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HIGH SCHOOL STUDENTS' MOTIVATIONS AND VIEWS OF AGRICULTURE AND AGRICULTURAL CAREERS UPON COMPLETION OF A PRE-COLLEGE PROGRAM

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HIGH SCHOOL STUDENTS' MOTIVATIONS AND VIEWS OF AGRICULTURE AND AGRICULTURAL CAREERS UPON COMPLETION OF A PRE-COLLEGE PROGRAM

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ABSTRACT

Scherer, Andrea K., Purdue University, August 2016. High School Students' Motivations and Views of Agriculture and Agricultural Careers upon Completion of a Pre-College Program. Major Professor: Neil A. Knobloch

Pre-college summer residential experiences hosted by a College of Agriculture have the potential to expose high school students to new career opportunities and fields of study that they may not have considered, and may influence agricultural literacy, perceptions of agriculture, and interest in agriculture. Engaging these students is important for meeting the demand for more students graduating with agriculture degrees prepared to solve 21st century challenges. The purpose of this study was to explore and describe the outcomes of two separate pre-college experiences, the Molecular Agriculture Summer Institute (MASI) and the Purdue Agribusiness Science Academy (PASA), and participating high school students' motivation, career interests, views, and educational aspirations. High school students who participated in the two pre-college programs were motivated to engage in the programs and activities, reported higher agricultural career interests after participating in the pre-college programs, described more positive views of agriculture after participating in the pre-college programs, and most participants aspired to attend a 4-year university. Recommendations for the MASI and PASA programs include incorporating: (1) opportunities for students to see how careers in agriculture can integrate science and working with people, (2) activities and speakers not related to

traditional agricultural careers, (3) 21st century challenges, and (4) activities providing PASA students with a preview of college. Additionally, it is recommended that the MASI and PASA programs continue to recruit students not from traditional agricultural backgrounds, embrace the diversity of student philosophies and values, and maintain communication with students after the programs.

CHAPTER 1 INTRODUCTION

1.1 Introduction

Summer pre-college programs can engage unserved, underserved, or underrepresented students to consider entering an agricultural career track. Engaging a wider range of students is important for meeting the demand for more students graduating with agricultural degrees prepared to solve 21st century challenges. Global challenges of the 21st century include food security, water scarcity, and climate variability, and addressing these challenges will require the work of talented individuals who can develop innovative strategies.

Addressing these challenges is important because globally, 795 million people are undernourished (Food and Agriculture Organization of the United Nations, 2015). Food production will need to double by 2050 (Association of Public and Land-Grant Universities, 2010), as it is projected that the world population will reach 9.7 billion by that point (United Nations, 2015). By 2025, worldwide 1.8 billion people will be residing in areas with absolute water scarcity (Food and Agriculture Organization of the United Nations, 2007). Globally, 70% of fresh water use is for agriculture (Food and Agriculture Organization of the United Nations, 2007). Droughts have become more common and it is projected that this will continue, leading to reduced crop productivity,

increased wildfires, and increased plant disease and insect infection (Food and Agriculture Organizaiton of the United Nations, 2013).

In order to resolve these substantial problems, resourceful solutions need to be developed, requiring knowledgeable individuals who are dedicated to meeting societal needs relating to agriculture. However, the United States Department of Agriculture forecasted 57,900 annual agriculture-related job openings through 2020, and only 35,000 new agriculture graduates annually to fill them (United States Department of Agriculture, 2015). This gap reveals the need for an increase in the number of graduating college students prepared to work in careers in agriculture, food and natural resources. Therefore, contemporary strategies for attracting more students to agriculture are important.

In the past, many students have been drawn to agriculture and introduced to agricultural career opportunities through youth organizations such as 4-H and FFA. Colleges of agriculture recruit high school students who participated in 4-H and FFA. For example, Petersen (2000) found that 72% of their undergraduate students participated in FFA and 53% participated in 4-H. However, colleges of agriculture should recruit students from varied background who may not have been exposed to careers in agriculture as a way to increase the diversity of ideas and solutions as well as the number of students pursuing degrees in agriculture (National Research Council, 2009). Increasing the number of underrepresented minorities in agriculture can be one way to achieve this, and there is certainly potential for advancement in this area, as the number of underrepresented minority undergraduate agriculture students has only slightly increased in recent years (Gilmore, Goecker, Smith, & Smith, 2006). Additionally, while agriculture has been traditionally associated with rural communities, increasing the

number of students from urban and suburban areas can be beneficial, as less than 5% of the U.S. population resides on farms and only 20% reside in rural communities (Dimitri, Effland, & Conklin, 2005).

A committee composed of leaders in agriculture recognized the importance of increasing the number and diversity of students acquiring agriculture degrees, and advocated that colleges and universities reach out to K-12 students before the students reach higher education (National Research Council, 2009). College of agriculture can expose youth to agriculture at a younger age through K-12 outreach, and may have the potential to boost agricultural literacy, influence perceptions of agriculture, cultivate interest in agriculture, broaden awareness of agriculture careers, and instill the value and importance of agriculture among K-12 students. This may influence the number, quality, and preparation of future undergraduates in agriculture because it may reduce barriers which can affect whether high school students select careers in agriculture. Barriers include misconceptions about agriculture, lack of awareness of the fields of study and employment opportunities, perceived importance, and family pressure (Gonzales, 2006).

Colleges and universities can engage with youth through K-12 outreach programs, urban agricultural education programs, youth enrichment programs, and pre-college programs. Examples of summer high school enrichment programs include summer research experiences allowing high-achieving high school students to conduct research with faculty on campus, and Governors' Schools for Agricultural Sciences, which are academic enrichment residential programs for high-achieving high school students (National Research Council, 2009).

1.2 Statement of Research Problem

Pre-college experiences on a university campus have the potential to expose high school students to new career opportunities and fields of study that they may not have considered, and may influence high school students' agricultural literacy, perceptions of agriculture, and interest in agriculture. As such, desired outcomes must be identified, evidences determined, and assessment strategies implemented to effectively evaluate pre-college experiences.

1.3 Significance of the Study

This study is significant for three reasons. First, this study is important for exploring ways to expand the number of students prepared to fill occupations that involve developing solutions to address 21st century challenges. Second, this research is valuable for the plant science community as they work towards increasing awareness of the importance of plant sciences and attracting individuals to the field. Third, this study is important for exploring ways to attract diverse students to colleges of agriculture.

1.3.1 Addressing 21st Century Global Issues

Professionals with skills and knowledge in agriculture are increasingly necessary to help address current issues in the United States and around the world. In 2012, the President's Council of Advisors on Science and Technology produced a Report to the President on Agricultural Preparedness and the Agriculture Research Enterprise. This report stated that in the 21st century, the world faces a series of agriculture-related challenges, including food security, efficient use of water, biotechnology, climate change,

and management of new invasive species, pathogens, and pests. Addressing these emerging issues will require optimization and enhancement of the existing structure, innovation and technological development, strategic research, and partnerships between researchers and private industry (PCAST, 2012).

In order to address these mounting agriculture-related issues, it is necessary to attract bright young minds to pursue careers in agriculture. It is a unique time in history for agriculture, and colleges of agriculture are uniquely positioned to educate and prepare future leaders who have the knowledge and skills necessary to resolve these issues. Through increasing interest in agriculture and motivating students to pursue excellence through careers which help resolve these substantial problems, colleges of agriculture have the opportunity impact the future by growing the number of qualified and motivated individuals ready to tackle these global issues and bring fresh, new perspectives and ideas to the table.

1.3.2 The Future of Horticulture and Plant Sciences

Agriculture encompasses many areas, including plant sciences, animal science, food science, agricultural engineering, and agricultural economics (National Research Council, 2009). Within recent years, the plant sciences community has become increasingly conscious of the need to expand awareness of the importance of the plant sciences, and to attract individuals to pursue careers in the field (American Society for Horticultural Science, 2013). Specifically, the horticulture community has recognized this issue, noting a decrease in the number of students considering careers in horticulture (American Society for Horticultural Science, 2013). Recent research has shown that the

general public, especially young people, are largely unaware of the importance of horticulture (Meyer, 2013; Morehouse & Nelson, 2007). Through a coordinated effort, leaders in horticulture, including prominent public gardens, professional organizations, and universities, have created a plan to help address this issue. The plan includes assessing ways to increase public awareness of horticulture, developing recommendations for educators, and working towards increasing the number of those pursuing degrees and careers in the field (American Society for Horticultural Science, 2013).

At Purdue University, due to the recent establishment of the Purdue Plant Sciences Initiative, attracting and developing experts in the plant sciences field is important. The mission of the initiative is to "propel the Purdue plant sciences program to a global leadership position by building a unique plant science research and education pipeline consisting of four core components" (Purdue Plant Sciences Initiative, 2014, n.p.). The components of this initiative consist of the creation of a center for molecular agriculture, the development of a plant genome editing facility, the establishment of an automated phenotyping field facility, and the formation of a plant commercialization incubation facility.

Exposing high school students to horticulture and plant sciences through pre-college summer programs could increase the number of students considering degrees and careers in horticulture and plant sciences. This could benefit the horticulture and plant sciences community as a whole, as well as the Plant Sciences Initiative at Purdue University, as students may be drawn to their Plant Sciences Research and Education Pipeline, where they can have access to the cutting-edge technology and teaching laboratories.

1.3.3 Enrollment in Agriculture Programs

Maintaining desired undergraduate student enrollment levels is important for Purdue University, and other colleges of agriculture. There are several strategies to increase enrollment in the College of Agriculture, but most of these methods have limitations. One short-term method is recruiting current Purdue students who are undecided about which major they will pursue. At Purdue, these individuals are deemed as "Exploratory Studies" students. However, in the Fall of 2014, only 4% of enrolled undergraduates at Purdue were Exploratory Studies (Purdue Office of Undergraduate Admissions, 2014). A second method is to increase the number of high school seniors applying to departments within the College of Agriculture. Although high school recruitment visits may be successful in attracting students who already had an interest in agriculture, students who have never been exposed to agriculture are less likely to be persuaded by a single recruitment visit. Therefore, exposure to agriculture through pre-college experiences can help expose students to careers and degrees in agriculture before they are required to declare a major when they apply to Purdue University.

1.4 Purpose of the Study

The purpose of this study was to explore and describe the outcomes of two separate pre-college experiences, the Molecular Agriculture Summer Institute (MASI) and the Purdue Agribusiness Science Academy (PASA), and participating high school students' motivation, career interests, views, and educational aspirations.

MASI was a one-week summer residential program for high-achieving, mostly suburban students facilitated by Purdue University's College of Agriculture Office of

Academic Engagement. PASA was a two-week summer residential program for urban underrepresented minorities facilitated by Purdue University's College of Agriculture Office of Multicultural Programs. Both programs introduced students to career opportunities in agriculture and allowed students to interact with industry professionals and university faculty and staff.

1.5. Research Questions

Four research questions, informed by the conceptual and theoretical frameworks, guided this study.

1. To what extent were students in two pre-college programs motivated to engage in the pre-college programs and activities?
2. To what extent were students in two pre-college programs interested in agriculture careers before and after participating in the pre-college programs?
3. What were the students' interest levels and views agriculture before and after participating in the pre-college programs?
4. What were students' future educational aspirations six to eight months after participating in the pre-college programs?

1.6 Limitations of the Study

There were eight limitations identified for the study: research design, sample size, generalizability, program and participant differences, Hawthorne effect, non-response bias, influences outside the scope of the research, and lack of longitudinal data.

Research Design

This was an exploratory, descriptive study. This limited the ability to make causal conclusions (Schutt, 2012).

Sample Size

The two samples in this research were small in size, (N = 13; N = 26). Therefore, statistical power was limited. However, the response rate for the pretests and posttests were very high (100% response rate for MASI and 96.3% response rate for PASA).

Generalizability

This research examined students in two pre-college programs, both conducted at Purdue University. There is limited external validity because findings may not be generalizable to other pre-college programs at Purdue University or other universities. Students in both programs were at the high school level of education; therefore, the research may not be generalizable to other age groups. Both pre-college programs were designed to expose students to agricultural careers, and activities, speakers, and field trips were agriculture-related. Therefore, the research may not be generalizable to content areas and career fields other than agriculture. The demographic qualities of the students also may not be consistent with other programs.

Program and Participant Differences

Although two samples from two pre-college programs were examined in this research, the results from the two programs cannot be compared. Both pre-college

programs concentrated on agriculture and were designed to provide students with opportunities in career exploration, academic preparation, skill building, and social relationship building and networking. Participants in both programs were high school students who did not come from agriculture backgrounds. However, MASI was facilitated by the Office of Academic Programs and PASA was facilitated by the Office of Multicultural Programs. Both offices were located in the College of Agriculture at Purdue University. MASI participants spent time in labs working with faculty and staff conducting research daily, while PASA participants spent time in one of three "tracks" where they engaged in a variety of activities related to their track topic. PASA was two weeks long and MASI was one week long. PASA had twice the number of participants compared to MASI. Participants in MASI were rising eleventh and twelfth grade students, were predominately from suburban areas, and from middle to high socioeconomic status. Participants in PASA were rising tenth, eleventh, and twelfth grade students, were predominately from urban areas, and from low to middle socioeconomic status.

Hawthorne Effect

In this research, the Hawthorne Effect posed a threat to validity. Participants may have provided answers they believed to be socially desirable (Schutt, 2012). Therefore, a limitation is honesty of responses. The researcher served as the Assistant Program Coordinator and Counselor Director for the duration of the MASI pre-college program. Although this was not observed, the researcher's involvement in the MASI program may have also influenced participant responses to questionnaire instruments. Additionally, the

follow-up phone interviews for both programs were conducted by the program coordinator and the researcher, which may have affected participant responses.

Influences Outside the Scope of the Research

During the six to eight months following students' MASI and PASA experiences, students may have been exposed to other influences, programs, or activities that may have affected their responses in the six to eight month follow-up phone interviews. Outside influencers may have impacted student interest in agriculture-related careers, perceptions of agriculture, and educational goals.

Lack of Longitudinal Data

Research question four addresses future educational aspirations of participants. To answer this question, participants were asked questions about their future educational plans in the six to eight month follow-up phone interviews. A limitation of this component of the research was the possibility of students changing their plans over time. Therefore, although students may have stated that they intended to pursue a certain degree or career. Because this study was not longitudinal, it was not possible to determine whether students actually did pursue the stated degree or career.

1.7 Definitions of Terms

4-H: "the youth development program of the Cooperative Extension System of land-grant universities, 4-H is the nation's largest youth development organization, empowering six million young people throughout the United States. Head, heart, hands,

and health are the four Hs in 4-H, and they are the four values members work on through fun and engaging programs" (National 4-H Council, 2015, n.p.).

Agribusiness: "the collective business activities that are performed from farm to fork, including the supply of agricultural inputs, the production and transformation of agricultural products, and their distribution to final consumers. Characterized by raw materials that are mostly perishable, variable in quality, and not regularly available" (Food and Agriculture Organization of the United Nations, 2016, n.p.)

Agriculture: "a field that encompasses the production of agricultural commodities, including food, fiber, wood products, horticultural crops, and other plant and animal products. The terms include the financing, processing, marketing, and distribution of agricultural products; farm production, supply and service industries; health, nutrition and food consumption; the use and conservation of land and water resources; development and maintenance of recreational resources; and related economic, sociological, political, environmental, and cultural characteristics of the food and fiber system" (National Council for Agricultural Education, 2009, p. 2).

Agriculture careers: "jobs in the agriculture and natural resources career cluster involve planning, managing, and performing agricultural production, horticulture and landscaping services, and related professional and technical services; planning, managing, and performing mining and extraction operations; managing and conserving

natural resources; and performing related environmental services" (Glencoe / McGraw Hill Education, n.d., n.p.).

Attainment value: "the personal importance of doing well on the task" (Eccles & Wigfield, 2002, p. 119).

Cost: "how the decision to engage in one activity limits access to other activities, assessments of how much effort will be taken to accomplish the activity, and its emotional cost" (Wigfield & Eccles, 2000, p. 72).

FFA: formerly Future Farmers of America, is "an intracurricular student organization for those interested in agriculture and leadership" (National FFA Organization, 2015, n.p.).

Food and agricultural sciences: "basic, applied, and developmental research, extension, and teaching activities in food and fiber, agricultural, renewable energy and natural resources, forestry, and physical and social sciences" (7 U.S.C. § 3103, 2011, n.p.).

Forensics: "the application of science to the study of legal or regulatory matters" (Echaore-McDavid & McDavid, 2008, p. 304).

Horticulture: “horticulture is defined as that branch of agriculture concerned with growing plants that are used by people for food, for medicinal purposes, and for aesthetic gratification” (United States Department of Agriculture, 2015, n.p.).

Intrinsic value: “the enjoyment the individual gets from performing the activity or the subjective interest the individual has in the subject” (Eccles & Wigfield, 2002, p. 120).

Molecular agriculture: the fundamental molecular mechanisms that form the basis for plant growth, development, and function, including the effect of genomes and environments on phenotypes and plant characteristics (Purdue University, 2012, n.p.)

Plant sciences: broadly defined encompasses plant biology, plant pathology, weed science, agronomy, turf science, biochemistry, biological engineering, horticulture, biotechnology, forestry, biophysics, ecology, cellular and molecular biology, plant genetics and breeding, paleobotany, taxonomy, natural resource management, entomology, and other sciences involving plants.

Pre-college program: “a program designed for students in grades eight through twelve. Pre-college interventions provide academic foundation skills, counseling, self-concept building and career planning, which are needed to adequately plan for college. Interventions are offered after school and during the summer break on many college/university campuses” (Adams, 1997, p. 8).

Self-efficacy: “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (Bandura, 1997, p. 3).

STEM: Science, technology, engineering, and math.

Sustainable agriculture: “an integrated system of plant and animal production practices having a site-specific application that will, over the long-term: satisfy human food and fiber needs; enhance environmental quality and the natural resource base upon which the agriculture economy depends; make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole” (7 U.S.C. § 3103, 2011, n.p.).

Underrepresented minority: “any ethnic group – African American, Alaskan Native, American Indian, Asian American, Hispanic American, Native Hawaiian, Pacific Islander, or any other group – whose representation among food and agricultural professionals in science, technology, engineering, and mathematics (STEM) fields is disproportionately less than their proportion in the general [U.S.] population as indicated in standard statistical references” (National Institute of Food and Agriculture, 2014, p. 9).

Utility value: “how well a task relates to current and future goals, such as career goals” (Eccles & Wigfield, 2002, p. 120).

1.8 Basic Assumptions

The researcher made the following assumptions in this study:

1. Researcher bias was minimized and the study was conducted objectively.
2. A positivist research paradigm was used. Therefore, the researcher assumed that "an external, objective reality exists apart from human perceptions of it" (Schutt, 1999, p. 611).
3. Instruments utilized to collect data were valid and reliable.
4. Participants responded to questionnaire instruments truthfully.
5. Participants' recall in the six to eight month follow-up interviews accurately represented their thoughts and feelings.
6. The research study being associated with Purdue University did not influence the student responses.

CHAPTER 2 LITERATURE REVIEW

2.1 Career Development and Adolescence

Most pre-college residential programs facilitated by colleges and universities are designed for middle and high school students. These students are in adolescence, a developmental stage spanning the second decade of life. Students typically begin to make decisions regarding their future educational plans and employment as they approach their final years of high school. Therefore, these years of adolescence are an important time for career exploration, planning, goal setting, and decision making (Paa & McWhirter, 2000). Career decisions are important during adolescence because forming an occupational identity plays an important role in the identity development (Erikson, 1959).

Farmer (1987) purported that adolescent career and achievement motivation is related to environment, background, and personal variables. Rogers et al. (2008) used a social cognitive perspective to examine the relationship between personality and adolescent career planning. The researchers found that adolescents who were open to experiences and conscientious were more likely to begin career planning. Adolescents who had high levels of goal setting and adolescents who had high levels of perceived social support were more likely to begin career exploration and planning. Rogers et al. (2008) also found that younger students were less likely to engage in career exploration

than older students. Gushue et al. (2006) found that adolescent engagement in career exploration activities was related to increased career decision-making self-efficacy.

2.2 Selection of Degrees and Careers in Agriculture

White, Stewart, and Linhardt (1991) studied inner-city high school students' perceived career opportunities in agriculture. Participants consisted of students who were enrolled in agriculture courses and students who were not enrolled in agriculture courses. Participants regarded horticulture, food science, education and extension, engineering, food service and lodging management as career areas in agriculture with the most opportunities. Qualities identified by participants as being important for working in agriculture included the capacity to learn on the job, an inclination to work outside, and a background in agriculture.

Thompson and Russell (1993) investigated the intentions and beliefs associated with agriculture careers of high school students, parents, and guidance counselors. More favorable beliefs of agriculture were held by high school students who had been exposed to agriculture though agriculture courses compared to high school students who had not taken agriculture courses. Agricultural career aspirations of high school students were associated with the beliefs of guidance counselors and parents. As such, high school students were more likely to have positive views of agricultural careers if guidance counselors and parents had positive views of agricultural careers. Moreover, guidance counselors in rural areas reported relatively negative beliefs toward agriculture, while guidance counselors in large urban communities reported more favorable beliefs. Parents with additional post-high school education had more positive beliefs of agriculture.

Frick et al. (1995) researched the knowledge and perceptions of agriculture, food, and natural resources held by students in urban inner-city and rural high schools. High school students from both urban inner-city and rural high schools viewed agriculture positively. Urban inner-city high school students possessed less agriculture knowledge than high school students from areas with smaller populations.

Conroy, Scanlon, and Kelsey (1998) found female students were less likely than male students to select an occupation in agriculture (35% vs. 65%) as their ideal job choice. Academic grades were nearly the same for students selecting agriculture occupations and students choosing other occupations. High school students with higher socioeconomic status were less likely to select an occupation in agriculture than students with lower socioeconomic status. High school students with parents who had not obtained a high school degree were more likely to select an occupation in agriculture. Parents, especially fathers, were linked to selecting an occupation in agriculture. High school students with a father living at home, as well as high school students with a father working in farming or a service/labor job, were more likely to select an occupation in agriculture. Of students who selected an occupation in agriculture, nearly one-third chose veterinarian, and many of the agriculture-related occupations selected require certifications or education beyond the secondary level.

In an ex post facto study, Esters and Bowen (2005) identified experiences and individuals influencing career decisions of graduates from an urban agricultural high school. Friends and parents were named as individuals with the greatest influence on career selection. Respondents who chose careers in agriculture identified work experiences, career opportunities, and educational high school experiences as influencing

that decision. Inadequate job opportunities, an absence of interest in agriculture, and interest in other career areas were identified as influential factors from those who did not pursue careers in agriculture.

Jones and Larke (2003) conducted an ex post facto study on Hispanic and African American individuals who had received an agriculture-related degree from a land-grant institution. The researchers found that the likelihood of respondents pursuing an agriculture related career was increased if respondents received encouragement from an underrepresented minority to consider agricultural careers. One-third of respondents reported that they did not have any role models who were underrepresented minorities employed in an agricultural profession. Respondents who perceived limited career possibilities in agriculture were less likely to choose careers in agriculture.

Swan and De Lay (2014) investigated why 911 undergraduate students chose to enroll in a major in a college of agriculture. The leading factors influencing the decision to enroll in the college of agriculture included parents, visiting campus, other relatives, and friends. Two-thirds of the students did not have agriculture courses offered in high school, and of those who did have the opportunity to enroll in agriculture courses in high school, only one-fourth chose to do so. Of the students who participated in FFA in high school, the majority indicated that their agriculture teacher played a significant role in their choice to attend a college of agriculture.

2.3 Selection of Degrees and Careers in Horticulture and Plant Sciences

Campbell et al. (2000) conducted a study involving students from five universities. The students consisted of two groups, students pursuing a degree in

horticulture and students not pursuing a degree in horticulture. The researchers found that gardening experience prior to entering college contributed to the choice to pursue a horticulture degree. Based on the time period when students reported making the decision to pursue a horticulture degree, the researchers found that efforts to attract students to pursue horticulture degrees should be focused on high school before college admittance. The top factors identified as influencing the decision to pursue a horticulture degree included horticulture as a hobby, individuals including relatives, students, parents, and employers, university literature, and visits from a recruiter. High school instructors, 4-H leaders, and FFA leaders were the least influential (Campbell Bradley, Kohlleppel, Waliczek, & Zajicek, 2000).

Baker et al. (2011) conducted focus group research on college students to explore awareness and perceptions of careers in ornamental horticulture and barriers to pursuing careers in ornamental horticulture. The researchers found that students had very limited awareness of the career opportunities available in ornamental horticulture. Students had negative perceptions of ornamental horticulture as a career path. However, their perceptions shifted once they were introduced to many of the available career opportunities. Students identified four barriers to entering the field of ornamental horticulture, and the greatest was lack of awareness of available opportunities. Many students expressed that they knew very little about horticulture and did not know what a job in horticulture would entail. The second barrier was the perception that careers in ornamental horticulture did not pay well and there was not demand in the job market. The third barrier to entering horticulture identified by students was the perception that due to the fact that horticulture involves flowers it was not masculine, and the fourth

barrier was lack of visibility and marketing from horticulture companies (Baker, Irani, & Abrams, 2011).

In the United Kingdom, the Royal Horticultural Society, horticulture industry, and government conducted research as a part of a multi-phase effort to increase awareness of horticulture and the number of skilled individuals entering the horticulture industry. Rather than examining why students chose to pursue careers in horticulture, the researchers explored perceived barriers to pursuing horticulture careers. A survey of 1,000 people indicated that nearly 50% of individuals under the age of 25 viewed horticulture as an unskilled career. The same survey revealed that 70% of 18 year olds thought of horticulture as a career for those who had failed academically. Two-hundred horticultural businesses were surveyed, and 90% of respondents reported that horticulture lacked career appeal. The top three reasons reported to deter individuals from pursuing horticulture careers were: "poor perception of the industry in schools, colleges and higher education institutions, and from career advisors" (83%), "poor public perception of the industry" (78%), and "poor perception of pay levels" (77%) (Royal Horticultural Society, 2013, p. 16).

The American Society for Horticultural Science and Longwood Gardens conducted research on public perception of careers in horticulture, which consisted of a phone survey of the general public, an online survey of horticulture stakeholders, and focus groups of horticulture stakeholders. The phone survey of the general public found that only 41% of those between the age of 18 and 24 were familiar with the word horticulture (Meyer et al., 2015). In the online survey of stakeholders in horticulture, 59% of respondents cited low pay as a reason students do not choose careers in

horticulture. The stakeholders were asked the best ways to increase interest in horticulture among youth, and the top four responses included gardening (33%), hands-on experiences (31%), early exposure and positive early experiences (16%), and teaching them about plants to increase awareness (13%) (Meyer et al., 2015). Horticulture stakeholder participants in the focus groups identified a variety ways they were introduced to horticulture, many of them related to gardening, and once they had become familiar with horticulture stakeholders then became aware of many of the positive attributes of a career in horticulture (Meyer et al., 2015).

2.4 Pre-College Programs

To expose high school students to career opportunities and encourage students to pursue degrees in certain fields of study, many universities have developed PK-12 outreach programs, including pre-college programs, focused on content areas including science, engineering, and math. Many universities also provide pre-college programs specifically designed for gifted students. Pre-college programs have the potential to benefit the host universities by supporting recruitment efforts (Tsui, 2009) as well as the student participants, who engage in skill-building, career exploration, academic preparation, social relationship building and networking.

Enersen (1993) conducted qualitative research to explore outcomes of summer residential programs for middle and high school students who participated in a pre-college program for gifted students. Participants indicated that building confidence in their skills (i.e., self-efficacy) and making friends were significant to their experiences in

the pre-college program. Students also valued having the opportunity to reside in a university residence hall and the ability to engage in challenging activities.

Li et al. (2009) conducted a quasi-experiment to document the effects of a pre-college program for gifted students. Using self-reports and standardized objective measures, Li et al. postulated that students who participated in the math or science pre-college programs were more likely to obtain math or science degrees in college. The researchers also found that students who participated in the pre-college programs were more likely to aspire to obtain a doctorate degree, suggesting that in-depth exploration of a subject area as a part of the pre-college program may have ignited a long-term curiosity.

Monroe Atwater et al. (1999) studied a three-week pre-college residential program focused on biomedical research. The researchers found that male students in the program had positive attitudes toward science, while females were neutral or undecided. The students' attitudes did not change over the course of the pre-college program. Upon completion of the pre-college program, students reported an increase in their commitment to take more than the required math courses, and a decline in their commitment to take more than the required science courses. Some students reported that they had an increased commitment to mathematics because an African American female facilitated the mathematics portion of the program. Of the student participants, 58% identified the social aspects of the pre-college program as a factor influencing their commitment to attend college.

Gibson and Chase (2002) researched the impact of a two-week pre-college science program hosted by a university. Gibson and Chase found that students who participated in the pre-college program had higher interest in science careers and more

positive views of science after the program. Additionally, the longitudinal portion of Gibson and Chase's study indicated that students who participated in the pre-college program were more likely to maintain an interest in science throughout high school than students who did not participate in the pre-college program.

Knox et al. (2003) also studied a pre-college science program on a university campus. The study indicated participating students expressed increased confidence, or self-efficacy, in their ability to use sophisticated laboratory techniques. Knox et al. purported that the increase in self-efficacy may have been related to the interaction with university scientists in the laboratory, exposure to advanced laboratory procedures, and hands-on experience. Additionally, participating students indicated that the program increased their interest in science careers, and was beneficial to their performance in advanced science courses.

Strayhorn (2011) examined students who participated in a summer pre-college bridge program, which was designed to prepare them for college before their freshman year. Strayhorn found that the pre-college program had several positive outcomes for students. First, students who participated in the pre-college program reported more positive academic self-efficacy. Second, students who participated in the pre-college program had an increased ability to utilize skills necessary for success in college, such as understanding and executing a syllabus and navigating technology.

Forrester (2010) studied students majoring in STEM areas who had engaged in competitive pre-college programs. Students reported that their motivation to compete in the pre-college programs was the result of encouragement from parents or teachers.

Forrester's research also revealed significant gender differences for academic major choice and science self-efficacy.

McCormick et al. (2014) studied female students who participated in a pre-college summer program hosed by Indiana University Purdue University Indianapolis designed to expose them to engineering. Upon completion of the post-hoc survey, 94% of the participants reported that they attended college after completing high school. Those who attended college had higher high school GPAs than those who did not attend college. More survey participants chose to attend Indiana University Purdue University Indianapolis than other universities. Significantly more students chose to major in engineering than other majors.

Klein-Gardener (2014) studied outcomes of a non-residential pre-college program called the STEM Summer Institute. The parents' of participating female students were engaged in the program though: (1) a homework assisgnment for their daughter requiring their participation, and (2) an invitation to participate in the program on the last day. Klein-Gardener found a significant increase in parents' knowledge of engineering. The parents' attitudes toward engineering also improved. Students participating in the program reported increased understanding of what engineers do and what engineering is. Vibhuti et al. (2010) also examined the outcomes of a pre-college program designed to expose female students to engineering, and found that: (1) students had a broader understanding of STEM after the pre-college program, and (2) enjoyed using the technology in the labratories. Fantz et al. (2013) studied a pre-college experiences and student self-efficacy and purported that students who were exposed to engineering before college through classes or hobbies had higher self-efficacy. Lam et al. (2005) studied a

pre-college engineering program aimed at underrepresented minorities, and found that 94% of students entered college and 66% pursued a STEM degree.

2.5 Agricultural Pre-College Programs

Much of the research on agriculture-related pre-college programs has focused on Governor's Schools for Agricultural Sciences. The original Governor's School was established in 1963 in North Carolina, and now more than 15 states have initiated their own Governor's Schools. While these pre-college programs vary in some ways, they are all summer programs for gifted high school students, are generally supported by state funding, and range from one to six weeks (The National Conference of Governor's Schools, 2015).

A study of 86 high school juniors and seniors who participated in a four-week Governor's School for Agriculture in 2003 at Virginia Tech found that participants had an increased level of agricultural literacy after the program. The study also examined perceptions of agriculture, and the largest observed change in perceptions among participants was associated with biotechnology and animal welfare (Duncan & Broyles, 2004).

Another study surveyed 188 alumni of the Virginia Governor's School for Agriculture who participated in the pre-college program between 2001 and 2004. Cannon and his colleagues (2006) found that the pre-college program did not impact the career choices of the alumni. However, it did influence perceptions and knowledge of agriculture, especially for participants who were not from agricultural backgrounds (Cannon, Broyles, Seibel, & Anderson, 2006).

Overbay and Broyles (2008) conducted a study on the participants of the 2006 Virginia Governor's School for Agriculture. The 98 participants indicated a narrow view of agriculture, skewed toward manual labor. The students were unaware of the variety of careers and companies in agriculture, and limited their view of agriculture to production farming (Overbay & Broyles, 2008).

Ortega (2011) studied a one-week pre-college summer program for underrepresented minority middle school students. The pre-college program, Ag Discovery Camp, introduced students to agricultural and life sciences, including the career fields of entomology, plant sciences, engineering, and food sciences. Ortega found that immediately following the pre-college program there was not an increase in interest in agriculture; however, one year after the program the students were more likely to consider agricultural careers if their first career choice did not work out. Students also reported being self-efficacious in science learning one year after the program, and were interested in science careers (Ortega, 2011).

2.6 Conceptual Framework

The conceptual framework for this research was informed by the Racial and Ethnic Minorities in STEM Model (Museus, Palmer, Davis, & Maramba, 2011). The model examines factors which influence racial and ethnic minorities' success in STEM. The seven constructs that make up the model include: the K-12 experience; K-12 outcomes; college experience; college outcomes; financial influences; parental expectations and involvement; and STEM-specific opportunity and support programs. Some constructs are made up of several factors (Figure 2.1).

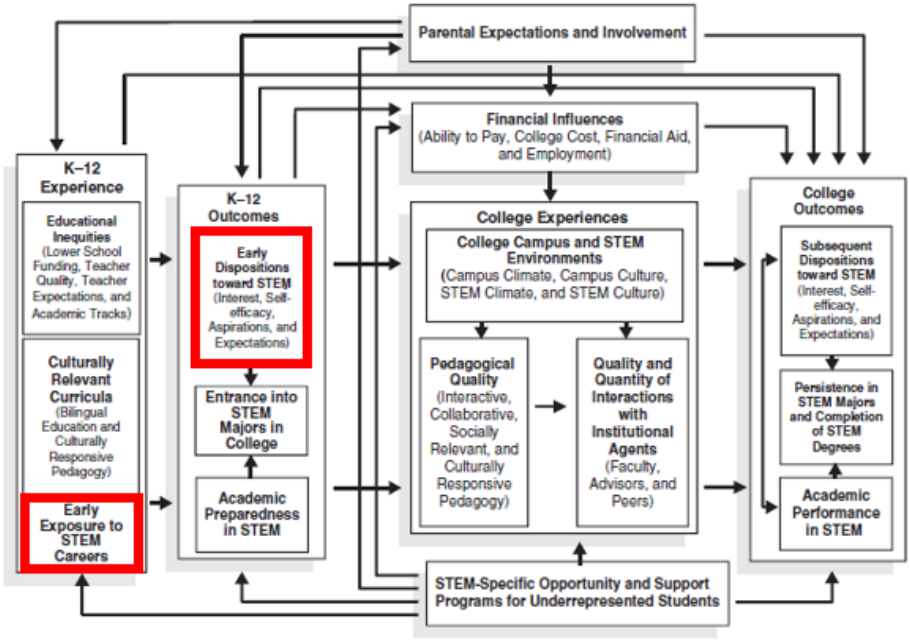

Figure 2.1 Racial and Ethnic Minories in STEM Model (Museus et al., 2011)

The K-12 experience construct includes educational inequities, culturally relevant curricula, and early exposure to STEM careers. The K-12 outcomes are affected by the K-12 experience, and the outcomes include early dispositions toward STEM, entrance into STEM majors in college, and academic preparedness in STEM. For this research, early exposure to STEM careers and early dispositions were observed.

Demographics included age, gender, and race. Disposition towards agriculture consisted of view of agriculture and interest in agricultural careers. In this research, the early exposure to agriculture was the pre-college experience. Demographics and disposition influenced how the participants experienced the early exposure to agriculture (Museus et al., 2011). The pre-college experience influenced disposition toward agriculture, which was related to future educational aspirations, which affected career

choice (Figure 2.2). Disposition toward agriculture appears twice in the operational framework because students come into the pre-college experiences with previously help views of agriculture and interest levels in agriculture (measured in the pretest), and leave the pre-college programs with possibly different views of agriculture and interest levels in agriculture (measured in the posttest).

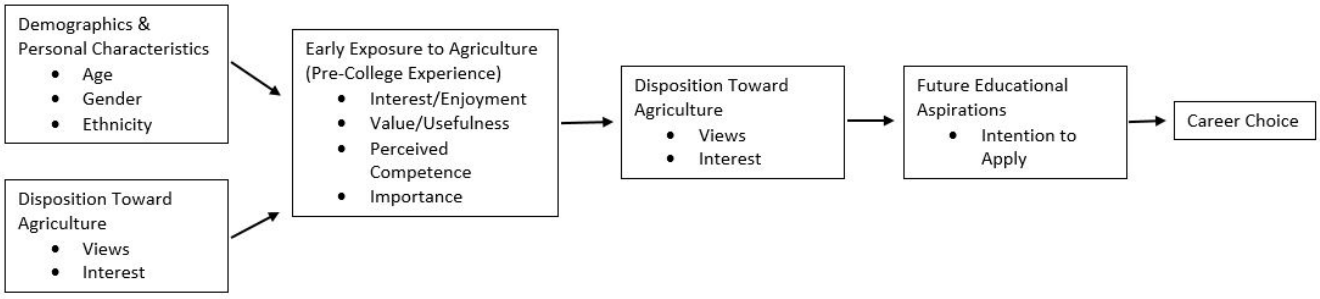

Figure 2.2 Operational Framework

2.7 Theoretical Framework

In this study, the Intrinsic Motivation Inventory was used to inform the variable of participant interest in the pre-college program. The Intrinsic Motivation Inventory was informed by self-determination theory (Deci & Ryan, 1985). Self-determination theory distinguishes intrinsic motivation, which originates from an internal drive, from extrinsic motivation, which is generated by a desire to secure an external outcome. Self-determination theory identifies autonomy, competence, and relatedness as factors influencing intrinsic motivation (Deci & Ryan, 1985). External motivation is related to lower interest, lower effort, and lower value (Ryan & Connell, 1989).

In this study, four scales from the Intrinsic Motivation Inventory were used to inform the variable of participant interest in the pre-college program:

Interest/enjoyment: intrinsic motivation, which is defined as "the enjoyment the individual gets from performing the activity or the subjective interest the individual has in the subject" (Eccles & Wigfield, 2002, p. 120).

Perceived competence: self-efficacy, which is defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3).

Effort/importance: attainment value, which is defined as "the personal importance of doing well on the task" (Eccles & Wigfield, 2002, p. 119).

Value/usefulness: utility value, defined as "how well a task relates to current and future goals, such as career goals" (Eccles & Wigfield, 2002, p. 120).

Disposition toward agriculture was a combination of view of agriculture and interest in agricultural careers. Eccles and Wigfield's (2002) prior work on schema was used to inform this variable. Eccles and Wigfield built upon the self-schema theory of Markus and Wurf (1987), and purported that tasks have a higher attainment value if the tasks align with an individual's current or desired self-schema. An individual's schema is based on what characteristics the individual perceives to be important to his or her self-definition (Eccles & Wigfield, 2002). As an individual's career relates to his or her self-definition, individuals interested in agricultural careers are likely to incorporate agriculture into their self-schema and therefore place a higher value on it.

2.8 Need for Study

Research focusing on interest of high school students in agricultural pre-college experiences is somewhat limited, and most of what does exist focused on Governors' Schools for Agricultural Science. Of the prior research concentrated on agriculture and STEM pre-college programs, several positive outcomes have been identified. Ortega et al. (2011) found that underrepresented minorities who participated in a one-week agricultural pre-college program experienced reported higher awareness of agriculture one year after the program (Ortega, 2011). Markowitz (2004) determined that students who participated in a pre-college science program reported that the program had a positive effect on their interest in pursuing a career in science. Foster and Savala (2012) observed that under-represented students participating in a one-week and six-week agriculture pre-college program experienced an increased understanding of food, agriculture, and natural resources.

However, other research has suggested that agricultural pre-college programs may be beneficial for students who were not familiar with agriculture prior to the program, but may not be beneficial for students who were already familiar with agriculture prior to the program. Settle et al. (2012) conducted a study on self-efficacy and career interests of urban students who participated in a one-week agricultural communications camp. Settle et al. concluded that non-agriculture students who participated in the pre-college camp had an increase in self-efficacy and career interest in agriculture; agriculture students who participated in the pre-college camp experienced a decrease in self-efficacy and career interest in agriculture. Settle et al. suggested that to optimize effectiveness, agricultural pre-college programs consider shifting their focus to students with non-agricultural backgrounds.

This study addressed a gap in the literature by exploring the variables of interest in the pre-college experience, view of agriculture, and interest in agriculture careers. Additionally, this study was unique because it was guided by the Racial and Ethnic Minorities in STEM Model (Museus, Palmer, Davis, & Miramba, 2011). This relatively new model has not been used to assess agricultural pre-college programs, specifically. This study focused on two specific factors from the Racial and Ethnic Minorities in STEM Model, early exposure and early dispositions, unlike prior research using the model.

CHAPTER 3 METHODS

This research sought examine two pre-college programs and measured participant interest the programs, participant interest in agriculture careers, participant views of agriculture, and the future educational plans of participants. Questionnaires were used to determine the immediate outcomes of the pre-college programs. Observations and semi-structured interviews also took place during the pre-college programs. Structured follow-up phone interviews were used to assess the longer-term outcomes of the pre-college programs. This research received IRB exemption on June 11, 2009 as IRB Protocol #1506016142 (Appendix A).

3.1 Research Design

A positivist research paradigm informed the researcher. Therefore, the researcher assumed that "an external, objective reality exists apart from human perceptions of it" (Schutt, 1999, p. 611). A deductive approach was used for the purpose of exploring and describing. The researcher took a dualist, objectivist role and used descriptive inquiry strategies (Knobloch, 2001).

This research was an exploratory descriptive study of the experiences of high school students who participated in one of two pre-college programs. Students self-selected to participate in a naturally occurring pre-college experience. Students were not

randomly selected or assigned to experimental and comparison groups. This limited the ability to make causal conclusions (Schutt, 2012).

A mixed-methods approach to data collection was utilized to describe students' interest in the pre-college program, interest in agriculture careers, view of agriculture, and future educational plans. Tashakkori and Teddlie (2003) defined mixed method studies as "those that combine the qualitative and quantitative approaches into the research methodology of a single study or multiphased study" (Tashakkori & Teddlie, 1998, p. 17). A mixed methods approach was used because it allowed for a more complete understanding of the students' experiences (Tashakkori & Teddlie, 2003). The mixed methods approach was selected because it allowed numbers to be supported by narrative (Johnson & Onwuegbuzie, 2004), expanding the scope of the study. Utilizing a mixed methods approach provided stronger support for conclusions through corroboration of the findings (Johnson & Onwuegbuzie, 2004). When discrepencies were found between the quanitative and qualitative results, the most believeable results were relied upon.

The specific method used was a sequential mixed model. In the sequential mixed model, "multiple approaches to data collection, analysis, and inference are employed in a sequence of phases" (Tashakkori & Teddlie, 1998, p. 149). This study was QUAN→qual; therefore, it was quantitatively-driven, followed with a qualitative component (Tashakkori & Teddlie, 2003).

For the quantitative portion of the study, a before-and-after design was used with a pretest and posttest. Figure 3.1 diagrams the before-and-after design of the study.

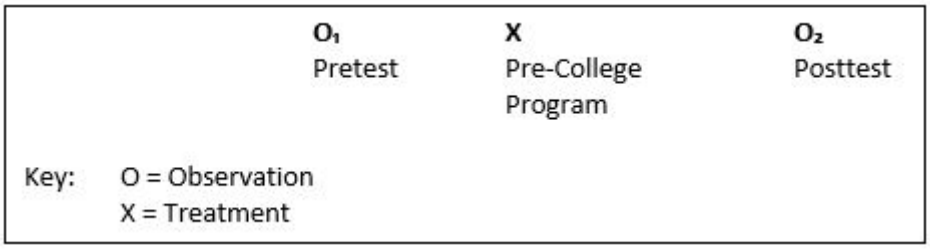

Figure 3.1 Research Design

This study consisted of two separate groups of participants. The same data collection instruments and methods were used for both groups. Both participant groups were composed of high school students; however, the two groups had several differences including grade levels, interests, and demographics. The treatment for one group of participants was the MASI, and the treatment for the second group was the Purdue Agribusiness Science Academy. Both treatments were pre-college residential programs and had some similar components; however, the programs had several differences including program length and content area focus. Due to the differences in the participants of the two groups and the differences in the treatment for the two groups, the data for each group was collected, analyzed, and reported separately. The two participant groups and two pre-college programs were not compared to each other due to the significant differences.

3.2 Participant Selection

3.2.1 Molecular Agriculture Summer Institute

The Molecular Agriculture Summer Institute (MASI) participants were recruited by the Office of Academic Programs in Purdue's College of Agriculture. Recruitment efforts were focused on encouraging Indiana high school science teachers to have their college-bound students apply. From the applicants, participants were selected by the MASI program coordinator based on the applications and the program criteria which included Indiana residency, minimum grade point average of 3.0 out of 4.0, and a letter of recommendation from a teacher. The participants were rising eleventh and twelfth grade students. The participants were predominately from suburban areas, and from middle to high socioeconomic status. All 13 students who participated in the MASI program were asked to take part in the research study.

3.2.2 Purdue Agribusiness Science Academy

The Purdue Agribusiness Science Academy (PASA) participants were recruited by the Office of Multicultural Programs in Purdue's College of Agriculture. Recruitment efforts focused on urban underrepresented minorities. From the applicants, participants were selected by the PASA program coordinator based on the applications and the program criteria which included a minimum grade point average of 2.85 out of 4.0, recommendations, a high school transcript, and student responses to essay questions. The participants were rising tenth, eleventh, and twelfth grade students. The participants were predominately from urban areas, and from low to middle socioeconomic status. All 27

students who participated in the PASA program were asked to take part in the research study, and 26 elected to do so. This research only focuses on those 26 PASA students.

3.3 Background of the Participants

3.3.1 Demographic Information

Demographic information for the MASI and PASA students was collected in the Pre-College Program Youth Questionnaire. This demographic information included gender, underrepresented minority status, grade level, and age.

MASI Demographics

The majority of MASI students were female (76.9%), and there only three male students (23.1%). Table 3.1 displays the gender of the 13 MASI students.

Table 3.1 Number and Frequency of MASI Students' Gender (N = 13)

Gender	Number (*n*)	Percentage (%)
Female	10	76.9%
Male	3	23.1%

There were two underrepresented minority students in the MASI pre-college program (15.4%), and 11 students were not underrepresented minorities (84.6%). Table 3.2 displays the underrepresented minority status of the 13 MASI students.

Table 3.2 Number and Frequency of Underrepresented Minority MASI Students (N = 13)

URM Status	Number (n)	Percentage (%)
Underrepresented Minority	2	15.4%
Non-Underrepresented Minority	11	84.6%

Students in the MASI pre-college program were entering their junior and senior years of high school during the 2015-2016 academic school year. Of the 13 MASI students, nine were entering 11th grade (69.2%), and four were entering 12th grade (30.8%). Table 3.3 displays the grade level of the 13 MASI students.

Table 3.3 Number and Frequency of MASI Students' Grade Classification for the 2015-2016 School Year (N = 13)

Grade	Number (n)	Percentage (%)
11th	9	69.2%
12th	4	30.8%

MASI students ranged in age from 15 to 17 years old. Of the 13 MASI students, three were 15 years old (23.1%), seven were 16 years old (53.8%), and three were 17 years old (23.1%). Table 3.4 displays the ages of the 13 MASI students.

Table 3.4 Number and Frequency of MASI Students' Age (N = 13)

Age	Number (n)	Percentage (%)
15	3	23.1%
16	7	53.8%
17	3	23.1%

PASA Demographics

Of the 26 students in the PASA pre-college program, 12 students were female (46.2%), and 14 students were male (53.8%). Table 3.5 displays the gender of the 26 PASA students.

Table 3.5 Number and Frequency of PASA Students' Gender (N = 26)

Gender	Number (n)	Percentage (%)
Female	12	46.2%
Male	14	53.8%

The majority of students in the PASA pre-college program were underrepresented minorities (92.3%), and only two students were not underrepresented minorities (7.7%). Table 3.6 displays the underrepresented minority status of the 26 PASA students.

Table 3.6 Number and Frequency of Underrepresented Minority PASA Students (N = 26)

URM Status	Number (n)	Percentage (%)
Underrepresented Minority	24	92.3%
Non-Underrepresented Minority	2	7.7%

Students in the PASA pre-college program were entering their freshman, sophomore, junior, and senior years in high school during the 2015-2016 academic year. Of the 26 students, one student was entering ninth grade (3.8%), six students were entering 10th grade (23.1%), 13 students were entering 11th grade (50.0%), and six students were entering 12th grade (23.1%). Table 3.7 displays the grade levels for the 26 PASA students.

Table 3.7 Number and Frequency of PASA Students' Grade Classification for the 2015-2016 School Year (N = 26)

Grade	Number (*n*)	Percentage (%)
9th	1	3.8%
10th	6	23.1%
11th	13	50.0%
12th	6	23.1%

Students in the PASA pre-college program ranged in age from 15 years old to 18 years old. Seven of the 26 PASA students were 15 years old (26.9%), 14 students were 16 years old (58.3%), four students were 17 years old (15.4%), and one student was 18 years old (3.8%). Table 3.8 displays the ages of the 26 PASA students.

Table 3.8 Number and Frequency of PASA Students' Age (N = 26)

Age	Number (n)	Percentage (%)
15	7	26.9%
16	14	58.3%
17	4	15.4%
18	1	3.8%

3.3.2 Agricultural Background

Information regarding students' agricultural backgrounds was collected during the follow-up phone interviews. However, not all MASI and PASA students participated in the follow-up interview. Therefore, this information was available for those who did participate in the phone interviews, which consisted of seven MASI students and 10 PASA students. Students were asked three questions to gain an understanding of their agricultural background and exposure to agriculture prior to participating in the MASI and PASA pre-college programs, and these questions addressed: (1) participation in 4-H prior to the pre-college programs, (2) participation in FFA prior to the pre-college programs, and (3) residing on a farm.

MASI Students' Agricultural Background

Overall, MASI students did not come from an agricultural background. Of the seven students who participated in the follow-up phone interviews, one participated in 4-H prior to MASI (14.3%), none participated in FFA prior to MASI, and none resided on a

farm. Table 3.9 displays the agricultural backgrounds of the seven MASI students who participated in the follow-up phone interviews.

Table 3.9 MASI Students' Agricultural Backgrounds (N = 7)

	Number (n)	Percentage (%)
Participated in 4-H prior to MASI	1	14.3%
Participated in FFA prior to MASI	0	0%
Resided on a farm	0	0%

PASA Students' Agricultural Background

Overall, PASA students did not come from an agricultural background. Of the 10 students who participated in the follow-up phone interviews, two participated in 4-H prior to PASA (20%), none participated in FFA prior to PASA, and none resided on a farm. Table 3.10 displays the agricultural backgrounds of the 10 PASA students who participated in the follow-up phone interview.

Table 3.10 PASA Students' Agricultural Backgrounds (N = 10)

	Number (n)	Percentage (%)
Participated in 4-H prior to MASI	2	20%
Participated in FFA prior to MASI	0	0%
Resided on a farm	0	0%

3.4 Role of the Researcher

3.4.1 MASI

The researcher served as the Assistant Program Coordinator and Counselor Director for the duration of the MASI pre-college program. As Assistant Program Coordinator, the researcher was responsible for assisting the Program Coordinator in designing and implementing select activities, and accompanying students throughout the program. As Counselor Director, the researcher was responsible for overseeing and assisting in the selection of the two undergraduate Agriculture camp counselors.

Due to the researcher's role as Assistant Program Coordinator and Counselor Director, the potential for bias existed. To monitor for bias, peer debriefing and reflexivity took place to monitor potential biases. The use of a questionnaire and structured interview were used as objective measures.

Additionally, the researcher's role had some benefits. The researcher's presence for the majority of the pre-college program's activities allowed the researcher to conduct observations throughout the program's duration. This allowed the researcher to detect perceptions, interactions, and comments which would not have been garnered otherwise. The researcher compiled field notes throughout the program to capture the information gained from these observations. The researcher's role also allowed for the facilitation of a relationship with the students, which increased their willingness to share thoughts and feelings.

3.4.2 PASA

The researcher did not have an active role in planning or implementation of the PASA program. The researcher observed participants during selected activities. During these observations, the researcher composed field notes and informally interacted with participants to ask questions aimed at gaining insights to perceptions and experiences.

As a result of the researcher's limited involvement in the program, students may have been less likely to share authentic opinions. Due to the researcher's varied involvement in the two pre-college programs, the potential for bias existed. Peer debriefing and reflexivity was used to monitor for bias.

3.5 Data Collection Instruments

Data collection consisted of three components: (1) a student questionnaire (pretest and posttest), (2) semi-structured interviews, and (3) a structured phone-interview.

3.5.1 Pre-College Program Youth Questionnaire

The Pre-College Program Youth Questionnaire, pretest and posttest, was used for both MASI and PASA (Appendix C). The Pre-College Program Youth Questionnaire was adapted from three instruments (i.e., The Intrinsic Motivation Inventory, Ag Discovery Camp Questionnaire, and Agricultural Awareness Survey) developed and utilized in prior research studies to measure similar variables. The pretest consisted of three sections: (1) agricultural career interest, (2) view of agriculture, and (3) demographic information. The posttest consisted of four sections: (1) interest in the pre-

college program, (2) agricultural career interest, (3) view of agriculture, and (4) demographic information.

The MASI and PASA program coordinators reviewed the Pre-College Program Youth Questionnaire to ensure it was appropriate for the age and background of the program participants. An expert panel with expertise in motivation, plant sciences education, and adolescent development, provided feedback to ensure content and face validity. The Intrinsic Motivation Inventory, Ag Discovery Camp Questionnaire, and Agricultural Awareness Survey had been previously tested and Cronbach's *alpha* was used to ensure that the scales were reliable.

Interest in the Pre-College Program Variable

The 25 items in the section measuring interest in the pre-college program originated from the Intrinsic Motivation Inventory, and were developed based on Deci and Ryan's (1985) self-determination theory. The Intrinsic Motivation Inventory consisted of six subscales. Four of these subscales were used for the Pre-College Program Youth Questionnaire: (1) interest/enjoyment, (2) value/usefulness, (3) perceived competence, and (4) effort/importance. The interest/enjoyment subscale consisted of seven items, the value/usefulness subscale consisted of seven items, the perceived competence subscale consisted of six items, and the effort/importance subscale consisted of five items. A five-point Likert scale was used to measure the items in each of these subscales: 1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely. Cronbach's alpha reliability verified that the four subscales were reliable: interest/enjoyment (.91), value/usefulness (.86), perceived competence (.89),

effort/importance (.72). Cronbach's alpha reliability verified that the combination of all four variables was reliable (.83).

Agricultural Career Interest Variable

Career interest consisted of 13 items with a five-point Likert scale. These items were adapted from The Ag Discovery Camp Questionnaire (Ortega, 2011), which was adapted from the 4-H Science Workshops for Youth Questionnaire (Knobloch et al., 2009). The Ag Discovery Camp Questionnaire was used to assess middle school students before and after participation in an agriculture pre-college program. The validity of the Ag Discovery Camp Questionnaire's was established through an expert panel, pilot-testing, and factor analysis (Ortega, 2011). The Ag Discovery Camp Questionnaire consisted of seven sections, and only the third section, career interests, was used for the Pre-College Program Youth Questionnaire. Minor adaptations made to the original items from the Ag Discovery Camp Questionnaire to reflect current language for career options. Cronbach's alpha reliability coefficients of the scale were 0.70 (pretest) and 0.52 (posttest). The items for career interest represented a wide variety of agricultural careers, which likely explains why this variable was less reliable on the posttest.

View of Agriculture

The 15 items in the section measuring view of agriculture were adapted from an Agricultural Awareness Survey developed to measure the task-value of integrating agriculture, and attitudes and perceptions of agriculture (Knobloch, 1997). Cronbach's

alpha reliability coefficients confirmed the reliability of the scale (pretest = .88; posttest = .95).

Demographics

The four items in the demographics section included gender, race, age, and school grade level.

3.5.2 Semi-Structured Interviews

Informal, semi-structured interviews were conducted during the pre-college programs. Prior to the interviews, the researcher developed questions intended to gain additional insights to students' experiences and components of the program that the students most enjoyed.

3.5.3 Structured Phone Interviews

The interview protocol consisted four sections (Appendix D). The first section consisted of three open-ended questions asking students to reflect upon their experiences during the pre-college program. The second section consisted of two open-ended questions asking students about their perceptions of agriculture. The third section consisted of three open-ended questions, four yes or no questions, two multiple choice questions, and one scaled question, all about the student's career interests and future educational plans. The fourth section consisted of seven questions regarding demographic information.

3.6 Research Setting and Treatment

3.6.1 MASI

The Molecular Agriculture Summer Institute (MASI) pre-college program was a one-week residential program at Purdue University hosted by the College of Agriculture's Office of Academic Programs. The Program Coordinator was the Office of Academic Programs' Plant Sciences Recruitment and Outreach Coordinator. The program was seven days and took place from Sunday, June 14, 2015 to Saturday, June 20, 2015.

MASI was a new program and 2015 was the first year it occurred. The program was sponsored by Verizon. Due to the fact that the program was fully funded, students and parents did not have to cover the cost of any of the fees or expenses associated with the program, including housing, food, field trips, or lab materials.

Student schedules were structured and consisted of five components: (1) preparing for college, (2) recreation, (3) labs, (4) guest speakers, and (5) tours. A program itinerary is included in Appendix E.

Preparing for college: To introduce students to residential college living, students were housed with a roommate in a Purdue University dorm. Students ate meals at a Purdue University dining court, and independently navigated their way around campus. Two undergraduate students pursing majors in agriculture served as counselors and answered student questions relating to college as they arose. Students participated in a presentation on majors in the College of Agriculture and the college application

process. Students also participated in a tour of the campus and athletic facilities while riding the Purdue University train mascot, the Boilermaker Special.

Recreation: Activities allowing students to socialize and recreate included games, bowling, a campus scavenger hunt, and time at Purdue University's student recreational sports center.

Labs: In groups of three and four, students spent a total of 20 hours working with College of Agriculture faculty and staff members in plant science laboratories. Lab activities varied among the four lab groups, but all groups conducted research. Lab assignments were made by the MASI Program Coordinator based on student interests as specified in student applications to the pre-college program. On the final day of the program, participants gave an oral presentation of their research findings for their families and, peers, lab directors, and some administrators from Purdue University's College of Agriculture.

Guest speakers: Participants experienced guest lecturers by individuals from both Purdue University and individuals from entities outside the university. The guest speakers included the Dean of the University's College of Agriculture, the University's Director of Agriculture Research, the University's 4-H Youth Development Science Education Specialist, an award winning turf specialist for the state's minor league baseball team, and an industry professional from Verizon.

Tours: Participants toured the Dow AgroSciences headquarters, Purdue University greenhouses, the Purdue University's microscopy lab, and Purdue University's Agronomy Center for Research and Education.

3.6.2 PASA

Purdue Agribusiness Science Academy (PASA) was a two-week residential pre-college program at Purdue University hosted by the College of Agriculture's Office of Multicultural Programs. The Program Coordinator was a Program Manager from the Office of Multicultural Programs. The program was 14 days and took place from Sunday, July 12, 2015 to Saturday, July 25, 2015.

The PASA program had taken place for several years, and was previously called the Hoosier Agribusiness Science Academy (HASA). Students are able to participate in the program multiple times. Therefore, some students had previously attended in prior years. The program cost $300 per student, and a limited number of partial scholarships were available. Students were able to participate in the program multiple years, and during the 2015 PASA pre-college program five of the 26 PASA students (19.2%) had participated in the program before.

Student schedules were structured and consisted of four components: (1) preparing for college, (2) recreation, (3) tracks, and (4) tours. A program itinerary is included in Appendix F.

Preparing for college: During the program students lived in a Purdue University dorm with a roommate and ate at a Purdue University dining hall. Each evening students participated in either study tables or SAT/ACT preparation. Students also participated in a presentation on college admissions.

Recreation: Opportunities for students to socialize and recreate included time at the University's student recreation center, a water park visit, a scavenger hunt, and going to a movie theater.

Academic Tracks: The program coordinator assigned students to an academic track prior to the program based student interests as expressed in their applications. The three tracks were sustainability, forensic science, and business education. Of the 26 PASA students, eight (30.8%) participated in the sustainability academic track, which had classes throughout the program from the College of Agriculture's departments of Forestry and Natural Resources, Animal Sciences, Agronomy, and Botany. Nine PASA students (34.6%) participated in the forensic sciences academic track, which had classes from the departments of Forensic Sciences, Biochemistry, and Veterinary Medicine. The business education academic track also had nine participants (34.6%) and had classes from the departments of Horticulture and Landscape Architecture, Agricultural Economics, and Youth Development and Agricultural Education. Each day students spent time doing lab activities, field activities, or listening to guest speakers related to their track. On the last day of the program, students presented what they learned in their track to their parents and peers.

Tours: Participants toured several off-campus organizations and businesses including the Museum of American Indians and Western Art, Dow AgroSciences, the Indiana statehouse, an agritourism farm called Fair Oaks, a blueberry farm, the Indiana State Fairgrounds, Ivy Tech Community College, DuPont Pioneer, and Elanco.

3.7 Data Collection

Data collection consisted of three components: (1) the Pre College Program Youth Questionnaire (pretest and posttest), (2) semi-structured interviews, and (3) structured phone interviews. Table 3.11 presents the dates on which the data collection was administered for MASI and Table 3.12 presents the dates on which the data collection was administered for PASA.

Table 3.11 MASI Data Collection Timeline

Data Collection Component	Date
Pre-College Program Pretest	June 14, 2015
Semi-Structured Interviews	June 19, 2015
Pre-College Program Posttest	June 20, 2015
Structured Phone Interviews	November-December 2015

Table 3.12 PASA Data Collection Timeline

Data Collection Component	Date
Pre-College Program Pretest	July 13, 2015
Semi-Structured Interviews	July 23, 2015
Pre-College Program Posttest	July 24, 2015
Structured Phone Interviews	February-March 2016

Prior to the pre-college programs, the Program Coordinators electronically sent a letter to all parents of students attending the program to notify them of the research study (Appendix B). The letter contained an overview of what student involvement in the study would entail. It also informed parents that participation in the study was voluntary

and information obtained would be kept confidential. Parents were given the opportunity to decline their son or daughter's participation in the study, however no parents chose to do so.

3.7.1 Pre-College Program Youth Questionnaire

For both MASI and PASA, the Pre-College Program Youth Questionnaire pretest was administered at the beginning of the program (Appendix C). The questionnaires were completed via hard copy. The researcher explained the questionnaire to the group of students and informed them that participation was voluntary and would not affect their involvement in the pre-college program, information gathered would be kept confidential, and they could choose to stop participating at any time. Students were not given a time limit to complete the questionnaire, and completed the questionnaires independently. The researcher was available to answer questions that arose while students completed the questionnaire. It took students less than 15 minutes to finish the questionnaires, and once questionnaires were completed they were collected by the researcher. All students who participated in MASI or PASA were offered the Pre-College Program Youth Questionnaire pretest. Of the MASI students, 13 chose to participate (100%). Of the 27 PASA students, 26 chose to participate (96.3%).

The Pre-College Program Youth Questionnaire posttest was completed at the conclusion of the program. Procedures followed were the same as those for the pretest. All students who participated in MASI or PASA were offered the Pre-College Program Youth Questionnaire posttest. Of the MASI students, 13 chose to participate (100%). Of the 27 PASA students, 26 chose to participate (96.3%).

3.7.2 Semi-Structured Interviews

For the MASI program, informal semi-structured interviews were conducted on one day of the program. The interviews took place during the students' free time, and were video recorded. Participation was voluntary and all students were given the opportunity to participate. Some students chose to participate in the interview independently, and other students chose to participate in the interview in a small group of their choice. Some questions were prepared in advance of the interviews, and were intended to gain additional insights to students' experiences and perceptions. However, not all students were asked all of the prepared questions, the interviewer formed additional questions during the interviews building upon student responses, and students were given the opportunity to share additional information or opinions that were not asked about. These videos were transcribed and used as a data source. Two students participated in the semi-structured interview as an individual, and eight students participated in the semi-structured interview as a small group.

The semi-structured interviews conducted during PASA took place while the researcher was conducting observations. The interviews were not video recorded, and instead the researcher wrote down student responses as field notes. Students were selected by the researcher based on student availability to participate in the interview and not all students were available to participate. There were seven students who participated in the semi-structured interview.

3.7.3 Structured Phone Interviews

The researcher and MASI Program Coordinator conducted telephone interviews six to eight months after the completion of program. Students were notified of the opportunity to participate in the telephone interview several days in advance through an electronic email from the Program Coordinator. The students had the opportunity to accept the invitation to participate and schedule a time for the phone interview, or decline participation. Of students who did not respond, a follow-up email was sent by the Program Coordinator a week later, and it was assumed that students who did not respond to that email did not wish to participate. Of the 13 MASI students, seven participated in a phone interview (53.9%).

At the scheduled time, the MASI Program Coordinator called the student from an office in the College of Agriculture's Office of Academic Programs. The Structured Phone Interview Protocol were used (Appendix D). The Program Coordinator greeted the student and introduced the student to the format of the phone interview. The researcher asked the first series of questions regarding the student's experience in the pre-college program. The Program Coordinator asked the second section of questions which was about the student's perceptions of agriculture. The researcher asked the third section of questions related to the student's future educational plans and career interests. The Program Coordinator asked the fourth section of questions consisting of demographic information.

Each interview lasted from five to 15 minutes in length. During the phone call both the Program Coordinator and the researcher logged the student responses on a hard

copy of the interview questions. This allowed the responses logged by each to be compared for accuracy and to ensure effective interpretation.

The same procedures were used for the PASA phone interviews. Of the 26 PASA students, 10 chose to participate in the phone interview (38.5%).

3.8 Researcher's Bias

The researcher served as the Assistant Camp Coordinator for one of the two pre-college programs in the study, the Molecular Agriculture Summer Institute. This had the potential to influence researcher bias resulting from the researcher's relationship with the students, and may have affect the students' responses. The researcher also had a Bachelor of Science in Environmental Management, and had prior interest and experience in environmental sciences, plant sciences, agriculture, and youth outreach programming, which could have influenced the researcher's interpretation of the findings. However, the researcher took precautions to monitor biases including reflexivity and peer debriefing. The researcher also attempted to avoid using biased language and used direct quotes to provide accurate descriptions of the students' comments.

Throughout the research process, strategies were used to ensure trustworthiness of the research and monitor researcher bias. To secure truth value, measures were taken to establish credibility, including varied and prolonged field experience, reflexivity, peer examination, and triangulation (Guba, 1981; Krefting, 1991).

The researcher obtained varied and prolonged field experience by spending a significant amount of time with the students in different settings during the pre-college programs. Submersion in the research setting and spending an extended period of time

with the students increased the ability of the researcher to identify recurrent patterns, achieve elevated familiarity and discovery, and expanded information gained from students through the development of rapport (Kielhofner, 1982; Lincoln & Guba, 1985; Krefting, 1991). However, the extent of the researcher's involvement varied between the two pre-college programs studied due to the researcher's role as an Assistant Camp Coordinator in the Molecular Agriculture Summer Institute.

Reflexivity occurred in the form of reflection on the effect of the researcher's interests, background, and perceptions on the data collection and analysis (Ruby, 1980). Reflexivity was also used to ensure that the researcher's relationship with the students did not alter the researcher's interpretation of the findings (Krefting, 1991). To ensure the honesty and impartiality of the research, the researcher also engaged in peer examination through the discussion of the research and findings with impartial peers (Lincoln & Guba, 1985).

Triangulation took place through the cross-checking of different pieces of data for mutual confirmation (Knafl & Breitmayer, 1989). Specifically, two forms of triangulation were used, triangulation of data methods and triangulation of data sources. Triangulation of data methods was achieved through the use and comparison of various means of data collection (Knafl & Breitmayer, 1989; Krefting, 1991). The methods of data collection included questionnaires, observations, semi-structured interviews, and structured interviews. Triangulated sources included different days, different groupings of students, and different settings. Sources originated from the first day of the pre-college programs, the days during the pre-college programs, the last day of the pre-college programs, and six to eight months after the pre-college program. Data sources

included those obtained from students independently, students working with their lab groups or track groups, and students in small groups of their choice. Different settings of the data sources included in the residence halls, in labs on the university campus, at field trip locations, and at over the phone while the students were at their homes.

3.9 Data Analysis

3.9.1 Quantitative Data

Quantitative data consisted of the data collected via the Pre-College Program Youth Questionnaire pretests and posttests, as well the responses to the closed-ended questions from the structured phone interviews. Questionnaire responses were entered into a statistical software program, Statistical Package for the Social Sciences (SPSS). Data for MASI and PASA were analyzed separately. To determine whether questionnaire components were reliable within the datasets, Cronbach's *alpha* post-hoc reliability coefficients were computed. Descriptive statistics and relationship coefficients used to analyze the data, including means, standard deviations, and frequencies (Table 3.13).

Table 3.13 Research questions, measures, levels of measurement, variables, and data analysis procedures

Research Question	Measures/ Evidence	Level of Measurement	Variables	Data Analysis Procedure
To what extent were students interested in the pre-college program and activities?	Intrinsic Motivation Inventory	Item: Ordinal Scale: Interval	1. Interest/ enjoyment 2. Value/ usefulness 3. Perceived competence 4. Effort/ Importance	Mean, SD
To what extent were students interested in agriculture careers before and after the pre-college program?	Ag Discovery Camp Questionnaire	Item: Ordinal Scale: Interval	Agriculture Career Interest	Item: Median Scale: Mean, SD
What were the students' perceptions of agriculture before and after participation in the pre-college program?	Agricultural Awareness Survey	Item: Ordinal Scale: Interval	View of Agriculture	Item: Median Scale: Mean, SD
What were the students' future educational plans six to eight months after participating in the pre-college program?	Intent to apply to Purdue's College of Agriculture	Nominal	Future Educational Plans	Frequency

3.9.2 Qualitative Data

Qualitative data consisted of the data collected through semi-structured interviews and open-ended questions from the structured phone interviews. Qualitative data was coded using the descriptive coding method (Saldana, 2013). The descriptive coding method was chosen because it is appropriate for beginning qualitative researchers. Descriptive coding is also congruous with studies consisting of a variety of data forms (Saldana, 2013). This research included several data forms: semi-structured interviews and structured interviews. Basic topics were identified in the passages of qualitative data. The topics were assigned labels, or codes, to summarize them in a word or short phrase (Saldana, 2013).

CHAPTER 4 RESULTS

The purpose of this study was to explore and describe high school students' motivation, career interests, views, and educational aspirations who participated in two pre-college experiences—the Molecular Agriculture Summer Institute (MASI) and the Purdue Agribusiness Science Academy (PASA). Four research questions were used to guide the study and results are presented accordingly.

4.1 Motivation

Research question 1: *To what extent were students in two pre-college programs motivated to engage in the pre-college programs and activities?*

Research question 1 was answered with: (1) quantitative data from the Pre-College Program Youth Questionnaire posttest; (2) qualitative data from the follow-up phone interviews; and, (3) qualitative data from informal interviews.

4.1.1 Pre-College Program Youth Questionnaire

To understand students' motivation to engage in the pre-college programs and activities, four subscales were used: (1) interest/enjoyment, (2) value/usefulness, (3) perceived competence, and (4) effort/importance. A five-point scale was used: 1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely. Means and standard

deviations were calculated for each of the four subscales, then a grand mean was calculated.

Participants in the MASI pre-college program were "absolutely" motivated regarding the value/usefulness (*M* = 4.68; *SD* = .52) and effort/importance (*M* = 4.62; *SD* = .56) of their experiences in the pre-college program (Table 4.1). Participants in the MASI pre-college program reported "a lot" of motivation for interest/enjoyment (*M* = 4.35; *SD* = .84) and perceived competence (*M* = 4.17; *SD* = .71) regarding their experiences in the pre-college program. The grand mean for the four subscales indicated that students in the MASI pre-college program had "a lot" of motivation to engage in the program (*M* = 4.45; *SD* = .56).

Participants in the PASA pre-college program reported "a lot" of motivation regarding the interest/enjoyment (*M* = 4.44; *SD* = .56), value/usefulness (*M* = 4.44; *SD* = .53) perceived competence (*M* = 3.92; *SD* = .75), and effort/importance (*M* = 4.48; *SD* = .49) regarding their experiences in the pre-college program. The grand mean for the four subscales indicated that students in the PASA pre-college program had "a lot" of motivation to engage in the program (*M* = 4.32; *SD* = .49). Table 4.1 displays the results for MASI and PASA students' motivation to engage in the pre-college programs and activities.

Table 4.1 MASI and PASA Students' Motivation to Engage in the Pre-College

	Pre-college program	
	MASI *N* = 13	PASA *N* = 26
Motivation subscale	Mean (*SD*)	Mean (*SD*)
Interest/enjoyment	4.35 (.84)	4.44 (.56)
Value/usefulness	4.68 (.52)	4.44 (.53)
Perceived competence	4.17 (.71)	3.92 (.75)
Effort/importance	4.62 (.56)	4.48 (.49)
Grand mean	4.45 (.56)	4.32 (.49)

Note. Means were calculated using a 5-point scale (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

4.1.2 Follow-Up Phone Interviews

Seven MASI students and 10 PASA students participated in follow-up phone interviews. To provide insight on why students were motivated to attend the pre-college programs and motivation during the pre-college programs, students were asked two open-ended questions in these interviews: (1) "*Why did you attend MASI/PASA?"* (2) "*What did you like most about MASI/PASA*?"

MASI Students' Motivation for Attending the Pre-College Program

Six codes were common among MASI students' responses to the question "*Why did you attend MASI?"* (Table 4.2). Four students mentioned the opportunity to explore Purdue, three mentioned the opportunity to explore science, three mentioned the

opportunity to meet other students, three mentioned MASI helping with the college decision making process, two mentioned the World Food Prize Institute, and two mentioned the opportunity to do lab activities with professors.

Table 4.2 MASI students' responses to "Why did you attend MASI?" (n = 7)

Code	Number of students who mentioned the code in their response. (%)
Explore Purdue	4 (57.1%)
To explore Science	4 (57.1%)
To meet other students	3 (42.9%)
Beneficial to the college decision making process	3 (42.9%)
Had attended the World Food Prize Institute	2 (28.6%)
To do lab activities with professors	2 (28.6%)

Note. Some student responses contained more than one theme.

PASA Students' Motivation for Attending the Pre-College Program

Four codes were common among PASA students' responses to the question "*Why did you attend PASA?"* (Table 4.3). Five responses mentioned hearing about the PASA pre-college program through a college preparatory program called Upward Bound, four mentioned hearing about the program from a person in their life, three mentioned the opportunity to learn about college, and one specifically mentioned her/his interest in the subject matter of food science.

Table 4.3 PASA students' responses to "Why did you attend PASA?" (n = 10)

Code	Number of students who mentioned the code in their response. (%)
Heard about PASA through Upward Bound	5 (50.0%)
Heard about PASA from a person in their life (friend, relative, teacher)	4 (40%)
To learn about college	3 (30%)
Interested in food science	1 (10%)

Note. Some student responses contained more than one theme.

MASI Students' Motivation during the Pre-College Program

The seven MASI students who participated in a follow-up phone interviews were asked what they enjoyed most about the pre-college program. Students' responses were coded in six categories (Table 4.4). Six students mentioned meeting other students and making friends, five students mentioned working in a lab, three students mentioned working with a professor, two students mentioned learning new things, and two students mentioned using lab equipment not available in their high school and doing things in the lab that were not a part of their high school classes.

Table 4.4 MASI students' responses to "What did you enjoy most about MASI?" (n = 7)

Code	Number of students who mentioned the code in their response. (%)
Meeting other students/making friends	6 (85.7%)
Working in a lab	5 (71.4%)
Working with a professor	3 (42.9%)
Learning new things	2 (28.6%)
Using lab equipment not available in high school/doing things not a part of high school classes	2 (28.6%)

Note. Some student responses contained more than one theme.

PASA Students' Motivation during the Pre-College Program

Ten PASA students who participated in the phone interviews were also asked what they enjoyed most about the PASA pre-college program. Students' responses were coded into four categories (Table 4.5). Four students mentioned that the program gave them a preview of college (e.g., schedule, courses, curricula). PS7 explained that the teachers of the botany and microbiology classes "opened my eyes to agriculture." PS9 said the PASA pre-college program was "an exact replica of college life…I felt like a college student and was treated like a college student." Field trips, which were mentioned by three students and the activities were mentioned by two students.

Table 4.5 PASA students' responses to "What did you enjoy most about PASA?" (n = 10)

Code	Number of students who mentioned the code in their response. (%)
Preview of college/college atmosphere	4 (40%)
Field trips	3 (30%)
Activities	2 (20%)

Note. Some student responses contained more than one theme.

4.1.3 Informal Student Interviews

Informal interviews were conducted during the MASI pre-college program. Several students indicated that they enjoyed the science component of the program. One student noted, "it's a science camp that's not for science nerds." One student liked the opportunity to "do stuff you wouldn't normally do in a science class." Another student stated that she/he enjoyed the hands-on experiments.

Several students also mentioned the social relationships formed through the pre-college program. One student stated that the pre-college program allowed her/him to "make really good friends." When reflecting on the pre-college program, another student stated, "you get to interact with a bunch of different people…and grow with each other." Students also mentioned liking that the program was small.

4.2 Interest in Agriculture Careers

Research question 2: *To what extent were students in two pre-college programs interested in agriculture careers before and after participating in the pre-college programs?*

Research question 2 was answered with: (1) quantitative data from the Pre-College Program Youth Questionnaire pretest and posttest; and, (2) quantitative and qualitative data from the follow-up phone interviews.

4.2.1 Pre-College Program Youth Questionnaire

The Pre-College Program Youth Questionnaire contained 13 items in the career interest section. Pretest and posttest medians were calculated for each of the 13 items, as well as the grand mean and standard deviation of all items. Table 4.6 contains the agriculture career interest pretest and posttest medians for the MASI and PASA pre-college programs. Appendix G contains the frequency results.

As a group, students in the MASI pre-college program reported they had the same level of interest before and after the pre-college program for careers in science (pretest and posttest *Mdn* = 5), careers in business (pretest and posttest *Mdn* = 2), careers working with plants (pretest and posttest *Mdn* = 3), careers working with animals (pretest and posttest *Mdn* = 3), careers working with machines (pretest and posttest *Mdn* = 3), careers working with natural resources (pretest and posttest *Mdn* = 3), careers working with organisms (pretest and posttest *Mdn* = 4), careers working with people (pretest and posttest *Mdn* = 5), careers working with numbers (pretest and posttest *Mdn* = 3), and careers in food production (pretest and posttest *Mdn* = 2). Posttest student interest was

higher than pretest student interest for careers in technology/engineering (pretest *Mdn* = 3; posttest *Mdn* = 4), careers in communication/education (pretest *Mdn* = 2; posttest *Mdn* = 3), and careers in agriculture (pretest *Mdn* = 3; posttest *Mdn* = 4). The grand mean indicated that students in the MASI pre-college program were "somewhat" interested in agriculture careers before and after the program (pretest Grand Mean = 3.15, *SD* = .58; posttest Grand Mean = 3.22, *SD* = .37). Effect sizes were calculated with Cohen's *d* and interpreted using Cohen's descriptors (Cohen, 1988). Upon completion of the MASI pre-college program, students reported higher interest in agriculture careers (*d* = .14, trivial effect size). Although the effect size was trivial, qualitative data supported higher agricultural career interests after participating in the pre-college programs.

As a group, students in the PASA pre-college program reported the same level of interest before and after the pre-college program for careers in science (pretest and posttest *Mdn* = 3.5), careers in technology/engineering (pretest and posttest *Mdn* = 3), careers working with plants (pretest and posttest *Mdn* = 2), careers working with animals (pretest and posttest *Mdn* = 3), careers working with machines (pretest and posttest *Mdn* = 3), careers working with organisms (pretest and posttest *Mdn* = 3), careers working with people (pretest and posttest *Mdn* = 4), and careers working with numbers (pretest and posttest *Mdn* = 3). Upon completion of PASA, students reported having higher interest for careers in communication/education (pretest *Mdn* = 2; posttest *Mdn* = 3), careers in business (pretest *Mdn* = 3.5; posttest *Mdn* = 4), careers working with natural resources (pretest *Mdn* = 2.5; posttest *Mdn* = 3), and careers working in food production (pretest *Mdn* = 2; posttest *Mdn* = 3). The grand mean indicated that students in the PASA pre-college program were "somewhat" interested in agriculture careers before and after

the program (pretest Grand Mean = 2.83, *SD* = .52; posttest Grand Mean = 3.15, *SD* = .53). Upon completion of the PASA pre-college program, students also reported higher interest in agriculture careers (*d* = .61, moderate effect size).

Table 4.6 Median of MASI and PASA Students' Agriculture Career Interests

"I'm interested in working"…	Pre-College Program			
	MASI *N* = 13		PASA *N* = 26	
	Pretest *Mdn*	Posttest *Mdn*	Pretest *Mdn*	Posttest *Mdn*
in Science	5	5	3.5	3.5
n Technology/Engineering	3	4	3	3
in Communication/Education	2	3	2	3
in Business	2	2	3.5	4
with plants	3	3	2	2
with animals	3	3	3	3
with machines	3	3	3	3
with natural resources	3	3	2.5	3
with organisms	4	4	3	3
with people	5	5	4	4
with numbers	3	3	3	3
in food production	2	2	2	3
in agriculture	3	4	3	3
Grand mean (SD)	3.15 (.58)	3.22 (.37)	2.83 (.52)	3.15 (.53)

Note. Medians were calculated using a 5-point scale (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

4.2.2 Follow-Up Phone Interviews

To gain additional insights into students' interest in agriculture careers, students were asked four questions: (1) "*What career path would you like to take in your future?"* (2) "*As a result of MASI/PASA, has your awareness of the various opportunities in agriculture increased?*" (3) "*Would you consider a career in agriculture*?" (4) "*Why would you/wouldn't you consider a career in agriculture*?"

MASI

When the seven MASI students who participated in the phone interviews were asked about their future career plans, all seven responses were science-related, and four of those were in agriculture. When asked if their awareness of the various career opportunities in agriculture had increased as a result of MASI, and all seven MASI students who participated in the phone interviews responded that their awareness of various agricultural careers had increased. MS2 said, "Before [MASI] I thought agriculture was just farming. Now I've realized there's a lot more opportunity, especially for girls." MS4 said, "Before [MASI] I thought the only career opportunity in agriculture was to own a farm or ag. business management."

All seven MASI students who participated in the phone interviews stated that they would consider a career in agriculture. When reflecting upon why they would consider a career in the agriculture, four students mentioned an interest in science, and three students mentioned working in a laboratory. MS6 stated that she would consider a career in the agricultural sciences "mostly because of MASI," noting that she wasn't interested

in agriculture before, however she had fun working in a lab with a professor, and said "MASI was a turning point for me." MS3 stated that science had always been her/his favorite subject and MASI was the first time she/he had the opportunity to work in a lab, and realized "this is what I can see myself doing." MS7 said, "Agriculture is the basis of society. Without enough food society can't function. I want to be a part of the group that makes sure there is enough food for everyone."

PASA

The 10 PASA students who participated in the follow-up phone interviews planned to pursue a variety of career paths including agricultural-related fields (3 students), business (3 students), engineering (2 students), arts (1 student), and medicine (1 student). All 10 PASA students reported that as a result of the PASA pre-college program their awareness of various career opportunities in agriculture had increased. PS2 said during the PASA program she/he "learned about more jobs, and PS4 stated that before PASA she/he "didn't know there were that many jobs in agriculture." Seven of 10 PASA students who participated in the phone interviews stated that they would consider a career in agriculture. When asked why they would consider a career in agriculture, student responses varied. PS1 stated that she/he would consider a job in agriculture because it could allow the opportunity to work outdoors. PS2 mentioned the need to supply enough food everyone, and that a job in agriculture would allow her/him to help achieve that. PS10 stated, "I feel like it's something that would give me a lot of opportunities."

4.3 Views of Agriculture

Research question 3: *What were the students' interest levels and views of agriculture before and after participating in the pre-college programs?*

Research question 3 was answered with: (1) quantitative data from the Pre-College Program Youth Questionnaire pretest and posttest; (2) quantitative and qualitative data from the follow-up phone interviews; and, (3) qualitative data from informal interviews.

4.3.1 Pre-College Program Youth Questionnaire

View of agriculture was measured using 15 items. Medians were calculated for each item, and a grand mean and standard deviation was calculated for all items. For reporting, the 15 items were placed into three categories: (1) students' view on incorporating agriculture into STEM; (2) students' views on industry sectors encompassed by agriculture; and, (3) students' views on characteristics of the agricultural industry.

Incorporation of Agriculture into STEM

The first four items in the view of agriculture variable addressed the incorporation of agriculture into STEM. Students in both MASI and PASA indicated that agriculture can be integrated into STEM. For both the MASI and PASA pre-college programs, the median for incorporating agriculture into science, technology, and engineering was 5 for both the pretest and posttest. For both the MASI and PASA pre-college programs, the median for incorporating agriculture into math was higher in the posttest than in the

pretest (MASI pretest *Mdn* = 4; MASI posttest *Mdn* = 5) (PASA pretest *Mdn* = 4.5; PASA posttest *Mdn* = 5). Table 4.7 contains the agriculture incorporation into STEM pretest and posttest medians for the MASI and PASA pre-college programs. Appendix H contains the response frequencies.

Table 4.7 Median of MASI and PASA students' view on Incorporating Agriculture into STEM

"Agriculture could be incorporated into"…	Pre-College Program			
	MASI *N* = 13		PASA *N* = 26	
	Pretest *Mdn*	Posttest *Mdn*	Pretest *Mdn*	Posttest *Mdn*
Science	5	5	5	5
Technology	5	5	5	5
Engineering	5	5	5	5
Math	4	5	4.5	5

Note. Medians were calculated using a 5-point scale (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

Industry Sectors Encompassed by Agriculture

The next four items in the view of agriculture variable consisted of industry sectors encompassed by agriculture. Students in both MASI and PASA indicated that agriculture includes horticulture and floriculture, wildlife and natural resources, forestry and woodlands, and food and fiber. Table 4.8 contains the sectors encompassed by agriculture pretest and posttest medians for the MASI and PASA pre-college programs. Appendix I contains the response frequencies. As a group, in both the pretest and posttest students in the MASI pre-college program indicated that agriculture "absolutely" includes horticulture and floriculture (pretest *Mdn* = 5; posttest *Mdn* = 5), wildlife and

natural resources (pretest *Mdn* = 5; posttest *Mdn* = 5), forestry and woodlands (pretest *Mdn* = 5; posttest *Mdn* = 5), and food and fiber (pretest *Mdn* = 5; posttest *Mdn* = 5). As a group, in both the pretest and posttest students in the PASA pre-college program indicated that agriculture "absolutely" includes wildlife and natural resources (pretest *Mdn* = 5; posttest *Mdn* = 5), and forestry and woodlands (pretest *Mdn* = 5; posttest *Mdn* = 5). For the PASA pre-college program the medians for agriculture including horticulture and floriculture (pretest *Mdn* = 4; posttest *Mdn* = 5) and agriculture including food and fiber (pretest *Mdn* = 4; posttest *Mdn* = 5) were higher in the posttest than in the pretest.

Table 4.8 Median of MASI and PASI Students' views on Industry Sectors Encompassed by Agriculture

"Agriculture includes"…	Pre-College Program			
	MASI *N* = 13		PASA *N* = 26	
	Pretest *Mdn*	Posttest *Mdn*	Pretest *Mdn*	Posttest *Mdn*
horticulture and floriculture	5	5	4	5
wildlife and natural resources	5	5	5	5
forestry and woodlands	5	5	5	5
food and fiber	5	5	4	5

Note. Medians were calculated using a 5-point scale (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

Qualities of the Agriculture Industry

The last seven items in the view of agriculture variable were related to qualities of the agriculture industry. Overall, students had a positive view of the agricultural industry. For both MASI and PASA, the mean for characteristics of the agricultural industry was higher in the posttest than in the pretest. Table 4.9 displays the medians for

the MASI and PASA students' perceptions of qualities of the agriculture industry. Appendix J contains the response frequencies.

Students in both the MASI and PASA pre-college programs indicated a more positive view for five of seven possible characteristics of the agricultural industry after participating in the pre-college program. For the MASI pre-college program, those five characteristics of the agricultural industry which had a higher median in the posttest than in the pretest were highly technological (pretest *Mdn* = 4; posttest *Mdn* = 5), environmentally sustainable (pretest *Mdn* = 4; posttest *Mdn* = 5), socially responsible (pretest *Mdn* = 4; posttest *Mdn* = 5), a skilled and educated workforce (pretest *Mdn* = 4; posttest *Mdn* = 5), a lot of career opportunities (pretest *Mdn* = 4; posttest *Mdn* = 5). For the MASI pre-college program, the two characteristics of the agricultural industry which had the same mean in both the pretest and posttest were science-based (pretest *Mdn* = 5; posttest *Mdn* = 5), and economically profitable (pretest *Mdn* = 5; posttest *Mdn* = 5). For the PASA pre-college program those five characteristics of the agriculture industry which had a higher median in the posttest than in the pretest were highly technological (pretest *Mdn* = 4; posttest *Mdn* = 5), science-based (pretest *Mdn* = 4; posttest *Mdn* = 5), economically profitable (pretest *Mdn* = 4; posttest *Mdn* = 5), environmentally sustainable (pretest *Mdn* = 4; posttest *Mdn* = 5), and socially responsible (pretest *Mdn* = 4; posttest *Mdn* = 5). For the PASA pre-college program, the two characteristics of the agriculture industry which had the same mean in both the pretest and posttest were skilled and educated workforce (pretest *Mdn* = 5; posttest *Mdn* = 5), and a lot of career opportunities (pretest *Mdn* = 5; posttest *Mdn* = 5).

Table 4.9 Median of MASI and PASA Students' views on Characteristics of the Agriculture Industry

"Agriculture"…	Pre-College Program			
	MASI *N* = 13		PASA *N* = 26	
	Pretest *Mdn*	Posttest *Mdn*	Pretest *Mdn*	Posttest *Mdn*
is a highly technological industry	4	5	4	5
is a science-based industry	5	5	4	5
is economically profitable	5	5	4	5
is environmentally-sustainable	4	5	4	5
is a socially-responsible industry	4	5	4	5
has a skilled, educated workforce	4	5	5	5
has a lot of career opportunities	4	5	5	5

Note. Medians were calculated using a 5-point scale (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

The grand mean, including all 15 items from the three categories of students' view on incorporating agriculture into STEM, students' views on industry sectors encompassed by agriculture, and students' views on characteristics of the agricultural industry, was 4.28 (*SD* =.43) for the MASI pretest, 4.87 (*SD* = .23) for the MASI posttest, 4.22 (*SD* = .62) for the PASA pretest, and 4.71 (*SD* = .44) for the PASA posttest. Upon completion of the MASI pre-college program, students reported a more positive view of agriculture (*d* = 1.71, strong effect size). Upon completion of the PASA pre-college program, students also reported a more positive view of agriculture (*d* = .91, strong effect size).

4.3.2 Follow-Up Phone Interviews

In the follow-up phone interview, students were asked three questions to gain insight on their views of agriculture: (1) "*Has your view of agriculture changed since participating in MASI/PASA?*" (2) "*If your view of agriculture has changed, in what ways has it changed*?" (3) "*What do you think of when you think of agriculture*?"

MASI

When asked if their view of agriculture changed after participating in the MASI pre-college program, and all seven MASI students who participated in the phone interview responded that their view had changed. MS3 said, "Meeting professors and students broadened my perspective. Science can be integrated into agriculture. Agriculture impacts society, the environment, and the future."

Two of the seven students who participated in the phone interviews indicated that they might study or work in agriculture in the future. One of the seven students who participated in the phone interviews mentioned that she/he had little interest in agriculture before MASI, and two mentioned that they had an increased interest in agriculture after MASI. MS6 said, "I'm more interested in agriculture than I was before. I never really gave it a second thought. Now it's something I'm definitely interested in." MS1 said, "I used to be closed off to it."

Six of the seven students who participated in the phone interviews indicated that before MASI they had a limited understanding of the scope of agriculture and there is a lot more to agriculture than they realized. MS1 stated "I thought, you have to be a farmer." MS2 described similar assumptions about agriculture, saying "Before MASI I

thought it was just farming. After I realize science goes into it." MS5 said "[MASI] opened my eyes that agriculture is more than what you learn in school." MS4 described similar views, saying "I thought agriculture was limited but MASI changed my perspective." MS7 stated "[I] realized agriculture is a multidisciplinary, economic, international, diverse field." MS3 also described an expanded understanding of agriculture, saying "There are so many new fields and branches I didn't think were incorporated or included in agriculture until MASI."

When asked, "*What do you think of when you think of agriculture?*" some common ideas were present. Six of the seven students who participated in the phone interview mentioned science or science topics in their response. MS6 said when she thinks of agriculture she thinks "It's scientific. There's more chemistry and biology than people realize." While talking about science, some students also seemed to make the connection between science, agriculture, and 21st century challenges. MS5 said when she thought of agriculture she thought of "science, genetic modification, trying to help people." MS3 said she thought of "plants and their different uses in science and society…the tedious nature of biofuel crops." MS2 said he thought of "plant biology, soil, and composition…bacteria and fungi working in a system to provide growing conditions for crops."

Three of the seven students who participated in the interview said that before participating in MASI they thought of agriculture mainly as farming. However, MASI broadened students' views. MS1 said "Before MASI, I thought of farming industry, crops, and livestock. After [MASI], I think of plant science, earth science, conservation, machine development…not just corn and soybeans." MS5 expressed somewhat similar

ideas, saying “after MASI, I think it’s not just machinery and farming.” MS6 said, “You can do anything in agriculture.”

PASA

Eight of 10 PASA students who participated in the phone interview reported that their view of agriculture changed since participating in PASA. When asked how their view of agriculture had changed, nine of 10 PASA students who participated in the phone interviews indicated that their understanding of the scope of agriculture had broadened. PS3 said, “I didn't know about [agriculture] at all ... now I realize it’s a huge part of life.” PS9 stated, “I’m more appreciative of all the agriculture that Indiana has… people think of hillbilly farmers and I know that that's not true… I like explaining to people that it's also genetic remodifying and protecting our crops from insects and pests… I like knowing something others don't know.” PS7 expressed similar thoughts “At first I just thought about farmers, and now it’s cool to know that machines and weather affect agriculture.” PS4 stated, “[PASA] showed different sides of agriculture, like technology and computer science.” PS6 said, “It’s not just farming.”

When asked “*What do you think of when you think of agriculture?*” common themes were present among student responses. Four of the 10 students explained that their understanding of the scope of agriculture was expanded through PASA. PS2 mentioned that before PASA she/he thought agriculture was just “farms and cows,” and another student (PS5) said, “Agriculture is more complicated than I once thought.” Five student responses included farming, three included plants, two included business, two included technology, two included science, and two included the outdoors.

4.3.3. Informal Student Interviews

A commonality in the informal student interviews related to students' perceptions of agriculture indicated an expanded understanding of the many components of how high school students viewed agriculture based on the pre-college program. MS9 said, "It wasn't just farmers and growing crops. It was a lot more than I thought it would be." When describing the MASI program MS3 said, "Don't let the stereotype of agriculture, meaning it only works with farming, scare you away. That's not anything related to what we did." When reflecting on the MASI pre-college program MS5 said, "Even though it says it's in agricultural sciences, that doesn't necessarily mean you have to be interested in agriculture."

4.4 Future Educational Aspirations

Research question 4: *What were students' future educational aspirations six to eight months after participating in the pre-college programs?*

Research question 4 was answered with quantitative and qualitative data from the follow-up phone interview.

4.4.1 Follow-Up Phone Interviews

In the follow-up phone interviews, eight questions were asked related to future educational plans: (1) "*Does your school offer agriculture courses*?" (2) "*Were any aspects of the MASI pre-college program that encouraged you to take more agriculture related classes in high school or college?*" (3) "*Which aspects of MASI encouraged you to pursue taking more agriculture related courses in high school or college?"* (4) *"What*

are your plans after graduating from high school?" (5) "*Do you intend to apply to Purdue*?" (6) "I*f you intend to apply to Purdue, have you already submitted your application*?" (7) "*If you have submitted your application, were you accepted to the program you applied to*?" (8) "*If you intend to complete a degree in the College of Agriculture at Purdue, which program?*"

MASI

Of the seven MASI students who participated in the phone interviews, six reported that their high schools offered agriculture courses. All seven students responded that there were aspects of the MASI pre-college program that encouraged them to take more agriculture-related classes in high school or college. Two students mentioned having the opportunity to work in a lab as an aspect of MASI that encouraged them to take more agriculture courses. MS1 said, "The botany department was fascinating." MS2 stated, "Before MASI, I hadn't thought about taking agriculture classes, but now I would definitely think about it." One student changed her/his high school class schedule after MASI to include a chemistry course in order to be better prepared for the degree the student now wanted to pursue in the College of Agriculture. MS3 said, "Seeing the broadness of agriculture and how it is growing. Being able to take a discipline that can help so many people and the environment."

All seven MASI students who participated in the phone interviews stated that they plan to attend a four-year university full-time upon graduating from high school. Students were asked if they intended to apply to Purdue University on a scale of one to five (1 = not at all, 2 = probably will not apply, 3 = undecided, 4 = probably will apply, 5

= definitely will apply/already applied). All seven students stated that they definitely will apply or already applied to Purdue. Of the seven, four had already applied and three had not. Of the four students who had already applied, three had already been accepted and one had not yet received notification. Students were asked if they intended to apply to a program in Purdue's College of Agriculture and which one they would apply to. Responses included: Agricultural and Biological Engineering, Agronomy, Botany, and Entomology. Table 4.10 summaries the future educational plans of the MASI students who participated in the phone interviews.

Table 4.10 Future Educational Plans of MASI Students who participated in Phone Interviews (n = 7)

	Frequency
Does current school offer Agriculture courses?	6 (85.7%)
Did MASI encourage you to take Agriculture classes in the future?	7 (100.0%)
Plan to attend a 4-year university	7 (100.0%)
Definitely will apply to Purdue or already applied	7 (100.0%)
Already accepted to Purdue	3 (42.9%)

PASA

Eight of the 10 PASA students who participated in the phone interview stated that there were aspects of the PASA pre-college program that encouraged them to take more agriculture related classes in high school or college. Three students mentioned the business portion of the PASA pre-college program encouraged them to take more agriculture classes, and PS1 stated "the hands-on parts involving analyzing things."

However, of the 10 PASA students who participated in phone interviews, all of them reported that their current high schools do not offer any agriculture courses.

When asked about their plans for after high school graduation, seven PASA students reported that they plan to attend a four-year university full-time, one student planned to attend a community college, one student planned to worked part-time and attend school part-time, and one student planned to attend a trade school. When asked if they intended to apply to Purdue University, one student reported "not at all," one student reported "probably will not apply," one student reported "undecided," three students reported that they "probably will apply," and four students reported that they "definitely will apply or already did apply." Of the four students who stated that they "definitely will apply or already did apply," two had already applied, and of those two who already applied, one was accepted to the food science program in the College of Agriculture, and one was referred to a Purdue regional campus. Table 4.11 summaries the future educational plans of the PASA students who participated in the phone interviews.

Table 4.11 Future Educational Plans of PASA Students who participated in Phone Interviews (n = 10)

	Frequency
Does current school offer Agriculture courses?	0 (0%)
Did MASI encourage you to take Agriculture classes in the future?	8 (0%)
Plan to attend a 4-year university	7 (70%)
Definitely will apply to Purdue or already applied	4 (40%)
Already accepted to Purdue	1 (10%)

CHAPTER 5 CONCLUSIONS & DISCUSSION

5.1 Conclusions & Discussion

There were four conclusions from the study that address students' motivation to participate in the pre-college programs, agricultural career interests, views of agriculture, and future educational plans. Each conclusion is followed by discussion regarding the contribution to the knowledge base and implications for practice. The chapter concludes with recommendations for future research.

5.2 Conclusion 1: Motivation to Participate in the Pre-College Programs

High school students who participated in the Molecular Agriculture Summer Institute (MASI) and Purdue Agribusiness Science Academy (PASA) were motivated to engage in the pre-college programs and activities.

5.2.1 Discussion

In examining the ways in which students in the MASI and PASA pre-college programs were motivated to engage in the program and activities, four subscales were utilized in the Pre-College Program Youth Questionnaire post-test: interest/enjoyment, value/usefulness, perceived competence, and effort/importance.

MASI students reported that they “absolutely” valued the pre-college program; the program was “absolutely” useful to the MASI. MASI students reported that the program was “absolutely” important; MASI students “absolutely” put effort into the pre-college program. MASI students reported “a lot” of interest and enjoyment in the program, and reported “a lot” of perceived competence in the pre-college program activities.

PASA students reported that the pre-college program had “a lot” of value; the program had “a lot” of usefulness to the PASA students. PASA students reported the program as having “a lot” of importance; PASA students put “a lot” of effort into the pre-college program. PASA students reported “a lot” of interest and enjoyment in the program, and reported “a lot” of perceived competence in the pre-college program activities.

This conclusion supported previous studies, which indicated that having the opportunity to increase perceived competence, or self-efficacy, is important to students who participate in pre-college programs and organized activities (Gambone & Arbreton, 1997; Enersen, 1993). Further, student self-efficacy was measured as the perceived competence variable using the Pre-college Program Youth Questionnaire. Compared to the other three motivation variables, perceived competence had the lowest mean for both MASI and PASA. Yet, perceived competence was “a lot” (MASI $M = 4.17$, PASA $M = 3.92$). This indicated that, overall, students in the MASI and PASA pre-college programs perceived themselves to be competent and were self-efficacious in their performances in the activities in the pre-college program. This is beneficial in the context of increasing

student interest in pursuing careers in agriculture, as prior researchers have purported that career self-efficacy influences career interests (Lent, Brown, & Hackett, 1994, 2000).

High school students were asked to reflect upon which components of the pre-college programs they enjoyed most. MASI students mentioned that they enjoyed having the opportunity to do activities they would not ordinarily have the opportunity to do in their high school science classes. This finding supported Olszewski-Kubilius et al.'s (1987) observation that summer programs for gifted students can provide a challenging learning experience different than what students might ordinarily experience in school. Although the MASI students did not have to qualify as "gifted" to participate in the pre-college program, many had high levels of aptitude and achievement. This finding also supported Enersen's (1993) results, which indicated gifted students identified the challenging coursework as a component of the summer pre-college residential program that was of important to them. MASI students were likely challenged to learn new concepts and operate new equipment when working in a laboratory with faculty and staff. This may have motivated the MASI students who are not exposed to similar challenges through their regular high school coursework. MASI students also reported appreciating the opportunity to use equipment not usually present in high school classrooms. This supports prior research by Vibhuti et al. (2010), which found that students in an engineering pre-college program enjoyed having the opportunity to use lab equiptment. Having the opportunity to use lab equipment in pre-college programs is important, as prior research indicated that being exposed to advanced lab procedures and equipment, as well as interacting with scientists in a laboratory setting, increased students' self-efficacy related to lab techniques (Knox, 2003).

When asked what they enjoyed most about the MASI program, the majority of MASI students mentioned meeting other students and making new friends. This supported previous studies that found students participating in a pre-college programs and organized activities valued making friends as an important component of the experience (Mahoney, Harris, & Eccles, 2006; Enersen, 1993). However, PASA students did not mention making new friends as one of the things they enjoyed most about the pre-college experience. This could be because some of the PASA students had previously participated in a different pre-college program called Upward Bound prior to PASA, and may have already built friendships amongst each other through that program.

Faculty and staff were a motivating factor for high school students to engage in the pre-college programs. For example, some MASI students mentioned the professors and program coordinators, and one PASA student mentioned program coordinator as one of the things they enjoyed about the program. This finding supports Enersen's (1993) result that students in pre-college programs valued having caring and expert teachers (Enersen, 1993). The identification of the PASA program coordinator (an underrepresented minority) as a favorite part of the pre-college program is also important to note as prior research on the factors which influenced the career selection of underrepresented minorities in agriculture indicated the importance of encouragement from other underrepresented minorities to pursue an agriculture career (Jones & Larke, 2001).

Previous research studies indicated that parents are a motivating factor for students electing to attend a pre-college program (Forrester, 2010). However, findings from the MASI program did not support this factor. Of the 13 MASI students, none of

them identified parents as a reason for attending MASI. This could be explained by the recruitment strategies used for MASI. Rather than recruiting students by reaching out to parents, students were recruited directly by their high school science teachers. Rather than motivation for attending MASI coming from external factors, such as a parents' encouragement, many students described motivation that was more driven by intrinsic value, or enjoyment from the activity and interest in the subject (Eccles & Wigfield, 2002), and utility value, or the value of the activity to future goals (Eccles & Wigfield, 2002). Intrinsically motivated reasons for attending MASI included: meeting other students and exploring science. Reasons for attending MASI regarding utility value included: exploring Purdue, helping with college decision making, and doing lab activities with professors, which would all help MASI students reach their future goals.

5.2.2 Implications for Practice

When considering Conclusion 1, there are two implications for practice related to student motivation to engage in the pre-college program and activities: (1) maintaining a small program size for the MASI pre-college program; and, (2) incorporating activities that provide students with a preview of college in the PASA pre-college program. First, MASI and PASA students were motivated to engage in the pre-college programs and activities, and one the factors identified by MASI students as enjoyable was making close friendships. Students also valued the small size of the program. In the future, as the newly created MASI program continues to develop, it is important to consider the value of keeping enrollment numbers at a level that still provides students with a similar experience. The small size of the MASI pre-college program sets it apart from many of

the other summer programs available to students. The small size of the program allowed the students to have one-on-one interactions with faculty and staff in a lab setting. This is something most high school students, and even many undergraduate students, do not have the opportunity to do. The small size of the program also created a sense of community for the MASI students, and allowed them to spend a significant amount of time with the same students. Navigating a large campus for the first time as a high school student may also be intimidating for students, so having a small group of students may have allowed students to feel less overwhelmed.

When examining student motivation to attend and participate in the PASA pre-college program, it appears that the components of the program which introduced students to college may be important. PASA students identified the opportunity to learn about college as a reason why they chose to attend PASA. Moreover, getting a preview of college was the most frequent response from PASA participants when asked about their favorite part of PASA. This indicates that PASA students may find it enjoyable, valuable, and important to learn about the college experience. One reason for this could possibly be improved self-efficacy related to attending college. A previous research study indicated that pre-college programs increased students' ability to use skills necessary to success in college, such as using technology and understanding how to read a syllabus (Strayhorn, 2011). PASA students may have appreciated the exposure to college life and college success skills because they felt better prepared and able to succeed in college as a result.

Due to the student interest and benefits, in program planning for PASA, it may be beneficial to incorporate more activities which introduce PASA students to college life.

PASA student could be assigned an undergraduate mentor to spend time with to answer their questions, assist in connecting them with campus groups or activities that may fit their interests, and providing them with a student's perspective on college life. Glenn et al. (2012) indicated that minority students participating in a summer program benefited from the incorporation of a mentorship component. Pairing PASA students with underrepresented minority students from the College of Agriculture to serve as mentors could be beneficial because underrepresented minorities who graduated from an urban agricultural high school found that students who received encouragement to consider agriculture careers from other underrepresented minorities reported it as an important factor in career choice (Jones & Larke, 2001). However, one-third of the students did not have an unrepresented minority role model who had an agriculture related career (Jones & Larke, 2001).

5.3 Conclusion 2: Agricultural Career Interests

High school students reported higher agricultural career interests after participating in the pre-college programs.

5.3.1 Discussion

Students in the MASI pre-college program were most interested in working in science and working with people. The interest in working in science could be explained by the recruiting methods for the MASI pre-college program, which were focused on recruitment through high school science teachers. MASI students shared they were least interested in working in business, food production, and communication/education. After

participating in the MASI pre-college program, students reported they were more interested in working in technology/engineering, in communication/education, and in agriculture, than they were at the beginning of the MASI pre-college program. Many factors throughout the program exposed students to careers in agriculture, including tours, talks, and activities designed and selected to expand student understanding of the breadth of agriculture. Further, MASI students were exposed to careers in technology/engineering during the pre-college program via a tour of the Purdue University Agronomy Center for Research and Education (i.e., new technology used for water quality research), a tour of the Purdue University transmission electron microscope facility, a tour of the Purdue University Horticulture Plant Growth Facilities (i.e., technology for growing plants), and a tour of Dow Agrosciences (i.e., technological advances in agriculture). MASI students were exposed to careers in communication/education during a talk from a Dow Agrosciences public relations specialist and a talk from an Extension Educator.

Students in the PASA pre-college program were most interested in working in business, in science, and with people. These interests were somewhat aligned with the three "tracks" PASA students could choose from: sustainability, forensic science, and business education. PASA students were least interested in working with plants, natural resources, and in food production, which can be perceived as more traditional agricultural careers. After participating in the PASA pre-college program, students reported they were more interested in working in communication/education, business, natural resources, and food production, than they were at the beginning of the PASA pre-college program. Many components of the PASA program exposed students to careers in these

areas of interest. For example, PASA students were exposed to careers in communication/education through a class in youth development and agricultural education, and careers in business through a tour of an agritourism business, a class in agricultural economics, and a class in entrepreneurship and innovation. PASA students were exposed to careers in natural resources through a class in forestry, and careers in food production through a tour of a blueberry farm, a tour of a dairy farm, a tour of Dow Agrosciences, a speaker from DuPont Poineer, a tour of Elanco, a class in agronomy, a class in animal sciences, and a class in food sciences.

Overall, students in both the MASI and PASA pre-college programs did not report a high level of interest in more traditional agricultural careers, such as working with plants, with animals, with natural resources, in food production, and in agriculture. However, students reported higher levels of interest in career areas which can be considered a part of the agricultural industry, broadly-defined. These findings supported Conroy's (2000) study, which examined career interests of middle school youth and found that while only 8.2% were interested in pursuing traditional agriculture careers, an additional 46.6% of students were interested in pursuing careers which fit into a broader classification of the agricultural industry.

A majority of MASI and PASA students in this research study reported an increased awareness of the various career opportunities in agriculture after participating in the pre-college programs. This finding supports Cannon et al.'s (2006) assertion that exposure to agriculture through a pre-college program "may open students' eyes to the numerous and diverse career opportunities" (p. 34). The increase in awareness of career opportunities in agriculture reported by MASI and PASA students is beneficial because

in prior research studies of students who selected a major in agriculture cited exposure to agriculture careers as having influenced their career choice (Jones & Larke, 2001), while students who did not select a career in agriculture cited lack of career opportunities as a reason for doing so (Esters & Bowen, 2005).

After participating in the MASI and PASA pre-college programs, many students described that prior to the pre-college program they had misconceptions about what a career in agriculture would consist of based on stereotypes. Several students mentioned holding the belief that having a job in agriculture meant working as a farmer. This supports Orthel et al.'s (1989) assertion that due to lack of information about the broad range of careers in agriculture, students have a negative view of pursuing a career in agriculture because they associated agriculture with farming and ranching. Changing these stereotypes is important for attracting skilled and diverse students to pursuing careers in agriculture because high school students are concerned about the image of agriculture and have misconceptions of agriculture when they considered a career in agriculture (Gonzalez, 2006).

When MASI and PASA students were asked why they would consider a career in agriculture, several mentioned 21st century challenges such as helping to feed the world. This supported the Board on Agriculture and Natural Resources Board on Life Sciences' assertion that colleges of agriculture may see an increase of students with societal concerns, such as helping people, conservation, and the environment (National Research Council, 2009). The Board on Agriculture also suggested that students going into colleges of agriculture may be interested in multidisciplinary outlets and may intend to obtain more than one degree, such as a doctor of medicine, master of science, or a master

of business administration (National Research Council, 1992). Some students shared career intentions to become a doctor or a researcher.

5.3.2 Implications for Practice

When considering the findings in this research, there are four implications for practice related to students' interest in agricultural careers: (1) providing MASI and PASA students with opportunities to see how careers in agriculture can combine science and working with people; (2) incorporating activities and speakers not related to traditional agriculture careers involving food production and plants; (3) in agricultural pre-college program planning and marketing, incorporating 21st century challenges and avoiding language that triggers traditional images of agriculture; and, (4) ensuring that the diversity of student philosophies and values is embraced throughout the pre-college program.

Students in both the MASI and PASA pre-college programs were very interested in working in science and working with people before and after the pre-college program. In order to increase the likelihood of students in the MASI and PASA pre-college programs choosing to pursue a major in the college of agriculture, it may be important to ensure that students are provided with plenty of opportunities to see how a career in agriculture can provide them with the opportunity to combine their interest in working in science and their interest in working with people. This should be taken into consideration in developing program activities to ensure students have these opportunities, especially in the MASI pre-college program because students spent 20 hours in a laboratory, where

many jobs observed by students do not necessarily involve spending time working with the public.

On the five-point scale used to measure interest in career areas, the median for "working in food production" for MASI students was two for both the pretest and posttest, indicating "a little" interest in working in food production. This median is low compared to the medians for the other career areas, the majority of which had a median of three, indicating "somewhat," or four indicating "a lot." The median for "working with plants" for PASA students was two for both the pretest and posttest, indicating "a little" interest in working with plants. This median is low compared to the other career medians for PASA students, the majority of which had a median of three or four. Students may have perceived working in food production and with plants as traditional agriculture, or farming, which was not of interest to them. Incorporating activities, speakers, or field trips which allow students to gain a greater understanding of the science, technology, engineering, and math involved in working in food production and working with plants may allow students to shift away from the stereotypes associated with these careers in agriculture (Conroy et al., 1998).

Several students in the MASI and PASA pre-college programs were interested in pursuing careers that address 21st century challenges such as food security. In order to attract high school students, when recruiting for the MASI and PASA pre-college programs, it may be important to move away from words and phrases associated with traditional agriculture that may trigger stereotypes (Conroy et al., 1998), and include keywords related current and emerging agriculture related issues such as sustainability, biorenewable engineering, landscape restoration, water conservation, and genomics

(National Research Council, 2009). This change in students may pose other challenges as well, as explained by the Board on Agriculture:

> Some students, as well as some of the faculty, who come to natural resource and other agriculture-related courses for traditional reasons may regard those students interested in conservation and the environment as espousing philosophies inconsistent with agricultural thought. But, it is a dichotomy that we should exploit, not fear. In order to gain acceptance of the principle, we may well need to put aside our parochial world views of agriculture, the desire to create a populace that thinks about agriculture as we want them to, and even the wish to rescue the traditional agricultural majors in college by turning around their decreasing enrollments (p. 152).

Embracing the diversity of students' philosophies and values during the pre-college experiences may be important for attracting a more diverse group of students to colleges of agriculture. For example, it may be important to make sure students who are interested in science still feel comfortable and welcomed in colleges of agriculture even though they may be very unfamiliar with traditional agricultural customs, traditions, and vocabulary. Prior research has indicated that embracing diversity in agriculture benefits both minority and majority students; however, students from many agriculture students from varying minority groups still feel marginalized in the existing culture (Woods & Moore, 2001). However, Woods and Moore also purported that when agriculture programs make a clear commitment to diversity that can be perceived by students, it benefits recruitment and retention.

5.4 Conclusion 3: Views of Agriculture

Students described more positive views of agriculture after participating in the pre-college programs.

5.4.1 Discussion

Before the MASI and PASA pre-college programs, students reported positive views of incorporating agriculture in STEM. After participating in the pre-college programs, students in both the MASI and PASA pre-college programs reported more positive views of incorporating agriculture in math.

The PASA students' positive view of incorporating agriculture into STEM before participating in the pre-college program could possibly be explained by one of the essay questions that PASA students had to complete as a part of the application process. The question asked students to a one-page response to the question, "How does STEM (science, technology, engineering, and math) work in agriculture and natural resources?" Through the process of contemplating this question and possibly researching STEM in agriculture to form their responses, PASA students may have increased their level of understanding of STEM and agriculture.

Additionally, students may already have been aware of agriculture and STEM integration because the MASI and PASA pre-college programs mentioned STEM in the promotional materials or website. The MASI website describes the program as "a residential program targeted at developing student leaders in STEM areas as it relates to molecular agriculture." The PASA brochure states that students will "learn about STEM in agriculture."

Before participating in the MASI pre-college program, the characteristics MASI students most associated with agriculture included: science-based and economically profitable. After participating in the MASI pre-college program, MASI students reported an increased understanding of agriculture as: highly technological, environmentally-sustainable, socially responsible, having a skilled and educated workforce, and having a lot of career opportunities.

Before participating in the PASA pre-college program, the characteristics PASA students most associated with agriculture included: a skilled and educated workforce and lots of career opportunities. After participating in the PASA pre-college program, PASA students reported an increased understanding of agriculture as: highly technological, science-based, economically profitable, environmentally-sustainable, and socially responsible.

The finding that before participating in the pre-college program the PASA students associated agriculture with lots of career opportunities does not support some other research suggesting lack of awareness of career opportunities in agriculture among underrepresented minorities (Vincent, Henry, & Anderson, 2012). This discrepancy could possibly be explained because some PASA students had participated in the PASA program at least once before, as students are allowed to participate in the program several times. This discrepancy could also possibly be explained by the involvement of many PASA students in the Upward Bound program. Many PASA students were recruited to the PASA program through the Upward Bound program, which is a college preparatory program that helps minority students explore career opportunities and college options.

Students in Upward Bound may have learned about the career opportunities available in agriculture through this program.

Students in both the MASI and PASA pre-college programs reported agriculture as more environmentally-sustainable and more socially responsible after participating in the pre-college programs. This finding aligns with prior research by Duncan and Broyles (2004), which utilized pre-test and post-test results of students participating in a Governor's School for Agriculture. Duncan and Broyles' research indicated that the largest changes in student perceptions of agricultural related to current issues in agriculture, specifically biotechnology and animal rights/welfare (Duncan & Broyles, 2004). While biotechnology and animal rights/welfare were not mentioned in the Pre-College Program Youth Questionnaire used for the PASA and MASI pre-college programs, environmental-sustainability and social responsibility were current issues in agriculture around the time of the pre-college programs.

5.4.2 Implications for Practice

When considering the findings of this research study, and implications for practice related to student views of agricultures, continuing to maximizing the potential effectiveness of the pre-college programs by recruiting students not from traditional agricultural backgrounds would be beneficial. Recruitment for MASI focused on students with an interest in science, and recruitment for PASA focused on students who were underrepresented minorities. These students were not from traditional agricultural backgrounds—none of the MASI and PASA students lived on a farm, none of the MASI

students participated in 4-H or FFA, and a majority of PASA students had not even heard of 4-H or FFA.

Pre-college agricultural programs had a higher influence on the perceptions of students who were not from a traditional agricultural background (Settle et al., 2012). Specifically, prior research indicates that students from urban areas and students who had not participated in 4-H or FFA stated participating in an agricultural pre-college program had a high level of influence on their perceptions of agriculture, while students from farms and students who had participated in 4-H or FFA reported the pre-college program having little influence on their perceptions of the agriculture industry (Cannon et al., 2006).

This study did not include a separate group of students from traditional agricultural backgrounds. Therefore, it was not possible to distinguish whether the MASI and PASA programs may have influenced the views of students who did not have a traditional agricultural background more than students from a traditional agricultural background. However, students in the MASI and PASA pre-college programs reported more positive views of agriculture after the pre-college programs, supporting prior research studies that agricultural pre-college programs can influence the perceptions of students from urban areas and students not in 4-H or FFA (Cannon et al., 2006).

As prior research as indicated the effectiveness of recruiting students who are not from traditional agricultural background, the MASI and PASA pre-college programs should continue focus recruitment efforts on these students. This would allow the programs to have the most impact. Targeting students who are not from traditional

agriculture backgrounds would also increase the diversity of students, and expose students to agriculture careers who may not be aware of them otherwise.

5.5 Conclusion 4: Future Educational Aspirations

Students in the MASI and PASA pre-college programs aspired to attend a four-year university, some were likely to attend Purdue University, and some would consider studying agriculture.

5.5.1 Implications for Practice

When considering the findings in this research and implications for practice related to the future educational plans of students, it would be beneficial to maintain communication with the students beyond the completion of the pre-college programs. While all MASI students intended to apply to Purdue University or had already applied to Purdue, that does not necessarily mean the students choose to attend Purdue. The MASI students were likely to have high GPAs, extensive extracurricular involvement, and good teacher recommendations. Therefore, it was likely that many of the students were accepted into several of the universities to which they applied. For this reason, extended communication with the students beyond the completion of the pre-college program may be beneficial in the future. As students consider multiple offers, having an existing and ongoing relationship with individuals at Purdue University may lead a student to be more inclined to choose Purdue. This may be especially beneficial for students who are also considering smaller colleges or universities, as Purdue University is large and forming

personal relationships with camp coordinators, counselors, and faculty may provide students with a sense of pre-established community.

Maintaining communication with PASA students beyond the completion of the program may also be beneficial. While many of the PASA students stated that they would like to attend a four-year university, several of the students would be first-generation college students. Therefore, communicating with the students after the program to provide them with support, to encourage them to apply to college, and to assist them with the college application process may have the potential to increase the likelihood of these students applying to Purdue University. Additionally, some of these students may not initially meet the requirements for acceptance to Purdue University. However, these students may be a good fit for programs that help students transition from community colleges to four-year universities, such as Pathway to Purdue. The Pathway to Purdue program is a partnership between Ivy Tech Community College and the Purdue University College of Agriculture which provides Ivy Tech students with the opportunity to work towards a Bachelor of Science degree from Purdue University's College of Agriculture through co-enrollment in both institutions. The Pathway to Purdue program could benefit PASA students who may not initially meet Purdue University's academic enrollment requirements but would like to work towards a degree in agriculture, or students who have limited available funds to support their academic pursuits. Therefore, maintaining communication beyond the completion of the PASA program could help guide these students into these programs or other opportunities.

5.6 Horticulture and Plant Sciences

The MASI and PASA programs introduced students to horticulture. MASI students took a guided tour of the Purdue University Horticulture Greenhouses, and as a part of their academic track some PASA students took a course in horticulture. Simply introducing these students to what horticulture may be very beneficial, as one study found that only 41% of respondents between the ages of 18 and 24 were familiar with the word horticulture (Meyer et al., 2015). However, helping students see the connections between horticulture careers and the career areas they are most interested in may have even more impact.

MASI students were only "somewhat" interested in working with plants, and PASA students were only "a little" interested in working with plants. However, MASI students expressed a high level of interest in working in science, and many careers in horticulture involve applying scientific knowledge and concepts. It may be important to make sure these students are exposed to how science is used daily by those working in horticulture careers such as growers, viticulturists, diagnosticians, arborists, irrigation specialists, and turf managers. If students become aware of the science involved in these careers, they may be more likely to consider them.

Both MASI and PASA students expressed a high level of interest in working with people, and many horticulture careers involve working with people. Introducing students to careers that would allow them to interact with people regularly may be beneficial, such as careers in horticultural therapy, landscape design, and public horticulture. Additionally, PASA students expressed a high level of interest in working in business.

Introducing these students to the many ways they can pursue a business career through horticulture may be beneficial, such as owning a nursery, landscaping company, landscape design firm, or integrated pest management company.

5.7 Recommendations for Future Research

Recommendations for future research are organized into three categories: increasing programs and participants, program design, and research design.

5.7.1 Increasing Programs and Participants

Future research leading to an increased number of programs and participants utilizing the Pre-College Program Youth Questionnaire would allow for greater generalizability of the results and validity of the instrument. Due to the small number of student participants in the MASI and PASA pre-college programs, the convenience samples were small. This limited the statistical power of the research. Future researchers should consider conducting similar research utilizing the Pre-College Program Youth Questionnaire with larger groups of participants and across several years. This would allow for greater generalizability, and would also provide the opportunity for increased construct validity of the instrument through factor analysis.

Generalizability could also be increased through future research by utilizing the Pre-College Program Youth Questionnaire for programs that include students of differing grade levels. Students in both the MASI and PASA programs were high school students, limiting the generalizability to students of that grade level. Studying the motivation to engage, agricultural career interests, views of agriculture, and educational plans of

students at different grade levels could be beneficial for determining what age range is best for intervention to achieve the desired results. Prior research indicated that it is important to reach students in middle school or earlier before perceptions are set and enrollment decisions are made (Conroy C. A., 2000). Therefore, it may be possible that exposing students to agriculture in high school is too late as students already have a perception of agriculture and have already started forming their career identity.

Another way to increase generalizability through future research is studying pre-college programs at other universities using the Pre-College Program Youth Questionnaire. This study examined two pre-college programs which were both held at Purdue University, and therefore, the results are not necessarily generalizable to pre-college programs at other universities. Additionally, both MASI and PASA were pre-college programs hosted by a College of Agriculture. Therefore, studying pre-college programs in content areas other than agriculture could also allow findings to be generalized to pre-college programs in general, rather than just pre-college programs with an agricultural focus.

Lastly, the MASI pre-college program was designed to attract students interested in science to consider degrees and careers in agriculture. It is possible to use the other three STEM components (technology, engineering, and math) to attract students to agriculture who might not otherwise consider agriculture as a future educational path or career choice, and future research should study these programs. For example, future research could examine an agricultural economics pre-college program which recruits students with an interest in math, or an agricultural engineering pre-college programs

which recruits students interested in engineering. This would allow researchers to explore the outcomes of programs utilizing STEM to introduce students to agriculture.

5.7.2 Pre-College Program Design

Future studies could provide further insight into effective pre-college program design. Program design for the two pre-college programs in this study varied. MASI students were divided into four lab groups, and PASA students were divided into three track groups. Each lab group in MASI had a different faculty or staff advisor, and did different research projects. Each track-group in PASA was focused on a different content area (sustainability, forensic science, and business education), and each track consisted of different speakers, tours, and activities. Future research on the MASI and PASA pre-college programs could examine the outcomes at a lab-group/track level. Examining the pre-college programs at this level may indicate that some lab-groups or track groups result in better outcomes than others. If this is the case, researchers could study which activities, teaching/engagement methods, context, or content are responsible for the more positive outcomes. These effective methods could be replicated by the other lab-groups or track groups in the future to improve their outcomes as well.

Comparing the motivation to engage, interest in agricultural careers, views of agriculture, and future educational plans of students in pre-college programs of differing lengths could also be beneficial. While the pre-college programs studied in this research were one week in length and two weeks in length, there are some pre-college programs that are just a couple of days and others that are three weeks or longer. Future research should assess the outcomes of these programs, and compare the outcomes of shorter

programs to longer programs. This could provide insight to the length of time that is necessary for the program to achieve the desired objectives. If shorter pre-college programs are not as effective, program planners should consider lengthening the programs. However, if the shorter programs are as effective as the longer programs, it could be possible to reduce the length of the longer programs to save resources or to offer more, shorter programs to reach a larger number of students.

5.7.3 Research Design

Future research design should involve extended data collection timelines, investigate additional variables which may influence students, and examine additional constructs of the Racial and Ethnic Minorities in STEM Model. Due to the limited timeframe available for this research, follow-up with students took place six to eight months after the completion of the pre-college programs. During these follow-up interviews, students were asked about their educational aspirations and career choices. However, the identified educational aspirations and career choices of the students at that point in time may not be the educational and career paths the students end up pursuing in the future. Therefore, future studies should include longitudinal data and long-term follow-up with participants. This would provide researchers with the opportunity to study the educational and career paths students chose to pursue, and would provide researchers with the opportunity to determine whether the pre-college programs had any long-term effects on participant interest in agriculture and views of agriculture.

While the response rate for the Pre-College Questionnaire pretest and posttest was high, the response rate for the follow-up phone interviews was not as high. In future

research, providing an incentive to students who participate in the phone interviews could increase participation (Schutt, 2012). For example, students could be informed they will receive a gift card, University t-shirt, or other small item if they choose to participate in the phone call.

This research examined students' interest in agricultural careers, views of agriculture, and future educational aspirations before and after participation in a pre-college program. However, pre-college programs are only one of many factors which may influence these variables. Future research should explore these other factors, including parents, teachers, friends, guidance counselors, and mentors. As a next step in the research of the MASI and PASA pre-college programs, parents' views of agriculture and agricultural careers should be studied. Parents are invited to the final presentations of both the MASI and PASA pre-college programs. Therefore, these two programs could utilize an assessment tool to study parents' views of agriculture. The assessment tool used could possibly be adapted from the Pre-College Program Youth Questionnaire.

The Racial and Ethnic Minorities in STEM Model (Museus et al., 2011) was used to inform the conceptual framework of this research. This research looked specifically at two of the items within the seven constructs of the model, early exposure to STEM careers (in the K-12 experience construct) and early disposition towards STEM (in the K-12 outcomes construct). Future research should examine additional items from the model in the context of agriculture, including education inequalities, culturally relevant curricula, entrance into STEM majors in college, academic preparedness in STEM, parental expectations and involvement, financial influences, college campus and STEM environments, pedagogical quality, quality and quantity of interaction with institutional

agents, STEM-specific support for underrepresented minorities, subsequent disposition toward STEM, completion of STEM degrees, and academic performance in STEM.

REFERENCES

REFERENCES

Adams, J. (1997). *A study to determine the impact of a precollege intervention on early adolescent aspiration and motivation for college in West Virginia.* Retrieved from https://theses.lib.vt.edu/theses/available/etd-101397-15292/unrestricted/etd.pdf

American Society for Horticultural Science. (2013). *Promoting horticulture in the United States*. Retrieved from http://c.ymcdn.com/sites/www.ashs.org/resource/resmgr/Docs/WhitePaper-PromotingUS-Horti.pdf

Association of Public and Land-Grant Universities. (2010). *A science roadmap for food and agriculture* . Retrieved from http://escop.ncsu.edu/docs/scienceroadmap.pdf

Baker, L. M., Irani, T., & Abrams, K. (2011). Communicating strategically with generation me: Aligning students' career needs with communication about academic programs and available careers. *North American Colleges and Teachers of Agriculture Journal*, *5*(2), 32-39. Retrieved from https://www.nactateachers.org/index.php/journal-sp-1148215168

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY: Freeman and Co.

Campbell Bradley, J., Kohlleppel, T., Waliczek, T. M., & Zajicek, J. M. (2000). Factors affecting recruitment of horticulture students at major universities. *Hort Technology*, *10*(3), 631-636. Retrieved from http://horttech.ashspublications.org/

Cannon, J. G., Broyles, T. W., Seibel, A., & Anderson, R. (2006). Summer enrichment programs: providing agricultural literacy and career exploration to gifted and talented students. *Journal of Agricultural Education*, *50*(2), 27-38. doi:10.5032/jae.2009.02026

Conroy, C. A. (2000). Reinventing career education and recruitment in agricultural education for the 21st centruy. *Journal of Agricultrual Education, 41*(4), 73-84. doi:10.5032/jae.2000.04073

Conroy, C., Scanlon, D., & Kelsey, K. (1998). Influences on adolescent job choice: Implications for teaching career awareness in agricultural education. *Journal of Agricultural Education, 39*(2), 30-38. doi: 10.5032/jae.1998.02030Deci, E., & Ryan, R. (1985). *Intrinsic motivation and self determination in human behavior.* New York, NY: Plenum.

Dimitri, C., Effland, A., & Conklin, N. (2005). *The 20th century transformation of U.S. agriculture and farm policy.* Retrieved from http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib3.aspx

Duncan, D. W., & Broyles, T. W. (2004). An evaluation of student knowledge and perceptions toward agriculture before and after attending a governor's school for agriculture. *Journal of Southern Agricultural Education Research,* 54(1), 280-292. Retrieved from http://pubs.aged.tamu.edu/

Eccles, J., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53*(1), 109-132. doi: 10.1146/annurev.psych.53.100901.135153

Echaore-McDavid, S., & McDavid, R. A. (2008). *Career opportunities in forensic science.* New York, NY: Infobase Publishing.

Enersen, D. L. (1993). Summer residential programs: academics and beyond. *Gifted Child Quarterly, 37*(4), 169-176. doi: 10.1177/001698629303700406

Erikson, E. (1959). *Identity and the life cycle.* New York, NY: International University Press.

Esters, L. T., & Bowen, B. E. (2005). Factors influencing career choices of urban agricultural education students. *Journal of Agricultural Education, 42*(1), 24-35. doi:10.5032/jae.2005.02024

Fantz, T. D., Siller, T. J., & Demiranda, M. A. (2013). Pre-collegiate factors influencing the self-efficacy of engineering students. *Journal of Engineering Education, 100*(3), 604-624. doi:10.1002/j.2168-9830.2011.tb00028

Farmer, H. S. (1987). A multivariate model for explaining gender differences in career and achievement motivation. *Educational Researcher, 16*(2), 5-9. doi:10.3102/0013189X016002005

Food and Agriculture Organizaiton of the United Nations. (2013). *Drought facts.* Retrieved from http://www.fao.org/docrep/017/aq191e/aq191e.pdf

Food and Agriculture Organization of the United Nations. (2007). *Coping with water scarcity: Challenge of the 21st century.* Retrieved from http://www.fao.org/nr/water/docs/escarcity.pdf

Food and Agriculture Organization of the United Nations. (2015). *The state of food insecurity in the world.* Retrieved from http://www.fao.org/3/a4ef2d16-70a7-460a-a9ac-2a65a533269a/i4646e.pdf

Food and Agriculture Organization of the United Nations. (2016). *Agribusiness development*. Retrieved from http://www.fao.org/ag/ags/agribusiness-development/en/

Forrester, J. H. (2010). *Competitive science events: Gender, interest, science self-efficacy, and academic major choice.* Retrieved from ProQuest Digitial Dissertations. (AAT 3442559)

Foster, E. F., & Savala, L. A. (2012). Engaging underrepresented youth in food, agriculture, and natural resources through pre-college residential programs. *North American Colleges and Teachers of Agriculture Journal* , *56*(2), 38-46. Retrieved from https://www.nactateachers.org/index.php/journal-sp-1148215168

Frick, M. J., Birkenholz, R. J., Gardener, H., & Machtmes, K. (1995). Rural and urban inner-city high school student knowledge and perceptions of agriculture. *Journal of Agricultural Education*, *36*(1), 1-9. doi:10.5032/jae.1995.04001

Gambone, M., & Arbreton, A. (1997). S*afe havens: The contributions of youth organizations to healthy adolescent development.* Philidelphia, PA: Public/Private Ventures.

Gibson, H. L., & Chase, C. (2002). Longitudinal impact of an inquiry-based science program on middle school students' attitudes toward science. *Science Education*, *86*(5), 693-705. doi:10.1002/sce.10039

Gilmore, J. L., Goecker, A. D., Smith, E., & Smith, G. (2006). Shifts in the Production and Employment of Baccalaureate Degree Graduates from United States Colleges of Agriculture and Natural Resources from 1990-2005. *Background paper for a leadership summit to effect change in teaching and learning* (http://www.nap.edu/read/12602/chapter/13). Washington, DC: The National Academies Press.

Glencoe / McGraw Hill Education. (n.d.). *Career cluster series: Agriculture and natural resources*. Retrieved from http://www.glencoe.com/sec/careers/cclusters/student/clusters/agriculture.shtml

Glenn, M., Esters, L., & Retallick, M. (2012). Mentoring perceptions and experiences of minority students participating in summer research opportunity programs. *North American Colleges and Teachers of Agriculture Journal* , *56*(1), 35-42. Retrieved from https://www.nactateachers.org/index.php/journal-sp-1148215168

Gonzalez, J. A. (2006). Agricultural programs: Are they able to adapt for the future? *CSREES Faculty Fellow presentation at USDA.* Washington, DC.

Guba, E. (1981). Criteria for assessing the trustworthiness of naturalistic inquiries. *Education Resources Information Center Annual Review Paper, 29*(2),75-91. doi:10.1007/BF02766777

Gushue, G. V., Scanlan, K. R., Pantzer, M., K., & Clarke, C. P. (2006). The relationship of career decision-making self-efficacy, vocational identity, and career exploration behavior in african american high school students. *Journal of Career Development, 33*(1), 19-28. doi:10.1177/0894845305283004

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14-26. doi:10.3102/0013189X033007014

Jones, W. A., & Larke, A. (2003). Factors influencing career choices of ethnic minorities majoring in agriculture . *North American Colleges and Teachers of Agriculture Journal, 4*(3), 11-17. Retrieved from https://www.nactateachers.org/index.php/journal-sp-1148215168

Kielhofner, G. (1982). Qualitative research: Paradigmatic grounds and issues of reliability and validity. *Occupational Therapy Journal of Research, 2*(2), 67-79. doi:10.1177/153944928200200201

Klein-Gardener, S. S. (2014). STEM summer institute increases student and parent understanding of engineering. *American Society of Engineering Education,* (p. 121st ASEE Annual Conference and Exposition). Indianapolis, IN.

Knafl, K., & Breitmayer, B. (1989). Triangulation in qualitative research: Issues of conceptual clarity and purpose. In J. Morse, *Qualitative Nursing Research: A Contemporary Dialogue* (pp. 193-203). Rockville, MD: Aspen.

Knox, K. L., Moynihan, J. A., & Markowitz, D. G. (2003). Evaluation of short-term impact of a high school summer science program on students' perceived knowledge and skills. *Journal of Science Education and Technology, 12*(4), 471-478. Retrieved from http://www.jstor.org/stable/40188751

Krefting, L. (1991). Rigor in qualitative research. *The American Journal of Occupational Therapy, 45*(3), 214-222. doi:10.5014/ajot.45.3.214

Lam, P. C., Srivatsan, T., Doverspike, D., Vesalo, J., & Mawasha, R. P. (2005). A ten year assessment of the pre-engineering program for under-represented, low income and/or first generation college students at the University of Akron. *Journal of STEM Education, 6*(3), 14-20. Retrieved from http://www.jstem.org/index.php?journal=JSTEM&page=index

Lent, R. W., Brown, S. D., & Hackett, G. (2000). Contextual supports and barriers to career choice: A social cognitive analysis. *Journal of Counseling Psychology,* 47(1) 36-49. doi:10.1037/0022-0167.47.1.36

Lent, R., Brown, S., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior*, *45*(1) 79-122. doi:10.1006/jvbe.1994.1027

Li, Y., Alfeld, C., Prince-Kennedy, R., & Putallaz, M. (2009). Effects of summer academic programs in middle school on high school test scores, course-taking, and college major. *Journal of Advanced Academics*, *20*(3), 404-436. doi:10.1177/1932202X0902000303

Lincoln, Y., & Guba, E. (1985). *Naturalistic Inquiry* . Beverly Hills, CA: Sage.

Mahoney, J. L., Harris, A. L., & Eccles, J. S. (2006). Organized activity participation, positive youth development, and the over-scheduling hypothesis. *Society for Research in Child Development Social Policy Report*, *20*(4) 3-32. Retrieved from http://www.srcd.org/

Markowitz, D. G. (2004). Evaluation of the long-term impact of a university high school summer science program on students' interest and perceived abilities in science. *Journal of Science Education and Technology*, *13*(3), 395-407. Retrieved from http://www.springer.com/education+%26+language/science+education/journal/10956

Markus, H., & Wurf, E. (1987). The dynamic self concept: A social psychological perspective. *Annual Review of Psychology*, *38*, 299-337. doi:10.1146/annurev.ps.38.020187.001503

McCormick, J. R., Talbert-Hatch, T. L., & Feldhaus, C. (2014). Increasing female participation in engineering: Evaluating POWER summer camp. *121st ASEE Annual Conference and Exposition.* Indianapolis, IN: American Society for Engineering Education. Retrieved from https://www.asee.org/public/conferences/32/papers/10539/view

Meyer, M.H. (2013). Horticulture career survey: What you said. *American Society for Horticultural Science Newsletter*, *29*(9), 3-4. Retrieved from http://www.ashs.org/index.php?option=com_content&view=article&id=1315:horticulture-career-survey-what-you-said&catid=131:mary-hockenberry-meyer-201314&Itemid=96

Meyer, M. H., Needham, D., Dole, J., Trader, B., Fox, J., Conley, M.,Shaw, J. (2015). *Importance of horticulture and perception and career.* Retrieved from http://www.seedyourfuture.org/sites/default/files/Research%20Report.pdf

Monroe-Atwater, M., Colson, J. J., & Simpson, R. D. (1999). Influences of a university summer residential program on high school students' commitment to the sciences and higher education. *Journal of Women and Minorities in Science and Engineering*, *5*(2), 155-173. doi:10.1615/JWomenMinorScienEng.v5.i2.40

Morehouse, B., & Nelson, D. (2007). Study of prospective students Cal Poly-San Luis Obispo Horticulture and Crop Science Department. Cedar Rapids, IA: *Stamats, Inc.*

Museus, S. D., Palmer, R. T., Davis, R. J., & Maramba, D. C. (2011). *Racial and ethnic minority students' success in STEM education.* Hoboken, NJ: Wiley Periodicals, Inc.

National 4-H Council. (2015). *4-H youth development and mentoring programs.* Retrieved from 4-H: http://www.4-h.org/about/

National Council for Agricultural Education. (2009). *A new era in agriculture: Executive summary of the reinventing agricultural education for the Year 2020 Project.* Washington, D.C.

National FFA Organization. (2015). *What is FFA.* Retrieved from https://www.ffa.org/about/what-is-ffa

National Institute of Food and Agriculture. (2014). *Women and minorities in science, technology, engineering, and mathematics fields program*. Retrieved from http://nifa.usda.gov/sites/default/files/14_WAMS.pdf

National Research Council. (2009). *Transforming agricultural education for a changing world.* Washington, DC: The National Academies Press.

Olszewski-Kubilius, P., Kulieke, M., & Willis, G. (1987). Changes in the self-perceptions of gifted students who participate in rigorous academic programs. *Journal for the Education of the Gifted*, *10*(4), 287-303. Retrieved from http://jeg.sagepub.com/

Ortega, R. R. (2011). *Motivation and career outcomes of a precollege life science experience for underrepresented minorities.* Retrieved from http://docs.lib.purdue.edu/dissertations/AAI3481117/

Orthel, G., Sorensen, J., Lierman, S., & Riesenberg, L. (1989). High school students' perceptions of agriculture and careers in agriculture. *Proceedings of the 16th National Agricultural Education Research Meeting.* Orlando, FL.

Overbay, A., & Broyles, T. (2008). Career values and perceptions of agriculture: What these gifted high school students thought. *North American Colleges and Teachers of Agriculture Journal*, *52*(2), 2-7. Retrieved from https://www.nactateachers.org/index.php/journal-sp-1148215168

Paa, H. K., & McWhirter, E. H. (2000). Perceived influences on high school students' current career expectations. *The Career Development Quarterly*, 49(1) 29-44. doi:10.1002/j.2161-0045.2000.tb00749

Petersen, J. (2000). Many ag students value 4-H, FFA. *Iowa State Daily*, Retreived from http://www.iowastatedaily.com/article_4f2508ec-19e4-5e86-a076-45977ff2f4b1.html.

Purdue University. (2012). *Center for Molecular Agriculture* . Retrieved from https://ag.purdue.edu/plantsciences/pages/molecularag.aspx

Rogers, M. E., Creed, P. A., & Glendon, I. A. (2008). The role of personality in adolescent career planning and exploration: A social cognitive perspective. *Journal of Vocational Behavior, 73*(1), 132-142. doi:10.1016/j.jvb.2008.02.002

Royal Horticultural Society. (2013*). Horticulture matters: The growing crisis in uk horticulture that is our economy, environment, and food security.* Retrieved from http://www.the-hta.org.uk/file.php?fileid=2237

Ruby, D. (1980). Exposing yourself: Reflexivity, anthropology and film. *Semiotica, 30*(1), 153-179. doi:10.1515/semi.1980.30.1-2.153

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*, 54-67. doi:10.1006/ceps.1999.1020

Ryan, R., & Connell, J. (1989). Perceived locus of causality and internalization. *Journal of Personality and Social Psychology, 57*(5), 749-761. doi:10.1037/0022-3514.57.5.749

Schutt, R. K. (2012). *Investingating the social world.* Thousand Oaks, CA: SAGE Publications, Inc.

Settle, Q., Doerfert, D. L., Irlbeck, E., Akers, C., Burris, S., Wingenbach, G., & Rutherford, T. (2012). The effects of an agricultural communications workshop on self-efficacy and career interest: A comparison between agriculture and non-agricuture students. *North American Colleges and Teachers of Agriculture Journal , 52*(4), 71-77. doi:10.5032/jae.2011.04123

Strayhorn, T. L. (2011). Bridging the pipeline: Increasing underrepresented students' preparation for college through a summer bridge program. *American Behavioral Scientist, 55*(2), 142-159. doi:10.1177/0002764210381871

Swan, B. T., & DeLay, A. M. (2014). Agricultural experiences and factors of undergraduates who enroll in a college of agriculture. *North American Colleges and Teachers of Agriculture Journal, 58*(4), 330-334. Retrieved from https://www.nactateachers.org/index.php/journal-sp-1148215168

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining the qualitative and quanitative approaches.* Thousand Oaks, CA: Sage Publications, Inc.

Tashakkori, A., & Teddlie, C. (2003). *Handbook of mixed methods in social and behavioral research.* Thousand Oaks: Sage Publications, Inc.

The National Conference of Governor's Schools. (2015). *What is a governor's school?* Retrieved from http://ncogs.org/index.php/faqs/governor-s-school-faqs/6-what-is-a-governor-s-school

Thompson, J., & Russell, D. (1993). Beliefs and intentions of counselors, parents, and students regarding agriculture as a career choice. *Journal of Agricultural Education*, *34*(4), 55-63. doi:10.5032/jae.1993.04055

Tsui, L. (2009). Recruiting femals into male dominated programs. *Journal of College Admission*, *203*, 8-13. Retrieved from http://www.nacacnet.org/research/publicationsresources/journal/Pages/Journal-of-College-Admission.aspx

United Nations. (2015). *World population prospects, 2015 revision.* Retrieved from http://esa.un.org/unpd/wpp/Publications/Files/Key_Findings_WPP_2015.pdf

United States Department of Agriculture. (2015). *Horticulture definition.* Retrieved from http://agclass.nal.usda.gov/mtwdk.exe?k=glossary&l=60&w=6234&n=1&s=5&t=2

Vibhuti, D., Blasko, D., Holliday-Darr, K., Kremer, J., Edwards, R., Ford, M., Hido, B. (2010). Re-enJEANeering STEM education: Math options summer camp. *The Journal of Technology Studies*, *36*(1), 35-45. Retrieved from http://scholar.lib.vt.edu/ejournals/JOTS/

Vincent, S. K., Henry, A. L., & Anderson, J. C. (2012). College major choice for students of color: toward a model of recruitment for the agricultural education profession. *Journal of Agricultural Education*, *53*(4), 187-200. doi:10.5032/jae.2012.04187

White, C., Stewart, B., & Linhardt, R. (1991). Career opportunities in agriculture as perceived by inner city high school students. *Journal of Agricultural Education*, *32*(1), 11-18. doi:10.5032/jae.1991.01030

Wibrowski, C. R., Matthews, W. K., & Kitsantas, A. (2016). The role of a skills learning support program on first-generation college students self-regulation, motivation, and academic achievement: A longitudinal study. *Journal of College Student Retention*. doi:10.1177/1521025116629152

Wigfield, A., & Eccles, J. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology*, *25*, 68-81. doi:10.1006/ceps.1999.1015

Woods, M. D., & Moore, E. A. (2001). Diversity in agricultural education: A review of the research. *Journal of Agricultural Education*, *45*(1), 10-20.

APPENDICIES

Appendix A: IRB Exemption

PURDUE UNIVERSITY

HUMAN RESEARCH PROTECTION PROGRAM
INSTITUTIONAL REVIEW BOARDS

To:	NEIL KNOBLOCH AGAD
From:	JEANNIE DICLEMENTI, Chair Social Science IRB
Date:	06/11/2015
Committee Action:	**Exemption Granted**
IRB Action Date:	06/11/2015
IRB Protocol #:	1506016142
Study Title:	High School Student Interest in Pre-College Agricultural Experiences

The Institutional Review Board (IRB) has reviewed the above-referenced study application and has determined that it meets the criteria for exemption under 45 CFR 46.101(b)(1) .

If you wish to make changes to this study, please refer to our guidance "**Minor Changes Not Requiring Review**" located on our website at http://www.irb.purdue.edu/policies.php. For changes requiring IRB review, please submit an **Amendment to Approved Study** form or **Personnel Amendment to Study** form, whichever is applicable, located on the forms page of our website www.irb.purdue.edu/forms.php. Please contact our office if you have any questions.

Below is a list of best practices that we request you use when conducting your research. The list contains both general items as well as those specific to the different exemption categories.

General

- To recruit from Purdue University classrooms, the instructor and all others associated with conduct of the course (e.g., teaching assistants) must not be present during announcement of the research opportunity or any recruitment activity. This may be accomplished by announcing, in advance, that class will either start later than usual or end earlier than usual so this activity may occur. It should be emphasized that attendance at the announcement and recruitment are voluntary and the student's attendance and enrollment decision will not be shared with those administering the course.
- If students earn extra credit towards their course grade through participation in a research project conducted by someone other than the course instructor(s), such as in the example above, the students participation should only be shared with the course instructor(s) at the end of the semester. Additionally, instructors who allow extra credit to be earned through participation in research must also provide an opportunity for students to earn comparable extra credit through a non-research activity requiring an amount of time and effort comparable to the research option.
- When conducting human subjects research at a non-Purdue college/university, investigators are urged to contact that institution's IRB to determine requirements for conducting research at that institution.
- When human subjects research will be conducted in schools or places of business, investigators must obtain written permission from an appropriate authority within the organization. If the written permission was not submitted with the study application at the time of IRB review (e.g., the school would not issue the letter without

Appendix B: Parent/Guardian Letter

July, 2015

Dear Parent/Guardian:

We are excited about your son or daughter's participation in in the Purdue Agribusiness Science Academy (PASA). As a participant in this program, we would like to learn more about your son or daughter's interest in Agriculture and in Science, Technology, Engineering, and Math (STEM) careers as a part of a research study. The purpose of this letter is to explain how this master's thesis study will be conducted for the participants in this program.

If your son or daughter participates, he or she will complete:

- One questionnaire at the beginning of the PASA program and one questionnaire at the conclusion of the program. The questions will focus on participants' interest in agriculture, agriculture careers, and future educational plans. (10-15 minutes each on campus)
- A brief phone call three months after the program. (5-10 minutes)

As you can see, most of this will be completed as a part of the program, and we will respect your son or daughter's time. Your child's participation in this project is completely voluntary. Only those students who have parental permission and who want to participate will do so. Your son or daughter may choose to withdraw from the study at any time and for any reason without penalty. These decisions will have no effect on his or her future relationship with the PASA program.

The information that is obtained during this project will be kept strictly confidential. Any sharing or publication of the results will not identify any of the participants by name. If you have any questions, please contact us (see contact information below).

We look forward to working with your child. If you have any questions about this project, please contact us using the information below. If you have any questions about your rights as a participant in research involving human subjects, please feel free to contact the Purdue University Institutional Review Board (IRB) Office at (765) 494-5942 or irb@purdue.edu.

Sincerely,

Neil Knobloch, Ph.D.	Kaylie Scherer	Myron McClure
Associate Professor	Masters Student	Program Manager
(765) 494-8439	765-496-3266	765-494-8471
nknobloc@purdue.edu	akschere@purdue.edu	mcclure0@purdue.edu

Appendix C: Pre-College Program Youth Questionnaire

For this section, please respond as you think about the entire pre-college experience, or program.	None/ Not at all	A Little	Somewhat	A Lot	Absolutely
I enjoyed doing this pre-college program very much.	1	2	3	4	5
This pre-college program was fun to do.	1	2	3	4	5
I thought this was a boring pre-college program.	1	2	3	4	5
This pre-college program did not hold my attention at all.	1	2	3	4	5
I would describe this pre-college program as very interesting.	1	2	3	4	5
I thought this pre-college program was quite enjoyable.	1	2	3	4	5
While I was doing this activities in this pre-college program, I was thinking about how much I enjoyed it.	1	2	3	4	5
I believe this pre-college program could be of some value to me.	1	2	3	4	5
I think that doing this pre-college program is useful for helping me explore my college options.	1	2	3	4	5
I think this is important to do because it can help me learn about college and career opportunities.	1	2	3	4	5
I would be willing to do this again because it has some value to me.	1	2	3	4	5
I think doing this pre-college program could help me to consider college possibilities.	1	2	3	4	5
I believe doing this pre-college program could be beneficial to me.	1	2	3	4	5

I think this is an important pre-college program.	1	2	3	4	5
I think I am pretty good at the activities in this pre-college program.	1	2	3	4	5
I think I did pretty well at the activities, compared to other students.	1	2	3	4	5
After working at this activities in this pre-college program for awhile, I felt pretty competent.	1	2	3	4	5
I am satisfied with my performance the tasks in this pre-college program.	1	2	3	4	5
I was pretty skilled at the activities in the pre-college program.	1	2	3	4	5
These were activities that I couldn't do very well.	1	2	3	4	5
I put a lot of effort into the activities in the pre-college program.	1	2	3	4	5
I didn't try very hard to do well at the activities in the pre-college program.	1	2	3	4	5
I tried very hard on the activities in the pre-college program.	1	2	3	4	5
It was important to me to do well at the tasks in the pre-college program.	1	2	3	4	5
I didn't put much energy into the activities in the pre-college program.	1	2	3	4	5

For this section, please select the corresponding number that aligns with your interest.	None/ Not at all	A Little	Somewhat	A Lot	Absolutely
I am interested in working in Science.	1	2	3	4	5
I am interested in working in Technology/Engineering.	1	2	3	4	5
I am interested in working in Communication/Education.	1	2	3	4	5
I am interested in working in Business.	1	2	3	4	5
I am interested in working with plants.	1	2	3	4	5
I am interested in working with animals.	1	2	3	4	5
I am interested in working with machines.	1	2	3	4	5
I am interested in working with natural resources.	1	2	3	4	5
I am interested in working with organisms.	1	2	3	4	5
I am interested in working with people.	1	2	3	4	5
I am interested in working with numbers.	1	2	3	4	5
I am interested in working in food production.	1	2	3	4	5
I am interested in working in agriculture.	1	2	3	4	5

For this section, please select the corresponding number that aligns with your thoughts on agriculture.	None/ Not at all	A Little	Somewhat	A Lot	Absolutely
Agriculture could be integrated into science.	1	2	3	4	5
Agriculture could be integrated into technology.	1	2	3	4	5
Agriculture could be integrated into engineering.	1	2	3	4	5
Agriculture could be integrated into math.	1	2	3	4	5
Agriculture includes horticulture and floriculture.	1	2	3	4	5
Agriculture includes wildlife and natural resources.	1	2	3	4	5
Agriculture includes forestry and woodlands.	1	2	3	4	5
Agriculture includes food and fiber.	1	2	3	4	5
Agriculture is a highly technological industry.	1	2	3	4	5
Agriculture is a science-based industry.	1	2	3	4	5
Agriculture is economically profitable.	1	2	3	4	5
Agriculture is an environmentally-sustainable industry.	1	2	3	4	5
Agriculture is a socially responsible industry.	1	2	3	4	5
Agriculture has a skilled, educated workforce.	1	2	3	4	5
Agriculture has a lot of career opportunities.	1	2	3	4	5

What is your gender?

- o Female
- o Male
- o Prefer not to answer

What is your race? (Select one or more)

- o White
- o American Indian
- o Asian
- o Black or African American
- o Native Hawaiian or Other Pacific Islander
- o Native Alaskan
- o Other
- o Prefer not to answer

What is your age? _____

What is your grade level?

- o 9th
- o 10th
- o 11th
- o 12th
- o Other
- o Prefer not to answer

Appendix D: Follow-Up Phone Interview Protocol

PASA INTERVIEW PROTOCOL

Hello, this is _____ from the Purdue Agribusiness Science Academy. I would like to thank you for taking the time to participate in this phone call interview. This interview is designed to give us greater insight to your experience at PASA held on the Purdue University campus from July 12th – July 25th of 2015. The interview will likely take between five and fifteen minutes, and consists of four sets of questions. All information collected from this interview is confidential and will be released only as summaries in which you will not be identified. Your participation in this interview is completely voluntary and you have the right to end the interview at any time. Do you understand the purpose of the interview and your rights as an interviewee? *If yes, continue to the interview.*

A. ACTIVITY INTEREST

- **The first series of questions will have you reflect about your experience at PASA. When answering these questions, think about:**
  - **The activities, including labs, social activities, and educational activities.**
  - **The people who you interacted with, including camp coordinator, camp counselors, presenters, lab supervisors, and other PASA participants.**
  - **And the experience as a whole.**

- A1. Why did you attend PASA?
  _____
  _____
  _____

- A2. What did you like most about PASA?
  _____
  _____
  _____
  Why?
  _____
  _____
  _____

- A3. What did you like least about PASA?
  _____
  _____
  _____

Why?
_____
_____
_____

B. PERCEPTIONS OF AGRICULTURE

- **The second series of questions will focus on your perceptions of Agriculture.**

- B1. What do you think of when you think of agriculture?
  _____
  _____
  _____

- B2. Has your view of agriculture changed since participating in PASA?
  - o Yes
    How?
    _____
    _____
    _____
  - o No

C. CAREER INTEREST / FUTURE EDUCATIONAL PLANS

- **The third series of questions looks at your career interests and future goals. Though these may change in the future, we would like to know about how you are thinking currently.**

- C1. Does your current school offer agriculture classes?
  - o Yes
  - o No

- C2. Were there any aspects of PASA that encouraged you to pursue taking more agriculture related courses in high school or college?
  - o Yes
    What?
    _____
    _____
    _____
  - o No

- C3. As a result of attending PASA, has your awareness of the various career opportunities in agriculture increased?
    - o Yes
    - o No

- C4. Currently, what is the career path that you would like to take in your future?
  _____

- C5. Would you consider a career in the agricultural sciences?
    - o Yes
      Why?
      _____
      _____
      _____
    - o No
      Why?
      _____
      _____
      _____

- C6. What are your plans after you graduate from high school?
    - o Attend a 4-year university full-time
    - o Attend a community college
    - o Attend a community college with the intent to transfer to a 4-year university
    - o Work part-time and attend college part-time
    - o Work full-time and don't go to college
    - o Military
    - o Undecided
    - o Other
      Please list:
      _____

- C7. Do you intend to apply to Purdue?

Not at all	Probably will not apply	Undecided	Probably will apply	Definitely will apply/ already applied
1	2	3	4	5

- C8. (If student stated 5 on the scale) Did you already apply?
  - Yes
  - No

- C9. (If student has already applied) Have you been accepted?
  - Yes, has been accepted to:_____
  - No, was not accepted
  - Has not received notification yet

- C10. If you intend to apply to a program in the College of Agriculture at Purdue, which one?
  - Does not intend to apply to a program in the College of Agriculture at Purdue
  - Agricultural & Biological Engineering
  - Agricultural Economics
  - Agronomy
  - Animal Sciences
  - Biochemistry
  - Botany & Plant Pathology
  - Entomology
  - Food Science
  - Forestry & Natural Resources
  - Horticulture & Landscape Architecture
  - Youth Development and Agricultural Education
  - Other _____

D. DEMOGRAPHICS

- **The fourth and final series of questions focuses on demographics.**

- D1. What is your gender?
  - Female
  - Male
  - Prefer not to answer

- D2. What is your race? (Select one or more)
  - White
  - American Indian
  - Asian
  - Black or African American
  - Native Hawaiian or Other Pacific Islander
  - Native Alaskan

  - Other
  - Prefer not to answer

- D3. What is your age? _____
  - Prefer not to answer

- D4. What is your grade level?
  - 9th
  - 10th
  - 11th
  - 12th
  - Other
  - Prefer not to answer

- D5. Did you participate in 4-H before PASA?
  - Yes
  - No

- D6. Did you participate in FFA before PASA?
  - Yes
  - No

- D7. Do you live on a farm?
  - Yes
  - No

- D8. Which PASA track were you in?
  - Track 1- Sustainability
  - Track 2- Forensic Science
  - Track 3- Business Education

Appendix E: MASI Schedule Overview

EXPERIENCE Purdue Agriculture | Pre-College Molecular Agriculture Summer Institute

2015 Pre-College MASI Schedule of Events

Sunday, June 14th

TIME	ACTIVITY	PLACE
2:30-4pm	Check-in/Registration	Earhart Hall Lobby
4:00pm	Residence Hall Orientation and Information	Earhart Hall Lobby
5:00pm	Welcome and Orientation – Marcos Fernandez	AGAD 128
6:00pm	Supper	AGAD 128
7:00-9:00pm	Ice Breakers/Social Time	AGAD 128
9:30-10:30pm	Room Time (Unpack, Shower, etc.)	Earhart Hall
11:00pm	LIGHTS OUT	

Monday, June 15th

TIME	ACTIVITY	PLACE
6:30- 7:45am	Breakfast	Hillenbrand
8:00-9:00am	Short Tour of residence halls to Ag Campus	
9:00 am	Faculty Introductions and Address from the Dean	PFEN 241
10:00-12pm	Lab Time	Assigned Lab Area
12:00-1:20pm	Lunch	Hillenbrand
1:30-3:20pm	MASI Undergraduate Fellows Presentations	WSLR 116
3:30-5:30pm	Lab/Project Time	Assigned Lab Area
5:30-6:30pm	Supper	Hillenbrand
7:00pm-9:00pm	Bowling	Purdue Memorial Union
9:30pm	Room Time	Earhart Hall
11:00pm	LIGHTS OUT	

Tuesday, June 16th

TIME	ACTIVITY	PLACE
6:30-7:45am	Breakfast	Hillenbrand
8:00 – 10:50am	Lab/Project Time	Assigned Lab Area
11:00-12:00pm	Finding Your Research Passion	LILY 2-425
12:00-1:20pm	Lunch	Hillenbrand
1:30-3:00pm	Lab/Project Time	Assigned Lab Area
3:00-4:00pm	What is Purdue Extension?	WSLR 116
4:00-5:30pm	Free Time/Interviews	
5:30-7:00pm	Supper	Hillenbrand
7:00pm	Campus Scavenger Hunt	Meet at Earhart Lobby
9:30pm	Room Time	Earhart Hall
11:00pm	LIGHTS OUT	

Wednesday, June 17th

TIME	ACTIVITY	PLACE
6:30-7:45am	Breakfast	Residence Hall
8:00am	Leave for Dow Agrosciences	Indianapolis Area
9:00am-12:30pm	DAS Tour and Lunch	DAS
1:30pm	Indianapolis Indians Game and Tour	Victory Field
~5:30pm	Supper	Indianapolis Area
~8:00pm	Drive Back to Campus	
9:30pm	Room Time	
11:00pm	LIGHTS OUT	

Thursday, June 18th

TIME	ACTIVITY	PLACE
6:30-7:45am	Breakfast	Hillenbrand
8:00–10:50am	Lab/Project Time	Assigned Lab Area
11:00-11:50	Greenhouse Tour	HGRH
12:00-1:20pm	Lunch	Hillenbrand
1:30-2:20pm	Farmers Market Tour	Purdue Memorial Mall
2:30-3:30pm	WSLR Tour	WLSR SO52
3:30-4:30pm	Lab/Project Time	Assigned Lab Area
4:30-5:30pm	Free Time	
5:30-7:00pm	Supper	Hillenbrand
7:00pm	Free Time/Change	
7:30pm	Purdue Traditions	Meet in Earhart Lobby
11:00pm	LIGHTS OUT	

Friday, June 19th

TIME	ACTIVITY	PLACE
6:30-7:45am	Breakfast	Hillenbrand
8:00-8:50am	Preparing for College	LILY 2-425
9:00am-11:50pm	Lab/Project Time	Assigned Lab Area
12:00-1pm	Lunch	Hillenbrand
1:30-3:15pm	Water Quality Field Experiment Activity	ACRE
3:30-5:30pm	Lab/Project Time	Assigned Lab Area
5:30-7:00pm	Supper	Hillenbrand
7:00pm	Rec Sports Night	Recreational Sports Center
11:00pm	LIGHTS OUT	

Saturday, June 20th

TIME	ACTIVITY	PLACE
6:30-9:00am	Breakfast, Pack, Ready to Check-Out	Hillenbrand
9:30-11:30am	Project Presentations	PFEN (Dean's Auditorium)
11:30am	Goodbye – Thanks for Coming! Check Out	

Appendix F: PASA Schedule Overview

Date & Time	SUN	MON	TUES	WED	THUR	FRI	SAT	SUN	MON	TUES	WED	THUR	FRI	SAT
TRACK NAME	12	13	14	15	16	17	18	19	20	21	22	23	24	25
7:00 AM		Breakfast	Breakfast	Breakfast	Breakfast	Breakfast			Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	
7:30 AM		Breakfast	Breakfast	Breakfast	Breakfast	Breakfast			Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	
8:00 AM		Breakfast	**Travel/Industry**	Breakfast	**Travel/Industry**	Breakfast	Continetal Breakfast	Continetal Breakfast	Breakfast	**Travel/Industry**	Breakfast	Breakfast	Breakfast	Snacks
8:30 AM		**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	Continetal Breakfast	Continetal Breakfast	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Presentation Prep**	Snacks
9:00 AM		**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	**Fair Oaks**	Personal Services (optional)	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Presentation Prep**	Check-Out Residence
9:30 AM		**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	**Fair Oaks**	Personal Services (optional)	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Presentation Prep**	Check-Out Residence
10:00 AM		**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	**Fair Oaks**	Personal Services (optional)	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Presentation Prep**	Check-Out Residence
10:30 AM		**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	**Fair Oaks**	Personal Services (optional)	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Presentation Prep**	*Closing Ceremonies*
11:00 AM		**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	**Fair Oaks**	Personal Services (optional)	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Presentation Prep**	**PFEN 241**
11:30 AM		**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	**Fair Oaks**	Personal Services (optional)	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Presentation Prep**	**PFEN 241**
12:00 PM		Lunch	**DAS-Lunch**	Lunch	Pre Box Lunch	Lunch	**Fair Oaks - Lunch**	Walmart/Mall Run	Lunch	Pre Box Lunch	Lunch	PB&J Lunch	Lunch	**PFEN 241**
12:30 PM	Check-In - Move-In	Lunch	**DAS-Lunch**	Lunch	Pre Box Lunch	Lunch	**Fair Oaks - Lunch**	Lunch OYO	Lunch	Pre Box Lunch	Lunch	PB&J Lunch	Lunch	**PFEN 241**
1:00 PM	Check-In - Move-In	Lunch	**DAS-Lunch**	Lunch	Pre Box Lunch	Lunch	**Fair Oaks - Lunch**	Walmart/Mall Run	Lunch	Pre Box Lunch	Lunch	PB&J Lunch	Lunch	**See You In 2016!!!**
1:30 PM	Check-In - Move-In	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Seavenger Hunt**	**Fair Oaks**	Lunch OYO	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	
2:00 PM	Check-In - Move-In	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Seavenger Hunt**	**Water Park/Movies**	Co-Rec or Room Time	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	
2:30 PM	Orientation	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Seavenger Hunt**	**Water Park/Movies**	Co-Rec or Room Time	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	
3:00 PM	Orientation	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Admission-Schl**	**Water Park/Movies**	Co-Rec or Room Time	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	
3:30 PM	Orientation	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Admission-Schl**	**Water Park/Movies**	**Blueberry Farm**	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	
4:00 PM	Squirrel Park	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Admission-Schl**	**Water Park/Movies**	**Blueberry Farm**	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	
4:30 PM	Squirrel Park	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**Admission-Schl**	**Water Park/Movies**	**Blueberry Farm**	**CLASS**	**Travel/Industry**	**CLASS**	**Travel/Industry**	**CLASS**	
5:00 PM	Squirrel Park	Co-Rec or Room Time	Co-Rec or Room Time	Co-Rec or Room Time	Co-Rec or Room Time	Co-Rec or Room Time	**Water Park/Movies**	**Blueberry Farm**	Co-Rec or Room Time	Co-Rec or Room Time	Co-Rec or Room Time	**Travel/Industry**	Co-Rec or Room Time	
5:30 PM	Squirrel Park	Dinner	Dinner	Dinner	Dinner	Dinner	**Water Park/Movies**	**Blueberry Farm**	Dinner	Dinner	Dinner	Dinner	Dinner	
6:00 PM	Squirrel Park	Dinner	Dinner	Dinner	Dinner	Dinner	OMP -Dinner	**Blueberry Farm**	Dinner	Dinner	Dinner	Dinner	Dinner	
6:30 PM	Room Checks	Dinner	Dinner	Dinner	Dinner	Dinner	OMP-Dinner	**Blueberry Farm**	Dinner	Dinner	Dinner	Dinner	Dinner	
7:00 PM	Room Checks	Evaluation-SC 179	Evaluation-SC 179	Evaluation-NLSN 1195	Evaluation-SC 179	Evaluation-SC 179	OMP-Dinner	**Blueberry Farm**	Evaluation-SC 179	Evaluation-SC 179	Evaluation-SC 179	Evaluation-SC 179	Evaluation-SC 179	
7:30 PM	Ag Campus Tour	Study Table-SC 179	Study Table-SC 179	SAT/ACT Prep-SC 179	Study Table-SC 179	SAT/ACT Prep-SC 179	OMP-Dinner	**Blueberry Farm**	SAT/ACT Prep-SC 179	Study Table-SC 179	SAT/ACT Prep-SC 179	Study Table-SC 179	Evaluation-SC 179	
8:00 PM	Pre-Test-SC-179	Study Table-SC 179	Study Table-SC 179	SAT/ACT Prep-SC 179	Study Table-SC 179	SAT/ACT Prep-SC 179	WASH & DRY	**Blueberry Farm**	SAT/ACT Prep-SC 179	Study Table-SC 179	SAT/ACT Prep-SC 179	Study Table-SC 179	Post-Test-SC-179	
8:30 PM	Pre-Test-SC-179	Study Table-SC 179	Study Table-SC 179	SAT/ACT Prep-SC 179	Study Table-SC 179	SAT/ACT Prep-SC 179	WASH & DRY	Residence Only Time	SAT/ACT Prep-SC 179	Study Table-SC 179	SAT/ACT Prep-SC 179	Study Table-SC 179	Post-Test-SC-179	
9:00 PM	Counselor/Student	Counselor/Student	Counselor/Student	Counselor/Student	Counselor/Student	Counselor/Student	Counselor/Student	Counselor/Student	Counselor/Student	Counselor/Student	Counselor/Student	Counselor/Student	Presentation Prep	
9:30 PM	Residence Only Time	Residence Only Time	Residence Only Time	Residence Only Time	Residence Only Time	Residence Only Time	WASH & DRY	Residence Only Time	Residence Only Time	Residence Only Time	Residence Only Time	Residence Only Time	Residence Only Time	
10:00 PM	Residence Only Time	Residence Only Time	Residence Only Time	Residence Only Time	Residence Only Time	Residence Only Time	WASH & DRY	Residence Only Time	Residence Only Time	Residence Only Time	Residence Only Time	Residence Only Time	Residence Only Time	
10:30 PM	In-Own Room	In-Own Room	In-Own Room	In-Own Room	In-Own Room	Residence Only Time	Residence Only Time	In-Own Room	In-Own Room	In-Own Room	In-Own Room	In-Own Room	Residence Only Time	
11:00 PM	Lights Out	Lights Out	Lights Out	Lights Out	Lights Out	In-Own Room	In-Own Room	Lights Out	Lights Out	Lights Out	Lights Out	Lights Out	In-Own Room	

Appendix G: Frequency of Responses: Agriculture Career Interests of MASI and PASA Students

Table 6.1

Frequency of Responses: Agriculture Career Interests of MASI Students (N = 13)

"I'm interested in working"…	Pre-test					Post-test				
	none/ not at all	a little	somewhat	a lot	absolutely	none/ not at all	a little	somewhat	a lot	absolutely
in Science	0 (0%)	0 (0%)	1 (7.7%)	2 (15.4%)	10 (76.9%)	0 (0%)	1 (7.7%)	1 (7.7%)	0 (0%)	11 (84.6%)
in Technology/ Engineering	0 (0%)	2 (15.4%)	7 (53.8%)	0 (0%)	4 (30.8%)	2 (15.4%)	1 (7.7%)	3 (23.1%)	3 (23.1%)	4 (30.8%)
in Communication/ Education	2 (15.4%)	6 (46.2%)	5 (38.5%)	0 (0%)	0 (0%)	3 (23.1%)	1 (7.7%)	8 (61.5)	1 (7.7%)	0 (0%)
in Business	6 (46.2%)	2 (15.4%)	2 (15.4%)	1 (7.7%)	2 (15.4%)	4 (30.8%)	6 (46.2%)	0 (0%)	0 (0%)	3 (23.1%)
with plants	0 (0%)	2 (15.4%)	7 (53.8%)	1 (7.7%)	3 (23.1%)	1 (7.7%)	3 (23.1%)	3 (23.1%)	3 (23.1%)	3 (23.1%)
with animals	1 (7.7%)	3 (23.1%)	5 (38.5%)	2 (15.4%)	2 (15.4%)	3 (23.1%)	3 (23.1%)	3 (23.1%)	2 (15.4%)	2 (15.4%)
with machines	3 (23.1%)	3 (23.1%)	4 (30.8%)	3 (23.1%)	0 (0%)	3 (23.1%)	3 (23.1%)	5 (38.5%)	2 (15.4%)	0 (0%)
with natural resources	2 (15.4%)	4 (30.8%)	4 (30.8%)	2 (15.4%)	1 (7.7%)	2 (15.4%)	2 (15.4%)	5 (38.5%)	3 (23.1%)	1 (7.7%)
with organisms	0 (0%)	2 (15.4%)	4 (30.8%)	4 (30.8%)	3 (23.1%)	1 (7.7%)	0 (0%)	2 (15.4%)	4 (30.8%)	6 (46.2%)
with people	1 (7.7%)	0 (0%)	1 (7.7%)	3 (23.1%)	7 (53.8%)	1 (7.7%)	0 (0%)	2 (15.4%)	3 (23.1%)	7 (53.8%)
with numbers	1 (7.7%)	5 (38.5%)	1 (7.7%)	3 (23.1%)	3 (23.1%)	1 (7.7%)	1 (7.7%)	6 (46.2%)	2 (15.4%)	3 (23.1%)
in food production	5 (38.5%)	2 (15.4%)	2 (15.4%)	1 (7.7%)	3 (23.1%)	2 (15.4%)	5 (38.5%)	3 (23.1%)	2 (15.4%)	1 (7.7%)
in agriculture	3 (23.1%)	1 (7.7%)	4 (30.8%)	2 (15.4%)	3 (23.1%)	3 (23.1%)	1 (7.7%)	2 (15.4%)	4 (30.8%)	3 (23.1%)

Note. A 5-point scale was used (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

Summary

In the pretest, 92.3% of MASI students stated that they were "a lot" or "absolutely" interested in working in science. In the posttest, 84.6% of MASI students stated that they were "a lot" or "absolutely" interested in working in science.

In the pretest, 30.8% of MASI students stated that they were “a lot” or “absolutely” interested in working in technology/engineering. In the posttest, 53.9% of MASI students stated that they were “a lot” or “absolutely” interested in working in technology/engineering.

In the pretest, 0.0% of MASI students stated that they were “a lot” or “absolutely” interested in working in communication/education. In the posttest, 7.7% of MASI students stated that they were “a lot” or “absolutely” interested in working in communication/education.

In the pretest, 23.1% of MASI students stated that they were “a lot” or “absolutely” interested in working in business. In the posttest, 23.1% of MASI students stated that they were “a lot” or “absolutely” interested in working in business.

In the pretest, 30.8% of MASI students stated that they were “a lot” or “absolutely” interested in working with plants. In the posttest, 46.2% of MASI students stated that they were “a lot” or “absolutely” interested in working with plants.

In the pretest, 30.8% of MASI students stated that they were “a lot” or “absolutely” interested in working with animals. In the posttest, 30.8% of MASI students stated that they were “a lot” or “absolutely” interested in working with animals.

In the pretest, 23.1% of MASI students stated that they were “a lot” or “absolutely” interested in working with machines. In the posttest, 15.4% of MASI students stated that they were “a lot” or “absolutely” interested in working with machines.

In the pretest, 23.1% of MASI students stated that they were “a lot” or “absolutely” interested in working with natural resources. In the posttest, 30.8% of

MASI students stated that they were “a lot” or “absolutely” interested in working with natural resources.

In the pretest, 53.9% of MASI students stated that they were “a lot” or “absolutely” interested in working with organisms. In the posttest, 77.0% of MASI students stated that they were “a lot” or “absolutely” interested in working with organisms.

In the pretest, 76.9% of MASI students stated that they were “a lot” or “absolutely” interested in working with people. In the posttest, 76.9% of MASI students stated that they were “a lot” or “absolutely” interested in working with people.

In the pretest, 46.2% of MASI students stated that they were “a lot” or “absolutely” interested in working with numbers. In the posttest, 38.5% of MASI students stated that they were “a lot” or “absolutely” interested in working with numbers.

In the pretest, 30.8% of MASI students stated that they were “a lot” or “absolutely” interested in working in food production. In the posttest, 23.1% of MASI students stated that they were “a lot” or “absolutely” interested in working in food production.

In the pretest, 38.5% of MASI students stated that they were “a lot” or “absolutely” interested in working in agriculture. In the posttest, 53.9% of MASI students stated that they were “a lot” or “absolutely” interested in working in agriculture.

Table 6.2

Frequency of Responses: Agriculture Career Interests of PASA Students (N = 26)

"I'm interested in working"…	Pre-test					Post-test				
	none/ not at all	a little	somewhat	a lot	absolutely	none/ not at all	a little	somewhat	a lot	absolutely
in Science	0 (0%)	2 (7.7%)	11 (42.3%)	7 (26.9%)	6 (23.1%)	1 (3.8%)	3 (11.5%)	9 (34.6%)	2 (7.7%)	11 (42.3%)
in Technology/ Engineering	3 (11.5%)	6 (23.1%)	6 (23.1%)	5 (19.2%)	6 (23.1%)	5 (19.2%)	1 (3.8%)	11 (42.3%)	4 (15.4%)	5 (19.2%)
in Communication/ Education	4 (15.4%)	13 (50.0%)	6 (23.1%)	2 (7.7%)	1 (3.8%)	3 (11.5%)	7 (26.9%)	13 (50.0%)	2 (7.7%)	1 (3.8%)
in Business	3 (11.5%)	2 (7.7%)	8 (30.8%)	10 (38.5%)	3 (11.5%)	2 (7.7%)	3 (11.5%)	6 (23.1%)	8 (30.8%)	7 (26.9%)
with plants	9 (34.6%)	7 (26.9%)	9 (34.6%)	0 (0%)	1 (3.8%)	7 (28.0%)	6 (24.0%)	6 (24.0%)	6 (24.0%)	0 (0%)
with animals	4 (15.4%)	7 (26.9%)	8 (30.8%)	4 (15.4%)	3 (11.5%)	4 (15.4%)	7 (26.9%)	5 (19.2%)	5 (19.2%)	5 (19.2%)
with machines	4 (15.4%)	4 (15.4%)	11 (42.3%)	3 (11.5%)	4 (15.4%)	4 (15.4%)	2 (7.7%)	9 (34.6%)	7 (26.9%)	4 (15.4%)
with natural resources	4 (15.4%)	9 (34.6%)	8 (30.8%)	3 (11.5%)	2 (7.7%)	3 (11.5%)	3 (11.5%)	10 (38.5%)	7 (26.9%)	3 (11.5%)
with organisms	4 (15.4%)	8 (30.8%)	9 (34.6%)	3 (11.5%)	2 (7.7%)	6 (23.1%)	5 (19.2%)	7 (26.9%)	3 (11.5%)	5 (19.2%)
with people	1 (3.8%)	3 (11.5%)	6 (23.1%)	10 (38.5%)	6 (23.1%)	1 (3.8%)	1 (3.8%)	6 (23.1%)	12 (46.2%)	6 (23.1%)
with numbers	4 (15.4%)	8 (30.8%)	5 (19.2%)	8 (30.8%)	1 (3.8%)	3 (11.5%)	6 (23.1%)	7 (26.9%)	6 (23.1%)	4 (15.4%)
in food production	7 (26.9%)	14 (53.8%)	3 (11.5%)	0 (0%)	2 (7.7%)	3 (11.5%)	6 (23.1%)	10 (38.5%)	5 (19.2%)	2 (7.7%)
in agriculture	3 (11.5%)	9 (34.6%)	10 (38.5%)	7 (26.9%)	7 (26.9%)	1 (3.8%)	3 (11.5%)	13 (50.0%)	2 (7.7%)	7 (26.9%)

Note. A 5-point scale was used (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

Summary

In the pretest, 50.0% of PASA students stated that they were "a lot" or "absolutely" interested in working in science. In the posttest, 50.0% of PASA students stated that they were "a lot" or "absolutely" interested in working in science.

In the pretest, 42.3% of PASA students stated that they were "a lot" or "absolutely" interested in working in technology/engineering. In the posttest, 34.6% of

PASA students stated that they were “a lot” or “absolutely” interested in working in technology/engineering.

In the pretest, 11.5% of PASA students stated that they were “a lot” or “absolutely” interested in working in communication/education. In the posttest, 11.5% of PASA students stated that they were “a lot” or “absolutely” interested in working in communication/education.

In the pretest, 50.0% of PASA students stated that they were “a lot” or “absolutely” interested in working in business. In the posttest, 57.7% of PASA students stated that they were “a lot” or “absolutely” interested in working in business.

In the pretest, 3.8% of PASA students stated that they were “a lot” or “absolutely” interested in working with plants. In the posttest, 24.0% of PASA students stated that they were “a lot” or “absolutely” interested in working with plants.

In the pretest, 26.9% of PASA students stated that they were “a lot” or “absolutely” interested in working with animals. In the posttest, 38.4% of PASA students stated that they were “a lot” or “absolutely” interested in working with animals.

In the pretest, 26.9% of PASA students stated that they were “a lot” or “absolutely” interested in working with machines. In the posttest, 42.3% of PASA students stated that they were “a lot” or “absolutely” interested in working with machines.

In the pretest, 19.2% of PASA students stated that they were “a lot” or “absolutely” interested in working with natural resources. In the posttest, 38.4% of PASA students stated that they were “a lot” or “absolutely” interested in working with natural resources.

In the pretest, 19.2% of PASA students stated that they were “a lot” or “absolutely” interested in working with organisms. In the posttest, 30.7% of PASA students stated that they were “a lot” or “absolutely” interested in working with organisms.

In the pretest, 61.6% of PASA students stated that they were “a lot” or “absolutely” interested in working with people. In the posttest, 69.3% of PASA students stated that they were “a lot” or “absolutely” interested in working with people.

In the pretest, 34.6% of PASA students stated that they were “a lot” or “absolutely” interested in working with numbers. In the posttest, 38.5% of PASA students stated that they were “a lot” or “absolutely” interested in working with numbers.

In the pretest, 7.7% of PASA students stated that they were “a lot” or “absolutely” interested in working in food production. In the posttest, 26.9% of PASA students stated that they were “a lot” or “absolutely” interested in working in food production.

In the pretest, 53.8% of PASA students stated that they were “a lot” or “absolutely” interested in working in agriculture. In the posttest, 34.6% of PASA students stated that they were “a lot” or “absolutely” interested in working in agriculture.

Appendix H: Frequency of Responses: MASI and PASA Students' Views on Incorporating Agriculture into STEM

Table 6.3

Frequency of Responses: MASI Students' Views on Incorporating Agriculture into STEM (N = 13)

	Pre-test					Post-test				
"Agriculture could be incorporated into"…	none/ not at all	a little	somewhat	a lot	absolutely	none/ not at all	a little	somewhat	a lot	absolutely
Science	0 (0%)	0 (0%)	0 (0%)	2 (15.4%)	11 (84.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	13 (100%)
Technology	0 (0%)	0 (0%)	1 (7.7%)	1 (7.7%)	11 (84.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	13 (100%)
Engineering	0 (0%)	1 (7.7%)	0 (0%)	1 (7.7%)	11 (84.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	13 (100%)
Math	0 (0%)	2 (15.4%)	2 (15.4%)	4 (30.8%)	5 (38.5%)	0 (0%)	0 (0%)	0 (0%)	1 (7.7%)	12 (92.3%)

Note. A 5-point scale was used (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

Summary

In the pretest, 100.0% of MASI students agreed "a lot" or "absolutely" that Agriculture could be incorporated into Science. In the posttest, 100.0% of MASI students agreed "a lot" or "absolutely" that Agriculture could be incorporated into Science.

In the pretest, 92.3% of MASI students agreed "a lot" or "absolutely" that Agriculture could be incorporated into Technology. In the posttest, 100.0% of MASI students agreed "a lot" or "absolutely" that Agriculture could be incorporated into Technology.

In the pretest, 92.3% of MASI students agreed "a lot" or "absolutely" that Agriculture could be incorporated into Engineering. In the posttest, 100.0% of MASI students agreed "a lot" or "absolutely" that Agriculture could be incorporated into Engineering.

In the pretest, 69.3% of MASI students agreed “a lot” or “absolutely” that Agriculture could be incorporated into Math. In the posttest, 100.0% of MASI students agreed “a lot” or “absolutely” that Agriculture could be incorporated into Math.

Table 6.4

Frequency of Responses: PASA Students’ Views on Incorporating Agriculture into STEM (N = 26)

	Pre-test					Post-test				
“Agriculture could be incorporated into”…	none/ not at all	a little	somewhat	a lot	absolutely	none/ not at all	a little	somewhat	a lot	absolutely
Science	0 (0%)	1 (3.8%)	3 (11.5%)	6 (23.1%)	16 (61.5%)	0 (0%)	0 (0%)	0 (0%)	7 (26.9%)	19 (73.1%)
Technology	0 (0%)	0 (0%)	4 (15.4%)	7 (26.9%)	15 (57.7%)	0 (0%)	0 (0%)	1 (3.8%)	4 (15.4%)	21 (80.8%)
Engineering	0 (0%)	0 (0%)	3 (11.5%)	8 (30.8%)	15 (57.7%)	0 (0%)	0 (0%)	1 (3.8%)	4 (15.4%)	21 (80.8%)
Math	0 (0%)	0 (0%)	6 (23.1%)	7 (26.9%)	13 (50.0%)	0 (0%)	1 (3.8%)	0 (0%)	5 (19.2%)	20 (76.9%)

Note. A 5-point scale was used (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

Summary

In the pretest, 84.6% of PASA students agreed “a lot” or “absolutely” that Agriculture could be incorporated into Science. In the posttest, 100.0% of PASA students agreed “a lot” or “absolutely” that Agriculture could be incorporated into Science.

In the pretest, 84.6% of PASA students agreed “a lot” or “absolutely” that Agriculture could be incorporated into Technology. In the posttest, 96.2% of PASA students agreed “a lot” or “absolutely” that Agriculture could be incorporated into Technology.

In the pretest, 88.5% of PASA students agreed “a lot” or “absolutely” that Agriculture could be incorporated into Engineering. In the posttest, 96.2% of PASA students agreed “a lot” or “absolutely” that Agriculture could be incorporated into Engineering.

In the pretest, 76.9% of PASA students agreed “a lot” or “absolutely” that Agriculture could be incorporated into Math. In the posttest, 96.1% of PASA students agreed “a lot” or “absolutely” that Agriculture could be incorporated into Math.

Appendix I: Frequency of Responses: MASI and PASA Students' Views on Sectors Encompassed by Agriculture

Table 6.5

Frequency of Responses: MASI Students' Views on Industry Sectors Encompassed by Agriculture (N = 13)

"Agriculture includes"…	Pre-test					Post-test				
	none/ not at all	a little	somewhat	a lot	absolutely	none/ not at all	a little	somewhat	a lot	absolutely
horticulture and floriculture	0 (0%)	1 (7.7%)	2 (15.2%)	3 (23.1%)	7 (53.8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	13 (100%)
wildlife and natural resources	0 (0%)	0 (0%)	1 (7.7%)	2 (15.2%)	10 (76.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	13 (100%)
forestry and woodlands	0 (0%)	1 (7.7%)	1 (7.7%)	4 (30.8%)	7 (53.8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	13 (100%)
food and fiber	0 (0%)	0 (0%)	0 (0%)	3 (23.1%)	10 (76.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	13 (100%)

Note. A 5-point scale was used (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

Summary

In the pretest, 76.9% of MASI students agreed "a lot" or "absolutely" that agriculture includes horticulture and floriculture. In the posttest, 100.0% of MASI students agreed "a lot" or "absolutely" that agriculture includes horticulture and floriculture.

In the pretest, 92.1% of MASI students agreed "a lot" or "absolutely" that agriculture includes wildlife and natural resources. In the posttest, 100.0% of MASI students agreed "a lot" or "absolutely" that agriculture includes wildlife and natural resources.

In the pretest, 84.6% of MASI students agreed "a lot" or "absolutely" that agriculture includes forestry and woodlands. In the posttest, 100.0% of MASI students agreed "a lot" or "absolutely" that agriculture includes forestry and woodlands.

In the pretest, 100.0% of MASI students agreed “a lot” or “absolutely” that agriculture includes food and fiber. In the posttest, 100.0% of MASI students agreed “a lot” or “absolutely” that agriculture includes food and fiber.

Table 6.6

Frequency of Responses: PASA Students’ Views on Sectors Encompassed by Agriculture (N = 26)

“Agriculture includes”…	Pre-test					Post-test				
	none/ not at all	a little	somewhat	a lot	absolutely	none/ not at all	a little	somewhat	a lot	absolutely
horticulture and floriculture	0 (0%)	2 (7.7%)	6 (23.1%)	6 (23.1%)	12 (46.2%)	0 (0%)	0 (0%)	3 (11.5%)	4 (15.4%)	19 (73.1%)
wildlife and natural resources	0 (0%)	0 (0%)	4 (15.4%)	5 (19.2%)	17 (65.4%)	0 (0%)	0 (0%)	0 (0%)	6 (23.1%)	20 (76.9%)
forestry and woodlands	0 (0%)	1 (3.8%)	5 (19.2%)	3 (11.5%)	17 (65.4%)	0 (0%)	0 (0%)	0 (0%)	5 (19.2%)	21 (80.8%)
food and fiber	0 (0%)	1 (3.8%)	7 (26.9%)	7 (26.9%)	11 (42.3%)	0 (0%)	0 (0%)	0 (0%)	4 (15.4%)	22 (84.6%)

Note. A 5-point scale was used (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

Summary

In the pretest, 69.3% of PASA students agreed “a lot” or “absolutely” that agriculture includes horticulture and floriculture. In the posttest, 88.5% of PASA students agreed “a lot” or “absolutely” that agriculture includes horticulture and floriculture.

In the pretest, 76.9% of PASA students agreed “a lot” or “absolutely” that agriculture includes wildlife and natural resources. In the posttest, 100.0% of PASA students agreed “a lot” or “absolutely” that agriculture includes wildlife and natural resources.

In the pretest, 76.9% of PASA students agreed “a lot” or “absolutely” that agriculture includes forestry and woodlands. In the posttest, 100.0% of PASA students agreed “a lot” or “absolutely” that agriculture includes forestry and woodlands.

In the pretest, 69.2% of PASA students agreed “a lot” or “absolutely” that agriculture includes food and fiber. In the posttest, 100.0% of PASA students agreed “a lot” or “absolutely” that agriculture includes food and fiber.

Appendix J: Frequency of Responses: MASI and PASA Students' Views on Qualities of the Agriculture Industry

Table 6.7

Frequency of Responses: MASI Students' Views on Qualities of the Agriculture Industry (N = 13)

"Agriculture"…	Pre-test					Post-test				
	none/ not at all	a little	somewhat	a lot	absolutely	none/ not at all	a little	somewhat	a lot	absolutely
is a highly technological industry	0 (0%)	0 (0%)	4 (30.8%)	4 (30.8%)	5 (38.5%)	0 (0%)	0 (0%)	0 (0%)	1 (7.7%)	12 (92.3%)
is a science-based industry	0 (0%)	0 (0%)	3 (23.1%)	0 (0%)	10 (76.9%)	0 (0%)	0 (0%)	0 (0%)	2 (15.4%)	11 (84.6%)
is economically profitable	0 (0%)	0 (0%)	2 (15.4%)	3 (23.1%)	8 (61.5%)	0 (0%)	0 (0%)	1 (7.7%)	0 (0%)	12 (92.3%)
is environmentally-sustainable	0 (0%)	2 (15.4%)	4 (30.8%)	4 (30.8%)	3 (23.1%)	0 (0%)	1 (7.7%)	1 (7.7%)	1 (7.7%)	10 (76.9%)
is a socially-responsible industry	1 (7.7%)	0 (0%)	4 (30.8%)	6 (46.2%)	2 (15.4%)	0 (0%)	0 (0%)	1 (7.7%)	4 (30.8%)	8 (61.5%)
has a skilled, educated workforce	0 (0%)	1 (7.7%)	5 (38.5%)	3 (23.1%)	4 (30.8%)	0 (0%)	0 (0%)	2 (15.4%)	1 (7.7%)	10 (76.9%)
has a lot of career opportunities	0 (0%)	1 (7.7%)	4 (30.8%)	3 (23.1%)	5 (38.5%)	0 (0%)	0 (0%)	1 (7.7%)	0 (0%)	12 (92.3%)

Note. A 5-point scale was used (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

Summary

In the pretest, 69.3% of MASI students agreed "a lot" or "absolutely" that agriculture is a highly technological industry. In the posttest 100% of MASI students agreed "a lot or "absolutely" that agriculture is a highly technological industry.

In the pretest, 76.9% of MASI students agreed "a lot" or "absolutely" that agriculture is a science-based industry. In the posttest 100% of MASI students agreed "a lot" or "absolutely" that agriculture is a science-based industry.

In the pretest, 84.6% of MASI students agreed “a lot” or “absolutely” that agriculture is economically profitable. In the posttest 92.3% of the MASI students agreed “a lot” or “absolutely” that agriculture is economically profitable.

In the pretest, 53.9% of MASI students agreed “a lot” or “absolutely” that agriculture is environmentally-sustainable. In the posttest, 84.6% of MASI students agreed “a lot” or “absolutely” that agriculture is environmentally-sustainable.

In the pretest, 61.6% of MASI students agreed “a lot” or “absolutely” that agriculture is a socially-responsible industry. In the posttest, 92.3% of MASI students agreed “a lot” or “absolutely” that agriculture is a socially-responsible industry.

In the pretest, 53.9% of MASI students agreed “a lot” or “absolutely” that agriculture has a skilled and educated workforce. In the posttest, 84.6% of MASI students agreed “a lot” or “absolutely” that agriculture has a skilled and educated workforce.

In the pretest, 61.6% of MASI students agreed “a lot” or “absolutely” that agriculture has a lot of career opportunities. In the posttest, 92.3% of MASI students agreed “a lot” or “absolutely” that agriculture has a lot of career opportunities.

Table 6.8

Frequency of Responses: PASA Students' Views on Qualities of the Agriculture Industry (N = 26)

"Agriculture"…	Pre-test					Post-test				
	none/ not at all	a little	somewhat	a lot	absolutely	none/ not at all	a little	somewhat	a lot	absolutely
is a highly technological industry	0 (0%)	1 (4.0)	4 (16.0%)	11 (44.0%)	9 (36.0%)	0 (0%)	0 (0%)	1 (3.8%)	8 (30.8%)	17 (65.4%)
is a science-based industry	1 (3.8%)	1 (3.8%)	3 (11.5%)	12 (46.2%)	9 (34.6%)	0 (0%)	0 (0%)	0 (0%)	9 (34.6%)	17 (65.4%)
is economically profitable	0 (0%)	1 (3.8%)	10 (38.5%)	5 (19.2%)	10 (38.5%)	0 (0%)	0 (0%)	3 (11.5%)	4 (15.4%)	19 (73.1%)
is environmentally-sustainable	0 (0%)	3 (11.5%)	4 (15.4%)	10 (38.5%)	9 (34.6%)	0 (0%)	0 (0%)	1 (3.8%)	6 (23.1%)	19 (73.1%)
is a socially-responsible industry	0 (0%)	0 (0%)	8 (30.8%)	12 (46.2%)	6 (23.1%)	0 (0%)	0 (0%)	1 (3.8%)	8 (30.8%)	17 (65.4%)
has a skilled, educated workforce	0 (0%)	1 (3.8%)	2 (7.7%)	9 (34.6%)	14 (53.8%)	0 (0%)	0 (0%)	2 (7.7%)	7 (26.9%)	17 (65.4%)
has a lot of career opportunities	0 (0%)	1 (3.8%)	2 (7.7%)	8 (30.8%)	15 (57.7%)	0 (0%)	0 (0%)	0 (0%)	4 (15.4%)	22 (84.6%)

Note. A 5-point scale was used (1 = none/not at all, 2 = a little, 3 = somewhat, 4 = a lot, 5 = absolutely).

Summary

In the pretest, 80.0% of PASA students agreed "a lot" or "absolutely" that agriculture is a highly technological industry. In the posttest 96.2% of PASA students agreed "a lot or "absolutely" that agriculture is a highly technological industry.

In the pretest, 80.8% of PASA students agreed "a lot" or "absolutely" that agriculture is a science-based industry. In the posttest 100.0% of PASA students agreed "a lot" or "absolutely" that agriculture is a science-based industry.

In the pretest, 57.7% of PASA students agreed "a lot" or "absolutely" that agriculture is economically profitable. In the posttest 92.3% of the PASA students agreed "a lot" or "absolutely" that agriculture is economically profitable.

In the pretest, 73.1% of PASA students agreed “a lot” or “absolutely” that agriculture is environmentally-sustainable. In the posttest, 96.2% of PASA students agreed “a lot” or “absolutely” that agriculture is environmentally-sustainable.

In the pretest, 69.3% of PASA students agreed “a lot” or “absolutely” that agriculture is a socially-responsible industry. In the posttest, 96.2% of PASA students agreed “a lot” or “absolutely” that agriculture is a socially-responsible industry.

In the pretest, 88.4% of PASA students agreed “a lot” or “absolutely” that agriculture has a skilled and educated workforce. In the posttest, 92.3% of PASA students agreed “a lot” or “absolutely” that agriculture has a skilled and educated workforce.

In the pretest, 88.5% of PASA students agreed “a lot” or “absolutely” that agriculture has a lot of career opportunities. In the posttest, 100.0% of PASA students agreed “a lot” or “absolutely” that agriculture has a lot of career opportunities.