell under IMPLAN sector 323-Retail-Building materials and garden supply. [d]Spending on Maintenance fell under IMPLAN sector 417-Commercial and industrial machinery and equipment repair and maintenance. [e]Spending on Seed fell under IMPLAN sector 2-Grain farming. [f]Spending on Fertilizer/Chemicals, Inventory Resale, and Commercial Fees fell under IMPLAN sector 19-Support activities for agriculture and forestry. [g]Spending on Other fell under IMPLAN sector 69-All other food manufacturing. [h]Remaining portions of spending on Inventory Resale fell under IMPLAN sector 11- Cattle farming. [i]Spending on Rent fell under IMPLAN sector 360-Real estate. [j]Spending on Fuel fell under IMPLAN sector 115-Petroleum refineries

The third combined category was Food Science Research and Emerging Technology. IMPLAN sector, 376-Scientific research and development services, covered the two SAE project categories of Food Science and Emerging Technology. Total spending in this group was $1,463. Feed and Paid Work Experience contained the largest financial investments of $800 and $468 respectively. Table 10 shows expenditures by students conducting Food Science Research and Emerging Technology projects.

Table 10

Statewide Spending in Food Science Research and Emerging Technology Industries

	Feed[a]	Supplies[b]	Seed[c]	Fert/ chemicals[d]	Other[d]	Paid Work exp.[e]	
IMPLAN sector	69	329	2	19	19	380	Total
376 - Scientific Research	$800	$58	$10	$20	$107	$468	$1,463
Total	$800	$58	$10	$20	$107	$468	$1,463

[a]Spending on Feed fell under the IMPLAN category 69-All other food manufacturing. [b]Spending on Supplies fell under the IMPLAN category 329-Retail-General merchandise. [c]Spending on Seed, fell under the IMPLAN category 2-Grain farming. [d]Spending on Fertilizer/Chemicals and Other fell under the IMPLAN category 19-Support activities for agriculture and forestry. [e]Spending on Paid Work Experience fell under the IMPLAN category 380-All other miscellaneous professional, scientific, and technical services

The Agribusiness category was an aggregated group of five IMPLAN sectors. The combined IMPLAN industry sectors included 323-Retail-building material and garden supply, 377-Advertising and related services, 388-Services to buildings and dwellings, 401-Other amusement and recreation industries, and 410-Other amusement and recreation industries. SAE projects of Sales, Communications, Landscaping management, Education, Home/community services, and Outdoor recreation projects comprised the five IMPLAN industry descriptions. Total spending across these projects was $18,048. Students invested the most money in the

Other category, $13,833, and Supplies, $2,344. Table 11 illustrates spending per category for Agribusiness projects.

Table 11

Statewide Spending in the Agribusiness Industry

	Feed[a]	Vet[b]	Supplies[c]	Maint.[d]	Seed[e]	Other[f]	Inv resale[f]	Rent[g]	Comm fees[f]	Fuel[h]	
IMPLAN sector	42	379	323	418	2	19	19	360	19	115	Total
323-Retail	$1,421	$87	$1,945	$0	$0	$10,471	$95	$50	$35	$0	$14,104
377-Advertising	$0	$0	$0	$0	$0	$2	$0	$0	$0	$0	$2
388-Services to building	$0	$0	$349	$100	$12	$2,775	$0	$0	$0	$0	$3,307
401-Community Services	$0	$0	$50	$0	$0	$385	$0	$0	$0	$0	$435
410-Other recreation	$0	$0	$0	$0	$0	$200	$0	$0	$0	$0	$200
Total	$1,421	$87	$2,344	$100	$12	$13,833	$95	$50	$35	$0	$18,048

[a]Spending on Feed fell under IMPLAN category 42-Other animal food manufacturing. [b]Spending on Vet fell under IMPLAN category 379-Veterinary services. [c]Spending on Supplies fell under IMPLAN category 323-Retail-Building material and garden supply. [d]Spending on Maintenance fell under IMPLAN category 418-Personal and household goods repair and maintenance. [e]Spending on Seed fell under IMPLAN category 2-Grain farming. [f]Spending on Other, Inventory Resale, and Commercial Fees fell under IMPLAN category 19-Support activities for agriculture and forestry. [g]Spending on Rent fell under IMPLAN category 360-Real estate. [h]Spending on Fuel fell under IMPLAN category 115-Petroleum refineries

Natural Resource Systems and Environmental Systems comprised the next category of projects that aligned with the IMPLAN sector 424-Grant-making, giving, and social advocacy organizations. Total spending by students who participated in Natural resource systems and Environmental science/natural resource management SAE projects was $1,076 with participants spending the most money on Feed, $612, and Supplies, $325. Expenditures by students completing projects in these industries are shown in Table 12.

Table 12

Statewide Spending in Natural Resource Systems and Environmental Systems Industries

	Feed[a]	Supplies[b]	Other[c]	InvResale[c]	Fuel[d]	
IMPLAN sector	42	323	19	19	115	Total
424-Social advocacy	$612	$325	$57	$22	$60	$1,076
Total	$612	$325	$57	$22	$60	$1,076

[a]Spending on Feed fell under IMPLAN category 42- Other animal food manufacturing. [b]Spending on Supplies fell under IMPLAN category 323- Retail-Building material and garden supply. [c]Spending on Other and Inventory Resale fell under IMPLAN category 19-Support activities for agriculture and forestry. [d]Spending on Fuel fell under IMPLAN category 115-Petroleum refineries

Power, structural, and technical systems formed the next category and aligned with the IMPLAN sectors of 31-Electric power generation, transmission and distribution, 186-Plate work and fabricated structural project manufacturing, and 417-Commerical and industrial machinery and equipment. The group combined SAE project data from Energy (power), Fabrication, and Repair/maintenance entrepreneurial activities. Total spending was $7,355 with students spending the most money on Maintenance, $5,165, and Supplies, $937. Table 13 illustrates spending by students participating in Power, structural, and technical systems projects.

Table 13

Statewide Spending in Power, Structural, and Technical Systems Industries

	Supplies[a]	Maint.[b]	Other[c]	Paid work exp.[d]	Comm fees[c]	Fuel[e]	
IMPLAN sector	329	417	19	186,31	19	115	Total
31-Electric power	$0	$0	$0	$700	$0	$0	$700
186-Fabrication	$369	$95	$412	$15	$1	$90	$982
417-Machinery	$568	$5,070	$0	$0	$0	$35	$5,673
Total	$937	$5,165	$412	$715	$1	$125	$7,355

[a]Spending on Supplies fell under IMPLAN category 329-Retail-General merchandise. [b]Spending on Maintenance fell under IMPLAN category 417-Commercial and industrial machinery and equipment repair and maintenance. [c]Spending on Other and Commercial Fees fell under IMPLAN category 19-Support activities for agriculture and forestry. [d]Spending on Paid Work Experience fell under IMPLAN categories 186- Plate work and fabricated structural product manufacturing and 31-Electric power generation, transmission, and distribution. [e]Spending on Fuel fell under IMPLAN category 115-Petroleum refineries

Leadership, Education, and Communications formed the final category and aligned with IMPLAN sector 391-Elementary and secondary schools. This group examined Personal growth, Career success, and Student development SAE projects and students' total investment was $57. Collectively, student spending for this sector was restricted to Feed, $37, and Other, $20 as reported in Table 14.

Table 14

Statewide Spending in Leadership, Education, and Communications Industries

	Feed[a]	Other[b]	
IMPLAN sector	69	329	Total
391-Elementary, secondary schools	$37	$20	$57
Total	$37	$20	$57

[a]Spending on Feed fell under IMPLAN category 69-All other food manufacturing. [b]Spending on Other fell under IMPLAN category 329-Retail-General Merchandise

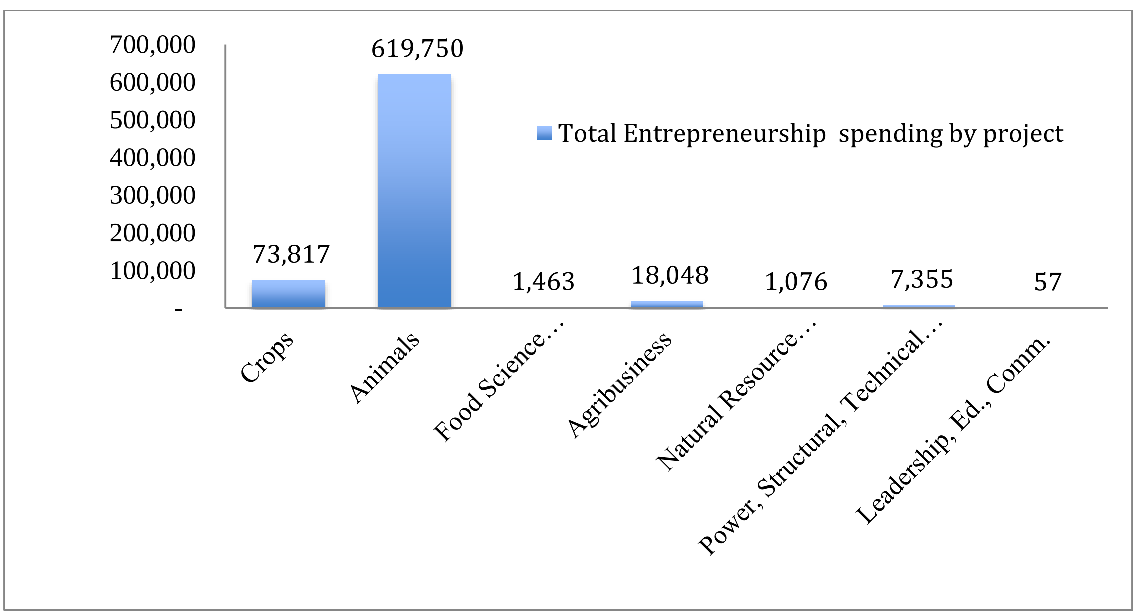
To summarize the entrepreneurship project spending data results, Arizona high school students spent $721,566 while participating in ownership activities during 2012-2013. Animal related projects comprised the greatest spending and represented 85.9% of total project expenditures. Crop related project spending followed with 10.2% of total spending. The breakdown of industry sector spending follows in Table 15.

Table 15

Entrepreneurship Project Spending by Industry

Industry name	%	Total spending
Animals	85.90	$619,750
Crops	10.20	$73,817
Agribusiness	2.50	$18,048
Power, Structural, Technical Systems	1.01	$7,355
Food Science Research, Emerging Technology	.20	$1,463
Natural Resource Systems, Environmental Systems	.15	$1,076
Leadership, Education, Communication	.03	$57
Total	100.00	$721,556

Figure 2. Chart of Entrepreneurship Project Spending



Note: Chart represents data shown in Table 15

Objective 3

Describe the average income from entrepreneurial SAE sales and placement SAE paid and unpaid hourly wage equivalents for each agricultural industry.

Entrepreneurial income comes from financial transactions during the life of a project such as livestock show sales, market sales, and crop and produce sales after harvesting. Total entrepreneurial project income for all 1,287 projects totaled $1,442,870 and average income per project equaled $1,113. Top five producing industries by IMPLAN sector included 1-Oilseed farming (Grain crops) at $545,284; 19-Support activities for agriculture and forestry (Beef-commercial and registered breeding) at $372,534; 14-Animal production, except cattle and poultry, and eggs (Swine-market, commercial, and registered breeding) at $222,700; 391-Elementary and secondary schools (Education, Personal Growth, Career success, and Student development) at $114,367; and 11-Cattle ranching and farming (beef-market cattle) at $104,936. A complete picture of statewide industry sales is found in Appendix D.

Placement outcomes include money received from a work experience, usually in the form of a paycheck, or recorded unpaid time. Unpaid time was valuable as described earlier and while the student did not benefit from income earned, unpaid hours could have been applied to award applications on the state and national FFA level. Time investment by student workers increases industry output, gross final sales, and thus influences income, spending, and employment. For the purposes of the study, logged unpaid hours were added to paid wages and totaled prior to entry into the IMPLAN economic model. The 434 projects were reduced to the equivalent of 108.5 full-time equivalent jobs given the methodology described in Chapter 3. In review, assumptions were made and a calculation of division was performed to convert the total 434 recorded student placement projects to an estimated 108.5 full-time workers. Total placement project wages for all 434 projects totaled $353,108 with average income per project totaling $813.61. Placement projects with the largest incomes included forage crops, sales, service, repair/maintenance, and food science. Placement projects with the highest student participation included Food science with 46 projects, Repair/maintenance with 36 projects, and Sales with 35 projects.

Objective 4

Describe the economic impact of entrepreneurial and placement SAEs on Arizona in terms of direct effects, indirect effects, and induced effects.

Economic modeling in IMPLAN created financial impact numbers that told the story of the effect of SAE projects on the Arizona economy. The unit of measurement was defined as the state of Arizona. The researcher shocked the IMPLAN model with employment figures and income dollars for placement projects and spending dollars and income dollars for entrepreneurial projects for each affected industry. Tables 16-21 illustrate the economic impact for aggregated industrial sectors affected by placement and entrepreneurship projects.

Students working in placement SAEs across the state of Arizona resulted in the equivalent of 108.5 jobs that were related to the number of projects completed. Total output effect was $20,338,404 with the creation of 166.4 jobs, an additional 57.9 jobs, 53.36% above the 108.5 originally entered. As seen in Table 16, estimated annual labor income rose to $3,804,083.20 from the initial input of $353,108, representative of original placement project incomes across the region. Corresponding total output was found to be $20,338,404, an increase of 56.18% beyond the initial direct output of $13,022,031. This placement project income total output effects represented 95% of the study’s total output generation.

Table 16

Placement SAE Income Impact Run

Impact type	Employment	Labor income	Value added	Output
Direct Effect	108.5	$1,414,364	$3,200,622	$13,022,031
Indirect Effect	37.4	$1,509,401	$2,518,964	$4,684,761
Induced Effect	20.5	$880,318	$1,589,218	$2,631,612
Total Effect	166.4	$3,804,083	$7,308,843	$20,338,404

Entrepreneurship project spending on inputs totaled $721,566 and represented gross spending by students to conduct 1,287 projects during the study year. The effects of this spending are illustrated in Table 17. When analyzed for statewide impact, the annual direct effect of this spending created 11.1 jobs, labor income totaled $306,193.80, with $293,214.30 value added and total output of $685,304.20. The total effect, direct + indirect + induced effects, of student spending on entrepreneurial projects revealed a statewide impact of 14.8 annual jobs, labor income of $470,377.60, value added of $584,522.80 with total annualized output of $1,225,245.20.

Table 17

Entrepreneurial SAE Spending Impact Run

Impact type	Employment	Labor income	Value added	Output
Direct Effect	11.1	$306,193.80	$293,214.30	$685,304.20
Indirect Effect	1.2	$55,011.00	$94,201.00	$213,708.70
Induced Effect	2.5	$109,172.90	$197,107.50	$326,232.30
Total Effect	14.8	$470,377.60	$584,522.80	$1,225,245.20

Industries most affected in terms of job creation by entrepreneurial project expenditures included support activities for agriculture and forestry, real estate establishments, food services, and other animal food manufacturing. These results, reported in Table 18, make sense because the greatest spending categories align with the industries that realized the greatest employment gains.

Table 18

Top Ten Employment Sectors Affected by Entrepreneurial SAE Spending

Sector	Description	Total employment	Total labor income	Total value added	Total output
19	Support activities for agriculture and forestry	10.0	$266,553.10	$214,388.10	$287,113.30
360	Real estate establishments	0.4	$4,556.60	$34,976.90	$51,151.70
413	Food services and drinking places	0.3	$7,275.50	$10,496.30	$18,752.10
42	Other animal food manufacturing	0.3	$16,315.40	$32,920.00	$306,487.50
11	Cattle ranching and farming	0.3	$3,204.70	$7,766.10	$45,351.30
323	Retail stores-Building material and garden supply	0.3	$9,608.90	$13,368.50	$19,579.90
319	Wholesale trade businesses	0.2	$16,765.80	$29,312.40	$39,241.90
379	Veterinary services	0.2	$4,828.10	$5,494.20	$9,424.40
394	Offices of physicians, dentists, and other health practitioners	0.1	$11,247.10	$11,598.80	$17,984.10
397	Private hospitals	0.1	$8,448.60	$9,385.60	$17,016.30

The total profit (gross income minus spending) student's earned from conducting entrepreneurship projects was $742,902. This direct factor change had a total direct effect on the Arizona economy of $685,486. The monetary effects on industries across the state can be viewed in Table 19. Since this impact report was calculated as a *Labor Income Change*, the results are summarized for induced effects; no direct or indirect effects were calculated. Total induced effects resulted in the creation of 5.1 jobs with labor income of $220,116, value added of $397,306.

Table 19

Entrepreneurial SAEs: Profit Impact Run

Impact type	Employment	Labor income	Value added	Output
Direct effect	0.0	0.00	0.00	0.00
Indirect effect	0.0	0.00	0.00	0.00
Induced effect	5.1	$220,116	$397,306	$685,486
Total effect	5.1	$220,116	$397,306	$685,486

Note: Induced effects were only produced as profit from all study SAEs was entered as labor income change impact scenario.

Industries that benefitted the most in terms of job creation from this analysis were food service and drinking places, real estate establishments, health offices, private hospitals, and retail stores. Students spent their entrepreneurial project income in these industry sectors as a result of total monies earned from their SAE experiences as shown in Table 20.

Table 20

Top Ten Employment Sectors Affected by Entrepreneurial SAE Profit Impact Run

Sector	Description	Total jobs	Total labor income	Total value added	Total output effect
413	Food services	0.8	$18,730.90	$27,023.00	$48,227.70
360	Real estate	0.5	$5,495.40	$42,183.10	$61,690.40
394	Offices of doctors, dentists and health services	0.4	$32,229.40	$33,237.40	$51,534.90
397	Private hospitals	0.3	$24,408.70	$27,116.00	$49,161.70
329	Retails stores - general merchandise	0.3	$7,302.90	$12,478.20	$16,107.30
319	Wholesale trade	0.2	$19,196.70	$33,562.60	$44,931.80
324	Retails stores - food, beverage	0.2	$8,170.50	$10,849.70	$15,129.40
356	Securities, commodity contracts, investments, and related	0.2	$5,367.70	$5,699.00	$29,631.00
398	Nursing, residential care	0.2	$6,672.60	$7,692.60	$11,977.00
320	Retail stores - motor vehicles and parts	0.2	$8,953.40	$11,184.70	$15,594.00

The economic impact of the 1,721 projects analyzed during the study was calculated. The impact from placement wages, entrepreneurial spending, and entrepreneurial project income, were summed. The impact of students working and earning wages in placement projects resulted in a total regional output effect of $20,338,404. The impact of student's spending money on entrepreneurship project resulted in total sales effect of $1,225,245.20. The impact of student's earning a profit from their entrepreneurial projects and spending their new income in the regional economy resulted in total output effect of $685,486. By adding the three totals, an estimated total effect of all students' spending and earning was determined to produce a total effect of $22,249,135 as illustrated in Table 21. It is important to note that the bulk of the economic impact was due to placement project wages and the assumptions made about the productivity of student workers.

Table 21

Total Economic Impact of SAEs on Arizona

Project types	Total project output
Placement project output effect from wages	$20,338,404.00
Entrepreneurship project output effect from spending	$1,225,245.20
Entrepreneurship project output effect from profit	$685,486.00
Total economic output effect	$22,249,135.00

Multipliers are used in impact analysis to assess relationships in a regional economy. Day (n.d.) stated that backward linkages trace sums of impacts back through an industry's supply chain. Type II multipliers were applied in this study and were calculated by dividing total employment or sales output by direct employment or sales effects. The employment multiplier for SAE placement projects in Arizona was 1.53, calculated by dividing the total effect of 166.4 jobs with the direct effect of 108.5 jobs found in the employment column of Table 16. Adjusted results indicate that for every four placement projects an additional .53 jobs were created during the study year. Simply, the findings showed that for every eight placement SAEs in Arizona a new job was created.

The Type II output multiplier for entrepreneurship spending was calculated by analyzing the figures in the right hand column of Table 17. Gross sales total output of $1,225,245.20 was divided by the direct sales output of $685,304.20. The resulting output multiplier was found to be 1.79. This means that for every $1 spent in the study economy due to entrepreneurship SAE spending, an additional $0.79 of sales was produced.

CHAPTER 5: CONCLUSIONS

Summary of Procedures

The design of this study was quantitative and descriptive and sought to describe the impact of entrepreneurial and placement SAEs on the Arizona economy. To meet the study's four objectives, a population of 9th through 12th grade agricultural education students was selected. A census of qualified subjects within the population was determined to be most effective in capturing economic impact data. Subjects within the population who chose to keep electronic records of their SAEs in the AET became the subject's population. As a result, the findings could not be generalized to all Arizona agricultural education students. To simplify the study process the statewide Arizona economy was defined as the unit of measurement. Data were collected from the Arizona Association FFA and the Agricultural Experience Tracker. Analysis took the form of descriptive statistical calculations and economic modeling in IMPLAN, an economic input-output analysis tool.

A data set of financial entries of 1,721 SAE projects entered by students in the selected study population formed the foundation for the study analysis. Modeling in IMPLAN for both entrepreneurial and placement SAEs involved manipulating the data set, aligning the assigned AET codes with the NAICS industry sector codes, and aggregating the resulting sectors into IMPLAN sectors. Once the 25 IMPLAN sectors affected by SAE project spending and income were created, a year 2013 model for Arizona SAE projects was established. Three key sets of financial data were analyzed. First, placement project employment and income numbers were entered per industrial sector. Second, entrepreneurship project spending habits were grouped to match seven widely recognized SAE project categories and then aggregated financial data were entered into the IMPLAN model. Expenditures within each category affected a varying number of suppliers, each with their own IMPLAN industrial sector classification code. Third, total profit was calculated for the 1,287 entrepreneurial projects (income minus expenses) and entered into an IMPLAN activity. Each of the three sets of data was then analyzed through the IMPLAN software to produce direct, indirect, and induced effects from which Type II multipliers could be extracted. In the end, economic impact numbers told the story of the ripple effect of student investments (sales income, spending, and wages) on the Arizona economy.

Summary of Findings

The study provided statewide Arizona economic impact data for entrepreneurial and placement SAEs to support the experiential learning mission of agricultural education. SAEs were infused early on in the history of vocational education to further the economic boost that resulted from career skill training coupled with academic rigor that was made available to all students. These real-world learning opportunities transferred classroom knowledge to the world of work and are applications of Dewey's experiential learning theory and the FFA's *learning by doing* mantra (Dewey, 1963; National FFA, 2013). Teaching students to connect problem-solving and goal-setting skills to meaningful workforce skills, SAEs encourage participants to become responsible and productive citizens in the pursuit of careers in agriculture. Dewey's theories are thus integrated into this study as students who recorded financial data in the AET reflected on their projects and completed the experiential learning circle articulated by Kolb (Baker, Robinson & Kolb, 2012; Dewey, 1990).

The second theoretical pillar of the study, Leontief's input-output economic model, paralleled the SAE recordkeeping by Arizona's agricultural education students. Like recordkeeping in the AET, IMPLAN analyzes monetary changes tracked by the flow of products and services between industries, households, and governments in a local economy. The findings demonstrate that SAE projects do have an economic impact on the Arizona economy.

Direct financial effects of SAE projects in Arizona were $721,566 due to entrepreneurship project spending and $353,108 due to placement project wages. These numbers indicate the initial spending or earned wages by the primary industries that experienced economic change as a result of SAE projects. Indirect effects, local spending that resulted from inter-industry spending because of backward linkages, were also reported. Indirect total output effects for entrepreneurship project spending were $213,708.70 and $4,684,761.00 for placement projects wages earned. Finally, induced effects, taken into consideration by Type II multipliers used in this study, were the result of a company in an economic region being affected by new spending in that region. The company's employees have more or less income to spend in the region (Beattie, 2004) as a result of monies earned or invested in SAE projects. Induced effects were $326,232.30 from entrepreneurship project spending and $2,631,612 from placement project income throughout the state of Arizona.

Placement SAEs, such as a student working in a retail farm supply store, generated an estimated $1,414,364.10 in annualized labor income. Labor income was defined as employee compensation plus proprietor income. These wages were estimated to produce 57.9 new jobs above the initial 108.5 adjusted placement projects. Total induced effects of $2,631,612.10 and total annual output of $20,338,404 were estimated from placement income. The Type II employment multiplier for placement projects was 1.53. When adjusted for the part-time nature of placement projects, the study revealed that for every eight placement projects, one additional job was created in Arizona.

Entrepreneurial SAEs were analyzed in terms of the influence of student spending during the study year. Sales totaling $721,566 from entrepreneurship project spending in the Arizona economy produced $1,225,245.20 in total outputs. The Type II output multiplier for entrepreneurial sales was 1.79, meaning that for every $1 spent from entrepreneurship SAE gross sales, an additional $0.79 of economic sales were produced in the region.

Finally, the study showed that the effect of student's earning profit from entrepreneurship projects and then spending their income in the regional produced $658,486 in direct economic impact effect. This resulted in the creation of 5.1 new jobs per year, $220,116 in total labor income, and $397,306 in total value added effect. The impact of spending and income of student's participating in both placement job experiences and entrepreneurship ownership ventures, resulted in a total economic ripple effect of $22,249,135. In sum, findings were determined through use of descriptive statistics, analyses of Arizona Association FFA Annual Report demographic and enrollment data, and input of the financial data contained in an AET data set into an IMPLAN scenario. Findings show how the ripple effect of experiential learning projects in Arizona, entrepreneurial and placement SAEs impacted the state's economy during 2012-2013.

Conclusions by Objective

Scenarios were analyzed in IMPLAN and results were examined to meet the study's four objectives. Appraising the results in relation to the study objectives of demographic information, enrollment figures, spending and income, and computations of economic impact through IMPLAN allowed the researcher to form conclusions. Economic conclusions are based on assumptions that the study produced gross effects. Conclusions are stated to explain findings that point toward implications for educational applications, followed by recommendations for each of the study objectives. This study's conclusions support the existence of SAEs as part of a balanced curriculum within the three components of agricultural education. Results coincide with results from related research and demonstrate that Arizona SAEs do show a sizeable economic impact on the state (Hanagriff, 2010; Harrison, H.D., Earnest, D., Grehan, L., Wallace, J., 2006; Retallick & Martin, 2005).

Objective 1

Describe the demographic characteristics of Arizona agricultural education programs in which students have kept SAE records in AET in terms of student demographic characteristics – sex, grade level, ethnicity, school location, total enrollment in agricultural education programs, and total student participation numbers for entrepreneurial and placement SAEs.

The number of SAE projects students completed declined the most between tenth and eleventh grades, dropping by 759 projects from 2,160 to 1,401. This downward trend continued as participation numbers fell from 2,187 in the 9th grade population to 950 projects in 12th grade. These findings contrast with related literature from an Oregon work-based learning impact study. That study discovered that participation in income generating activities within AST or FFA chapter programs were most frequently reported by juniors and seniors while sophomore and freshman participation was less (Cole & Connell, 1993).

The three highest SAE participation categories of Animal Systems, Power Structural Systems, and AgriScience had similar enrollment numbers, all totaling over 1,000 projects. Participation results are similar to results found in a Georgia SAE study (West & Iverson, 1999) where animal and crop projects were the most prevalent. Results deviated from SAE participation findings from a 1999 Missouri study (Stewart & Birkenholz). That study found that placement programs in agribusiness and production were the most frequently reported types of

SAE while ownership projects in beef and swine were ranked three and four in terms of participation. The next four categories of Plant Systems, Natural Resource Systems, Food Product and Processing Systems, and Environmental Systems had participation totals that dropped off noticeably. Biotechnology Systems had zero projects completed during the study period. While findings are not exactly comparable, several related studies showed that a few top projects contained the strongest participation numbers while remaining projects, related to each state's agricultural and geographic conditions, sharply declined (Stewart & Birkenholz, 1999; West & Iverson, 1999).

Statewide participation between females and males was about equal when overall agricultural enrollment was examined. Distribution was fairly balanced between the sexes across ethnicities, with the exception of Asian and Pacific Islander students. This finding illustrates a positive trend in Arizona agriculture, as comparatively more females were involved with agricultural education than the state average of female principal farm operators that stood at 38.5% in 2007 (USDA, 2012). More Asian males, 57.6% (n = 38), compared to Asian females, 42.4% (n = 28), participated in a SAE. Meanwhile, the reverse was true for students identifying as Pacific Islander as more females, 80% (n = 4), participated in SAEs than males, 20% (n = 1), during 2012-2013. The majority of Arizona students participating in SAEs identified as white, 64.71%, or Hispanic, 21.95%.

Students living in study-defined rural areas had greater participation levels at 1,033 or 59.71%, than suburban, 675 or 39.02%, and urban areas, 22 projects or 1.27%. This finding compares to results reported by the AAAE (TeamAgEd, 2007). The AAAE reported that of the 4.07% of FFA chapters in Arizona, 48.6% were located in small town and rural areas, 27% in suburban and second city schools, while 21.6% were in urban schools (TeamAgEd, 2007). On a national level, the same report stated that while 54% of all U.S. schools are located in small town and rural areas, 84% of all FFA chapters reside in these same schools. Finally, three times more students selected entrepreneurial projects than placement projects at 74.8% (n = 1,287) to 25.2% (n = 434). This finding reflects results from a similar study in Georgia where 49.8% of students completed entrepreneurship projects and 25.8% completed placement projects. The other 24.4% completed improvement projects, a category of SAEs not considered in this study (West & Iverson, 1999). These findings are in contrast to a 1999 Missouri SAE study (Graham & Birkenholz), where ownership project participation declined by 25.5% between 1988 and 1999, while placement project numbers increased by 130%.

Implications

Implications for the demographic results of Objective 1 indicate some general trends that hold meaning across career and technical education. Project enrollment data showed that ninth and tenth graders participated considerably more in SAEs than their eleventh and twelfth grade counterparts. Thus, there is a need to examine why students in upper grades are not continuing to engage in the SAE. If the decline in SAE participation is not addressed, fewer students may obtain agriculture career-readiness skills and regional economies may not benefit from SAE project investments (Wilson & Moore, 2007).

Findings also show that the ethnic diversity found among SAE participants accurately reflected the Arizona's 2012 U.S. Census. The U.S. Census Bureau (2014) reported 57.1% of the population identified as being white while 30.2% categorized themselves as Hispanic or Latino. The ethnic diversity of SAEs differed from the percentages of principal farm operators in Arizona agriculture. In the USDA 2007 Census of Agriculture, American Indians and whites had the highest percentages at 51.7% and 42.5% respectively while Hispanic and Latino principal farm operators had a low 4.84% ranking (USDA, 2012). Therefore, this conclusion suggests a need to maintain the current well-rounded diversity in SAE participation. It implies a need to consider how to promote the SAE program to Arizona Native American populations to increase participation of this ethnic group.

Furthermore, students living in study-defined rural areas had greater participation levels than suburban and urban areas. This points toward the national historical trend of agricultural education's higher concentration in rural regions where farmland was more plentiful and the business of agriculture was handed down from generation to generation. These trends demonstrate a challenging opportunity to bridge the gap between rural and urban SAE participation. Finally, the finding that three times more students selected entrepreneurial projects than placement projects denotes a need for teachers to explore stronger local business partnerships to widen the network of job options. Since the majority of ownership projects have traditional been in production agriculture, these findings also highlight the challenges of aligning SAEs with 21st century workforce needs.

The declining trends in SAE participation throughout a student's high school career and lower representation in ethnicities other than whites and Hispanics, indicate the need to examine the effectiveness of work-based learning programs reaching all types of students in secondary education. If downsizing in educational programs with hands-on learning continues, such as the experiential learning of career and technical education programs, then a return to CTE as the *dumping ground* of education could occur (Elliot, 2007). Declining participation could lead to fewer CTE programs and a return to an emphasis on formal education at the expense of project-based learning.

An unbalanced curriculum would decrease America's ability to compete in a globally competitive workforce and would leave our students unprepared to learn the academic and technical skills required to solve critical agricultural issues such as food safety. A final concern is that if a declining SAE participation trend was left unattended, the readiness of the next generation of agriculture producers and workers in agricultural industries could remain at risk. The rising average age of farm operators, 59 years in Arizona (USDA, 2012), implies that attention needs to be paid to the promotion of CTE success stories. Communicating the economic impact of SAEs and work-based learning through demographic data is a powerful tool in showing stakeholders that CTE programs are readying a younger skilled workforce (Whetstone, 2011).

Recommendations

As a result of specific needs that arose in agricultural education because of SAE analysis along with general needs in other CTE work-based learning programs, opportunities for instructional and programming improvements exist. In order to increase SAE participation among differing grade levels, ethnic groups, and geographic areas, teachers and educational entities could implement these recommendations. National and state level FFA conventions could offer grants to schools in which SAE participation exists but no district funding is available for convention travel. At the state and national level, the AgriScience Fair competition could be expanded to include similar poster presentations for SAE projects. State level Farm Bureaus and community level Rotary clubs could be invited to speak about careers in agriculture and asked to contribute to scholarship donations to help fund SAE projects. Selecting speakers of ethnic diversity and both female and male agribusiness leaders would be another way to encourage participation across student populations.

Because findings from this study may provide meaningful SAE economic impact data to stakeholders at the Arizona Department of Education, Arizona Association FFA, and Arizona Universities, holding state-level forums on the economic impact of SAEs could prove beneficial. Policies made by these state level influencers filter down to local school districts and may affect teacher and student motivation surrounding SAE projects. As a result of state-level funding and programming directives, participants in statewide teacher-preparation programs would be better informed about the economic impact of SAEs and other CTE work-based learning experiences, such as the student run DECA store offered through marketing education.

Additionally, with updated knowledge about the effectiveness of the AET for accurate recordkeeping, agricultural education teacher-preparation programs are better equipped to instruct future teachers. Enhanced instruction may include problem-solving sessions about how to overcome SAE implementation barriers such as the lack of time for project-method instruction along with the lack of accounting knowledge to assist students with accurate financial recordkeeping. As a result, there is an opportunity in collegiate CTE teacher-preparation programs to improve excitement and motivation for SAE participation. There is a need to implement similar financial recordkeeping in other CTE programs where students have opportunities to learn skills that lead to certificates that improve employability, such as in automotive education.

To focus these recommended efforts at the individual school level, teachers could talk about the economic impact of SAEs with their 9th grade classes before they signed up for sophomore classes and made decisions about continuing their 9th grade SAEs or investing in new SAEs in 10th grade. Distributing marketing material to school counselors and displaying promotional material outside classrooms that highlighted student SAEs for the entire student population to view could represent an enhanced effort by teachers to communicate the authentic earning potential. Such promotional efforts may broaden SAE participation numbers among underrepresented participation groups.

Finally, there is an opportunity to bridge the gap between rural and urban participation through increased promotion in urban high schools and stronger messages from top-level stakeholders and policy makers to school administrators and teachers. Through increased promotion in urban high schools, stronger linkages between the county JTED and urban high schools could be formed. Stronger messaging from the Arizona Department of Education about the potential for students to earn profit and communities to experience economic improvement from work-based learning programs could help boost SAE participation for students living in urban and suburban areas. Practical outcomes of this messaging may include allocation of funding for on-campus greenhouses and research labs where students can conduct SAEs on site. Such outcomes reduce barriers such as cost for students to invest, time for students to travel to off-site farms or job sites, and time for teachers to travel to supervise.

Objective 2

Describe the average spending on inputs for each agricultural industry related to entrepreneurial and placement supervised agricultural experience projects.

Students spent $721,566 to participate in entrepreneurship projects during one year from July 2012 to June 2013. While placement project spending was also tracked and totaled $35,840, it was only included in the net profit analyses to meet objective four. Expenditures by students who conducted animal related entrepreneurship projects consumed the greatest investment of $619,750, followed by crop projects at $73,817. SAE spending followed state patterns as released in the 2010 Arizona Agricultural Census. SAE spending for specific crop projects such as hay, grain, cotton, and forage crop farming mirror the higher value of production dollars for those commodities in Arizona. Similarly, SAE animal related project spending for beef and swine ventures match two of the top three livestock inventory figures for Arizona as reported in 2011 (USDA, 2012). Meanwhile, equine project spending was the third largest consumer of student funds and the equine industry is rarely reflected in Arizona agricultural reports.

Implications

The findings that met Objective 2 suggest several trends that hold meaning across career and technical education. Of particular interest was the finding that animal-related projects generated the overwhelming majority of spending by students conducting entrepreneurial ventures. Thus, questions of how to help students spend smarter to reduce risks of investment loss and how to increase investments in other types of projects arose. Greater spending on animal related projects in this study of Arizona SAEs corresponded to results of studies in Texas and Iowa. Research in a Texas SAE economic impact study (Hanagriff, Murphy, Roberts, Briers, & Lindner, 2010) showed similar outcomes, as the investment cost was highest for animal and crop projects. However, although this spending implies these projects cost more, it also implies that these industries have the potential to produce greater income streams. SAE spending, for the most part, accurately reflected spending patterns by top producing Arizona agricultural industries.

Even though animal and crop projects may yield larger profit, several project categories within these costly groups experienced a net profit loss during the study year. For example, although the 78 equine projects, equivalent to 19.5 jobs, yielded a solid profit of $77,544, expenses were high at $117,544, for a net loss of $40,286. The largest expenses were feed, other, and inventory resale. To encourage greater participation in equine projects, an industry estimated to have over a $1 billion economic impact in Arizona (Beattie, Teegerstrom, Mortensen, & Monke, 2001), there is a need to discover what is included in the category named Other and to determine how spending on equine projects could be reduced.

Recommendations

To help students spend smarter and reduce financial risk, agricultural education and other CTE programs can utilize electronic more effectively. By reporting more detailed levels of expenditures, accuracy of spending records can increase and a greater understanding of overspending and losses become clearer. If spending entries tracked in the AET, for example, were aligned with IMPLAN sectors before students established their SAE, the economic impact scenario performed may show that animal sector spending was more evenly dispersed across industries. The direct result of students spending in their local economies must be accurately captured and results communicated to local businesses. As a part of a student's SAE efforts, an abstract of their yearly results could be created from financial reports already built into the AET. These financial results could be analyzed through IMPLAN and students could be responsible for publishing the results in a local newspaper or creating a brochure to distribute to related businesses in the area.

Objective 3

Describe the average income from entrepreneurial SAE sales and placement SAE paid and unpaid hourly pay equivalents for each agricultural industry.

Earnings by students as owners of agriculture or agriculture-related businesses, or proprietor income from entrepreneurship projects, totaled $1,442,870. Income from these SAEs mainly came from the three top industries of hay and grain farming (oilseed crops), beef (support activities for agriculture) and swine production (animal production). Employee compensation earned in placement projects equaled $353,108. Placement projects with the largest incomes included forage crops, sales, service, repair/maintenance, and food science.

These findings both support and deviate from facts about the value of 2010 Arizona agriculture production (Arizona Department of Agriculture, 2010; Arizona Farm Bureau, 2012). Top agricultural crop commodities included lettuce, cotton, and hay, according to the USDA statistics (2010). While vegetable crops do not make the top of the SAE project list, oilseed crops that included cotton and hay seed sales, top the entrepreneurial project list and forage crops, primarily hay, top the source of wages for placement projects. Receipts from cattle, calves, and dairy goods comprise Arizona's most valuable farm products that are partially reflected in beef projects ranking second in entrepreneurial income sources for SAEs. Conversely, SAE project income results do not reflect the fact that 20% of Arizona state farm receipts are from dairy. Similarly, SAE projects do not reflect that lettuce, other leaf vegetables, and fruit production are among the reasons why Arizona is ranked 2nd nationally in this category (Arizona Department of Agriculture, 2010).

Implications

Findings from Objective 3 suggest that SAE programs contain both similar and different statistics than actual trends in Arizona agriculture. A key assumption of the study concerned student productivity in placement projects. There is a need to examine how employment and total output effect are affected by liberal or conservative adjustments of student employment productivity. As is, the study assumed four placement projects equated to one full-time job.

Another topic of inference includes student income as compared to student participation. To continue to support SAE crop projects with large income-potential such as grain, oilseed, cotton, and forage farming, the fact that only a relatively few number of students participate needs to be examined. Alternatively, Arizona top agricultural crop commodities, crop exports, and value of farm production dollars should be accurately reflected in top producing SAE projects. For instance, Yuma, Arizona is the winter lettuce capital of the world and lettuce production from the state ranks second nationally (Arizona Farm Bureau, 2012). However, of the eighty-eight projects conducted by Yuma area high school students, only one was focused on vegetable production. It could be that since the leafy green industry was not well represented in this study, there is an opportunity to investigate the reasons behind lower lettuce-based SAE participation, especially in the Yuma area. Aligning career preparation programs with industry economic trends produces opportunities for greater industry support that in turn could boost SAE employment and investment experiences for CTE students.

Positive revenue streams from SAE projects indicate that these experiential learning opportunities support the positive trend in American agriculture. A USDA Accomplishments report by Tom Vilsack, current U.S. Secretary of Agriculture, reported that net farm income rose $29 billion from 2008 to 2012 and that American agriculture is responsible for one in twelve jobs, providing U.S. consumers with 80 percent or more of the food consumed (2013). These facts underscore the vital importance of job preparedness and work-based learning scenarios that lead to immediate profit outcomes and increased future earning potential and job placements in agriculture for Arizona students.

Recommendations

In practice, for-profit experiential learning programs such as SAEs and other CTE work-based learning programs can benefit from economic impact study results. The primary recommendation for this objective is for increased public relations of study results to stakeholders. Communication of income results can encourage stakeholder support and student participation as it highlights the earning potential afforded by SAE projects. Income from sales and wages can also be used to inform a region's business community of the economic ripple on the economy that can result from SAE investments.

The concern stated in the implications about student worker productivity can now be addressed. IMPLAN is a linear input-output economic modeling tool. If research showed that student workers were working more hours than the 10 hours per week assumed for this study and were as productive as full time adult workers, a different ration of projects to employment would affect total output numbers. If it was discovered that students were not working an average of 10 hours per week or they were less projective than assumed, a more conservative total output were result. For example, if students were half as productive as assumed in this study, the total output effect would be reduced by 50 percent, from about $20 million to $10 million. The inverse is true. If students were 25 percent more productive than assumed, then total output effect would be increased by 25 percent, from about $20 million to $25 million.

Furthermore, the realization of how SAE projects correspond to Arizona agriculture can help teachers focus on differences and strengths. Differences between SAE project impact and Arizona agricultural production impact arise in crop production projects like lettuce, vegetables, and fruit. Teachers can also highlight areas of strength, like strong SAE sales within the beef and swine industries that match the high percentage of contribution to the Arizona economy from the beef industry.

There is also a need to promote small-scale farming in Arizona to balance the trend of *big* farms. In Maricopa County, for example, most farms are less than 10 acres while less than 8% of all farms in the county are larger than 500 acres. However, statewide, larger farms totaling nearly 7% of all Arizona farms, account for about 98% of all agricultural sales (Arizona Farm

Bureau, 2012). Giving teachers resources on networking practices and business to business partnering could supplement their efforts to help students form alliances with agriculture industries. These relationships may lead to greater employment opportunities and added marketing and investing opportunities for budding entrepreneurs.

Objective 4

Describe the economic impact of entrepreneurial and placement SAEs on Arizona in terms of direct effects, indirect effects, induced effects, and total effects.

Three economic impact scenarios were calculated to reveal the impact of entrepreneurship spending, placement wages, and total SAE profit. Most entrepreneurial expenditures out of the total, $721,566, involved student spending in the sectors of 42-Other animal food manufacturing and 19-Support activities for agriculture and forestry. The indirect statewide SAE spending from entrepreneurial projects supported an additional $1,225,245.20 in gross sales (total effect plus direct effect) within the Arizona economy. The effects of entrepreneurship project income and how student's spent their earnings resulted in an economic impact of $658,486. To get the holistic picture of the potential economic impact of placement wages, entrepreneurship spending, and entrepreneurship profit was combined. Combining these totals revealed a statewide gross economic impact of $22,249,135.

In conclusion, a Type II output multiplier was calculated to be 1.79. This means that per $1.00 of economic impact from entrepreneurship SAE spending an additional $.079 of economic boost was generated. In comparison, a 2010 SAE economic impact study performed in Texas revealed a 1.80 Type II output multiplier (Hanagriff, 2010). Differing results were reported in an Oregon study that calculated a 2.87 output multiplier. However, this multiplier was a liberal estimate as many of the activities that reported income did not meet the state's input-output multiplier criteria of new money created in a community (Cole & Connell, 1993).

For every eight SAE placement projects, one new job was created in Arizona. This was extrapolated from the 1.53 Type II multiplier calculated. No existing studies were found to compare the SAE employment multiplier scenario calculated in this study.

Implications

Direct, indirect, and induced effects from SAE projects supported annualized employment and monetary gains within a variety of Arizona industries. This finding alone creates a strong case for increased support of SAEs and other work-based learning programs within CTE. Findings suggest that SAE investments and increased employment, labor income, and industry output are related. In the final analysis, SAE projects contributed to the statewide economy but a number of practices could be considered to augment lagging participation numbers and increase AET recordkeeping usage and accuracy in future years. There is a need to improve documentation accuracy. Correctly transforming AET records to IMPLAN industry sectors was a study challenge and is noteworthy. The proper assignment of SAE project spending and income to IMPLAN sectors would improve future study's reliability. Accurate documentation of SAE records and ensuing economic reports and impacts on local and state economies could serve as a model for other CTE programs, Cooperative Extension, and county 4-H programs.

Recommendations

Greater SAE participation by students would further the ripple effect of future SAE participation and economic impact across Arizona communities. One way to increase student participation is by establishing more standardized and robust teaching units on SAE recordkeeping in the AET. Already included in some Arizona collegiate teacher-preparation programs, the AET unit could be expanded to ensure future teachers understand the economic and accounting principles behind the projects that are essential to accurate SAE reporting. Perhaps all agriculture teachers-in-training need to take an agribusiness and economics class and participate in SAE equivalent scenarios under the guided practice of experienced instructors. Stronger teaching units provide tools for teachers in training to use SAE recordkeeping and AET software (Retallick & Martin, 2005). The Handbook on SAE stated the success of SAE is largely influenced by teacher attitudes and expectations (Barrick, et al., 1992). And, according to the Arizona Agriculture Teachers Association (2014), a central goal is a competency-based curriculum in agriculture that includes, among other skills, development of applied academics and financial management.

Another way to encourage teacher confidence with the AET is by connecting teachers with colleagues who have identified themselves as AET experts. Teachers who list themselves as resources on the AET site could more proactively assist with correct AET set up and get students excited about how best to use the software, thus lessoning the recordkeeping barrier. Incorporation of the *Explore AET* website in classroom teaching lessons, published by the AET in 2014, could aid in the explanation of sound record keeping methods and provide a truer understanding of investments and expenditures by teachers and students. Use of new tools now built in to the AET for state and national level FFA awards and wider use of the Agricultural Career Network may generate excitement and increase motivation for SAE participation. National and regional in-services featuring AET training for teachers during the national AAAE convention, regional AAAE conventions, and during the ACTE and ACTEAZ conferences could also support increased adaptation of the AET by more teachers in more states. These in-service sessions would be conducted with the intent of raising the knowledge of current AET adapters and creating teacher-ambassadors equipped to offer their colleagues AET support in their home state.

Another barrier to SAE implementation is cost. Students may be discouraged by investment requirements. And, programs may lack funding to create a balanced agricultural education program and build a strong SAE component. The National Association of Agriculture Educators (NAAE) is a 7,800-member organization whose members advocate for agriculture teachers and programs. Since a portion of federal funding for CTE comes from annual approval of Perkins funding appropriation bills, the NAAE could offer continuing education credits (CEUs) for teachers to take action after attending policy advocacy seminars. Action by teachers could come in the form of contacting their state's Member of Congress, like Senator Jeff Flake in Arizona, to ask for support of Perkins program funding (Jackman, 2011).

Increased funding at the state and federal level for SAEs and work-based learning could also result in advanced teacher-training programs in the form of collaborative financial reporting in-services. In 2001, the AAAE adopted a *National Standard for Teacher Education in Agriculture* that included a professional knowledge standard of business, management, and economic systems. Offering continuing education credits for attending collaborative in-service projects among a diversity of CTE teachers could be implemented in fulfillment of this professional standard. In doing so, the collective brainpower of teachers from various CTE would be used to problem-solve recordkeeping and economic challenges particular to a district. Opportunities to work together often yield more effective and efficient results. Heightened teacher training would aid in more accurate and complete record keeping on the student level, as increased teacher knowledge would increase students' financial acumen.

To overcome the barrier of student cost, especially in animal related projects, increased business partnership development with animal producers and support service providers could encourage more support from local companies. This is key to increasing placement opportunities in a school's local community and promoting awareness of students' local spending habits. More grants or an increase in grant funding through the annual SAE Grants program managed by the National FFA Organization and in-service teacher training may increase entrepreneurship and placement project motivation by teachers and thus boost student participation. Communication of this study's economic impact and return on student investment may also serve to heighten awareness and motivation for teacher and student involvement.

The robust AET software offers students a component of the hands-on learning experiences championed by Dewey's experiential learning theory. A grant program for the 2014-2015 school year was launched by the AET to reward outstanding AET usage. This AET Program Improvement Grant for AET users will award around 20 winners with program-level financial assistance an average of $1,000 (The AET, 2013).

A few adjustments to the AET design could allow for simpler and more accurate alignment with IMPLAN tools. As mentioned in the implications, the improvement of study accuracy can be improved if AET categories were mapped to NAICS and IMPLAN sectors. Assignment of SAE financial spending and income figures to the right industry better illustrates the productivity of student workers. Augmented reliability of code assignment could also improve the acceptability of a study's economic impact direct, indirect, and induced effects on a regional economy. If the AET would add software coding to map the current pull down options per project type and subtype to appropriate pre-determined four-digit NAICS codes, translation accuracy to IMPLAN economic modeling would increase. The teacher should provide instruction on how SAE projects match national industry codes as a part of the *Getting Started Module* available to teachers on the AET website. The more accurate the financial data entered in IMPLAN, the truer the economic impact results and more realistic the economic picture. Realistic economic projections enable stakeholders at the Arizona Department of Education to advocate for statewide policy change in support of work-based learning.

Increased SAE participation and the resulting ripple effect of student spending and income could be used to make a stronger case for work-based learning in career and technical education and can be assisted by more widespread SAE economic impact results. Experiential learning efforts are realized through agricultural education, marketing and business education, and automotive education programs. Research by Bassi and Ludwig (2000) highlighted the benefits and costs of school-to-work (STW) programs in the U.S. Training costs were reported as the largest barrier to companies considering hiring student workers. Conversely, the increase in a skilled labor force and decrease in employee training costs were the largest benefits to these companies. The SAE program, where the training responsibility falls to teachers, overcomes the largest barrier reported in the Bassi and Ludwig study. Fougèrea and Schwerdt (2002) asked *why invest in human capital?* This question was answered by their research as the authors found that apprentices provide cheaper labor yet produce the same or more output than unskilled labor. Companies were shown to be more likely to invest in apprenticeship programs if an industry experienced a worker shortage and overall benefits were greater in small to medium-sized firms (Fougèrea & Schwerdt, 2002). Apprentices or students involved with unpaid work-based learning experiences benefit from these experiential learning hours in numerous ways. Chief among the benefits of authentic learning are the technical, leadership, and personal growth skills that come from time in the workplace, making meaningful connections between classroom learning and the global marketplace (Dewey, 1963; TeamAgEd, 2007).

Finally, recent studies that mine large sets of data to provide parents and students with return on investment figures for higher education prove that economic impact research is on the rise. Economic impact research helps to meet the growing demand by students, parents, and employers who are looking to better grasp the tough questions about financial outcomes from higher education in a slowly recovering economy (Peters & Belkin, 2014).

Recommendations for further research

Similar to related research, the economic impact of SAEs discovered by the researcher demonstrates a need for further research. Further research is desired to demonstrate the hands-on learning benefits of agricultural education through more regular and widespread economic impact studies that analyze SAE impact (Hanagriff, 2010; Hanagriff, Murphy, Roberts, Briers, & Lindner, 2010; West & Iverson, 1999). Stakeholders in agricultural education benefit from public relations materials that paint a reliable economic picture, as would teachers in many CTE areas (Whetstone, 2011). Funding is a matter of policy and economics and many CTE areas, in addition to agricultural education, require investment dollars and non-monetary expenses such as time and unpaid student hours to continue these experiential learning opportunities. However, it is hard for policy makers to commit monetary resources to programs that lack known returns (Hanagriff, 2010).

Hence, the need for further economic impact research to build support for CTE programs also aligns with the Association for Career and Technical Education. The ACTE reported that policymakers should support CTE programs to aid student career preparation efforts and help students understand the relevance of their school work and career skills. Creating this meaningful connection is at the center of Dewey's experiential learning theory (1963) and can "help build and sustain our economy" (ACTE, 2013a). Inclusion of experiential learning in agricultural education also fulfills a national teaching standard (TeamAgEd, 2007).

Studies that summarize existing economic impact results could be used to encourage wider IMPLAN implementation across Arizona's secondary and higher education systems. Regularly conducting economic impact studies in agricultural education across the nation would provide opportunities for state Association FFAs, Department of Educations, graduate and Ph.D. researchers to get involved, work together and share knowledge to increase teacher motivation, program funding, and community and student participation in SAEs and other work-based learning situations. Further studies could answer questions such as:

- Are student workers, like those conducting SAE placement projects, as productive as the American worker, relative to the national average? Why or why not?
- Why did the relatively small percentage of placement projects (25%) contribute 95% to the study's total output effect compared to the 5% output effect contribution by entrepreneurship projects?
- What other CTE work-based learning programs could be a positive fit with economic input-output modeling through IMPLAN analysis?
- What demographic and economic impact information would stakeholders deem valuable for informed decision-making?
- How could more local businesses take action and become involved in work-based learning programs in secondary schools?

For example, further studies could document the economic impact of other CTE work-based learning programs, such as performance of IMPLAN studies in marketing programs that capture and analyze the ripple effect of a DECA store to the local economy. Automotive CTE programs offer students a variety of certificates that can lead to quicker employment after high school graduation. Qualitative studies utilizing survey research could be conducted in metro areas in Arizona to determine if secondary CTE automotive training and certificates lead to higher employability outcomes. In turn, if positive correlations were discovered, the ripple effect of employment gains and income could be analyzed in an economic impact study.

Some economic impact studies exist for Arizona Cooperative Extension and 4-H. However, they have been fairly unstandardized so more research could be conducted. These programs, like SAEs, provide the public with educational programs based on experiential learning. Those programs within Cooperative Extension and 4-H that promote job skill development, opportunities for profit making, and chances for internships are best aligned with economic impact analysis. Research results could be used to further the organization's efforts and promote secondary agricultural education impact data findings. There could be an opportunity to conduct similar economic impact studies in county level JTED programs to reverse the downward funding trends experienced in Pima County, for instance. Reflection on how and why students enrolled in agricultural education chapters are currently using the AET could prove beneficial to further research. Using mixed methods research, future studies could help answer questions about teacher adoption rates of AET software. Survey instruments could be developed to ask teachers and students for input about recordkeeping effectiveness and barriers.

In sum, the experiential learning component does exist in SAE programs (Baker, Robinson, & Kolb, 2012). These programs are vital to achieving a balanced program within agricultural education, are key to the American agricultural industry, and are essential to prepare students to bridge the skills gap that exists in agricultural related fields in the fragile U.S. economy (ACTE, 2013c; USDA, 2010; Wang & King, 2009). The findings are consistent with related economic impact research and demonstrate that SAEs do have an economic impact on a region's economy (Cole & Connell, 1993; Hanagriff, 2010; Hanagriff, Murphy, Roberts, Briers, & Lindner, 2010; Retallick & Martin, 2005; West & Iverson, 1999).

Implications suggest a need for application of practical recommendations such as economic impact promotional material, stronger teacher-preparation units, and FFA in-services held during the annual national convention. Following these recommendations to improve the quality and availability of hands-on learning, CTE programs could realize a boost in funding and student enrollment. Greater SAE participation means larger student spending and income generation would result in a greater economic impact. With the infusion of more new jobs and new money into the local economy, better community and state level support is encouraged through awareness of SAE success. This awareness should lead stakeholders to approve funding to increase CTE teacher hiring. More teachers could increase the number of CTE classes. More classes may expand the number of student's enrolled. Expansion of student participation in work-based learning completes the cycle of a positive economic ripple effect.

This learning cycle is both economic and academic in nature and ultimately complements Kolb's experiential learning cycle (Baker, Robinson, & Kolb, 2012), built on theories espoused by Dewey (1963, 1990) and Stimson (1919). There is a critical need to supply food to the world's population and to allocate educational resources that prepare students to excel in a technological world. These needs position agricultural and career and technical education programs at the forefront of American education. Moreover, demonstration of the evidence of program effectiveness can occur through economic impact studies of entrepreneurship and placement SAEs and meets the 2011-2015 National Research Agenda of the AAAE (2010).

By taking students into the community to connect classroom learning to job skills, agricultural education fulfills its own mission (Eyler, 2009; Knobloch, 2003; National FFA, 2013) through the experiential and authentic learning that occur in SAEs. Since SAEs exist to teach students to how to turn a profit in the agriculture industry, the advancement of the individual and the betterment of the community stimulate the regional economy (Stimson, 1919). This study found that for every eight placement SAEs, a new job was created in Arizona and for every new dollar of entrepreneurship SAE spending, $0.79 of additional monetary impact was created. These findings illustrate the need to continue the traditional animal related and crop farming SAEs. They also show a need to expand food science, power and structural systems, and emerging technology SAEs for the economic and educational advancement of students and society.

"U.S. agriculture represents…the greatest single achievement in the history of mankind's struggle for food, clothing and shelter" (Roy, Corty & Sullivan, 1971, p. 18).

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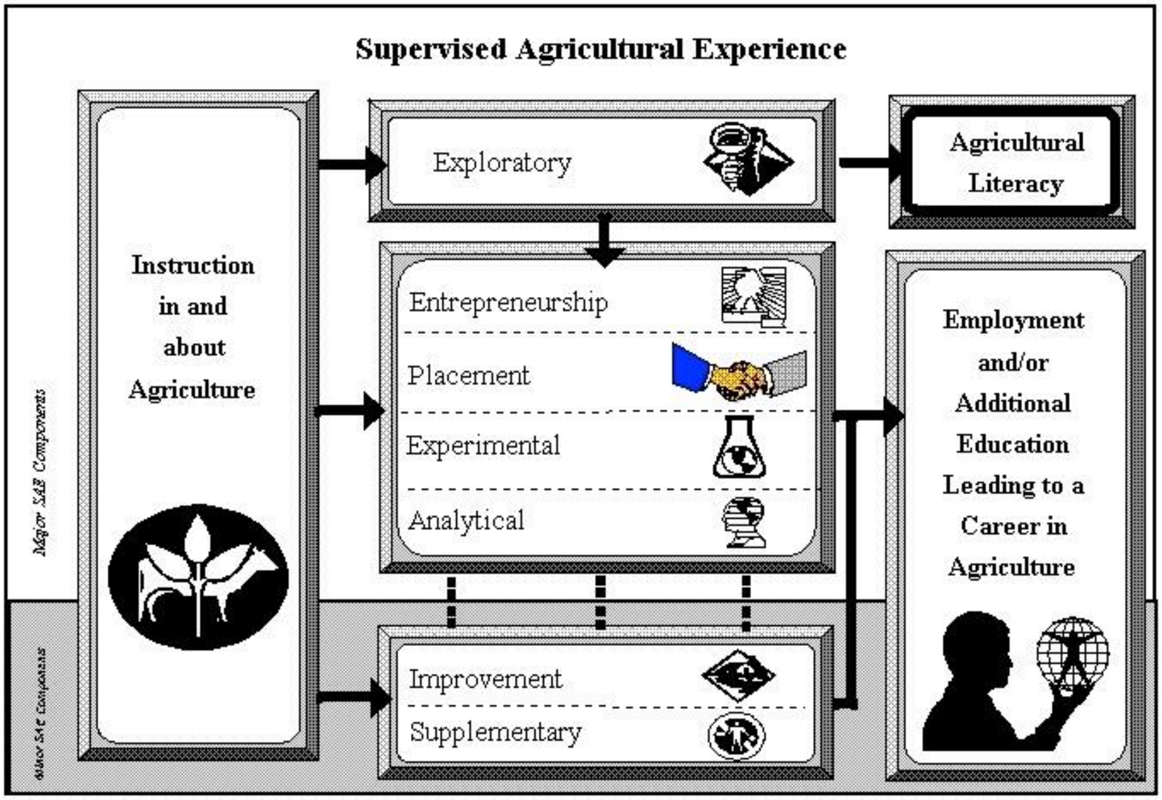
Appendix A



Note: Retrieved from STRENGTHENING AGRICULTURAL EDUCATION PROGRAMS THROUGH AN EXPANDED MODEL FOR SUPERVISED AGRICULTURAL EXPERIENCE. *The Agricultural Education Magazine*, (1993) Vol. 66, Issue 1, pages 18, 19 & 23. Gary Moore, Professor and Jim Flowers, Associate Professor, Agricultural Education Department, North Carolina State University

Appendix B

Figure 3. Code Transposition for Entrepreneurship and Placement Project Participation

IMPLAN sector	IMPLAN description	NACIS code	ID (AET)	Project description (AET)	No. of Projects	
					Entrepreneurship	Placement
1	Oilseed farming	1111	41	Grain Crops	6	5
3	Vegetable, melon farming	11121	46	Vegetable	34	9
4	Fruit farming	1113	47	Fruit	5	3
6	Greenhouse, nursery, and floriculture production	111421	49, 50	Nursery Operations; Floriculture	11	3
8	Cotton farming	111920	44	Fiber/oil crops	2	3
10	All other crop farming	111940, 111998	45, 48, 52	Forage crops; Turf grass; Specialty crop	8	16
11	Cattle ranching and farming	112111	26	Beef	50	6
12	Dairy cattle and milk production	112120	27	Dairy	10	0
13	Poultry and egg production	112330, 112340, 112390	31	Poultry	118	8
14	Animal production, except cattle and poultry and eggs	112210, 112410, 112420, 112511, 112519, 112930, 112990	28, 29, 30, 33, 34, 36	Swine; Sheep; Goats; Aquaculture; Small Animal; Specialty animal	533	40
15	Forest nurseries, forest products, and timber tracts	113	51	Forestry	0	1
18	Hunting and trapping	114210	35	Wildlife	3	1
19	Support activities for agriculture and forestry	115210	26, 27, 28, 29, 30, 32	Beef, Dairy, Swine, Sheep, Goats, Equine	287	50
31	Electric power generation, transmission, and distribution	221119	54	Energy (Power)	1	3
186	Plate work and fabricated structural product manufacturing	332312	53	Fabrication	18	25
323	Retail – Building material and garden supply	444220	56	Sales	39	35
376	Scientific research and development services	541711, 541712	62, 66	Food Science; Emerging technology	15	47
377	Advertising and related services	541890	63	Communications	1	1
379	Veterinary services	541940	68	Veterinarian	7	2
388	Services to buildings and dwellings	561730	58, 69	Landscape Management; Landscape	73	42
391	Elementary and secondary schools	611110, 611710	64, 70, 74, 75	Education; Student Development;	8	14

IMPLAN sector	IMPLAN description	NACIS code	ID (AET)	Project description (AET)	No. of Projects	
					Entrepreneurship	Placement
1	Oilseed farming	1111	41	Grain Crops	6	5
3	Vegetable, melon farming	11121	46	Vegetable	34	9
4	Fruit farming	1113	47	Fruit	5	3
6	Greenhouse, nursery, and floriculture production	111421	49, 50	Nursery Operations; Floriculture	11	3
8	Cotton farming	111920	44	Fiber/oil crops	2	3
10	All other crop farming	111940, 111998	45, 48, 52	Forage crops; Turf grass; Specialty crop	8	16
11	Cattle ranching and farming	112111	26	Beef	50	6
12	Dairy cattle and milk production	112120	27	Dairy	10	0
13	Poultry and egg production	112330, 112340, 112390	31	Poultry	118	8
14	Animal production, except cattle and poultry and eggs	112210, 112410, 112420, 112511, 112519, 112930, 112990	28, 29, 30, 33, 34, 36	Swine; Sheep; Goats; Aquaculture; Small Animal; Specialty animal	533	40
15	Forest nurseries, forest products, and timber tracts	113	51	Forestry	0	1
18	Hunting and trapping	114210	35	Wildlife	3	1
19	Support activities for agriculture and forestry	115210	26, 27, 28, 29, 30, 32	Beef, Dairy, Swine, Sheep, Goats, Equine	287	50
31	Electric power generation, transmission, and distribution	221119	54	Energy (Power)	1	3
186	Plate work and fabricated structural product manufacturing	332312	53	Fabrication	18	25
323	Retail – Building material and garden supply	444220	56	Sales	39	35
376	Scientific research and development services	541711, 541712	62, 66	Food Science; Emerging technology	15	47
377	Advertising and related services	541890	63	Communications	1	1
379	Veterinary services	541940	68	Veterinarian	7	2
388	Services to buildings and dwellings	561730	58, 69	Landscape Management; Landscape	73	42
				Personal growth; Career success		
401	Community food, housing, and other relief services	6242	57, 60	Service; Home/ Community Dev.	18	51

(continued)

Figure 3. Code Transposition for Entrepreneurship and Placement Project Participation (continued)

					No. of Projects	
IMPLAN sector	IMPLAN description	NACIS code	ID (AET)	Project description (AET)	Entrepreneurship	Placement
410	Other amusement and recreation industries	713990	61	Outdoor recreation	3	4
424	Grant-making, giving, and social advocacy organizations	813312	65, 67	Environmental Science/Natural Resource; Natural Resource Systems	20	29
TOTALS					1,287	434

Note: IMPLAN code conversions from AET IDs through NACIS codes with statewide number of Entrepreneurship and Placement projects per IMPLAN sector. AET categories were carefully researched to align with NAICS and IMPLAN codes; A-Animal Science AET codes were split by UnitID descriptions to fit within the appropriate IMPLAN sector.

Appendix C

Table 22

SAE Project Categories

SAE category	SAE project type	SAE project subtype
Animal Systems	Aquaculture	Catfish, other, tilapia, trout
	Beef	Commercial breeding, market, registered breeding, show
	Dairy	Other, production, registered breeding, replacement heifers
	Equine	Equine
	Goats	Breeding, dairy, market, other
	Poultry	Other, head of production hens, head of production pullets, head of turkeys, pens of broilers
	Swine	Commercial breeding, market, registered breeding, show
	Sheep	Commercial breeding, market, registered breeding, show
	Small animal	Cats, dogs, other
	Specialty animal	Meat rabbits, other
	Veterinarian	No subcategory
	Wildlife	No subcategory
Agribusiness Systems	Communications; Education; Home/community development; Landscape management; Outdoor recreation; Processing; Sales; Service	No subcategories
Leadership, Education, and Communications	Career Success; Chapter Development; Community Development; Personal Growth; Premier Leadership; Social Sciences; Student Development	No subcategories
Environmental Service Systems	Environmental science/natural resource management	No subcategory
Food Product and Processing Systems	Food science	No subcategory
Power, structural, and technical systems	Fabrication; Energy (power); Repair/maintenance	No subcategories
Natural Resource Systems	Natural resource systems	No subcategory
Plant Systems	Fiber/oil crops; Floriculture; Forage crops; Forestry; Fruit; Grain; Landscape; Nursery operations; Specialty crops; Turf grass; Vegetable	No subcategories
Biotechnology	Emerging technologies	No subcategory

Appendix D

Table 23

Sales by Industry for Entrepreneurship Projects

IMPLAN sector	Industry description	SAE project (AET)	Total sales
1	Oilseed farming	Grain Crops	$545,284
3	Vegetable and melon farming	Vegetable	$1,142
4	Fruit farming	Fruit	$117
6	Greenhouse, nursery, and floriculture production	Nursery Operations; Floriculture	$126
8	Cotton farming	Fiber/oil crops	$37
10	All other crop farming	Forage crops; Turf grass; Specialty crops	$1,220
11	Cattle ranching and farming	Beef	$104,936
12	Dairy cattle and milk production	Dairy	$4,430
13	Poultry and egg production	Poultry	$7,422
14	Animal production, except cattle and poultry and eggs	Swine; Sheep; Goats; Aquaculture; Small Animal; Specialty animal	$222,700
15	Forest nurseries, forest products, and timber tracts	Forestry	$0
18	Hunting and trapping	Wildlife	$59
19	Support activities for agriculture and forestry	Beef, Dairy, Swine, Sheep, Goats, Equine	$372,534
31	Electric power generation, transmission, and distribution	Energy (Power)	$967
186	Plate work and fabricated structural product manufacturing	Fabrication	$1,320
323	Retail – Building material and garden supply	Sales	$15,582

(continued)

Table 23. Sales by Industry for Entrepreneurship Projects (continued)

IMPLAN sector	Industry description	SAE project (AET)	Total sales
376	Scientific research and development services	Food Science; Emerging technology	$8,621
377	Advertising and related services	Communications	$0
379	Veterinary services	Veterinarian	$1,273
388	Services to buildings, dwellings	Landscape Management; Landscape	$9,070
391	Elementary, secondary schools	Education; Student Development; Personal Growth; Career success	$114,367
401	Community food, housing, and other relief services	Service; Home/Community Development	$5,501
410	Other amusement and recreation industries	Outdoor recreation	$525
417	Commercial, industrial machinery and equipment	Repair/Maintenance	$18,884
424	Grant-making, giving, and social advocacy organizations	Environmental Science, Natural Resource; Natural Resource Systems	$6,753
Total			$1,422,870