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**Poster Chair:**

Joy Morgan, North Carolina State University

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A total of 210 posters were received, 92 in the Innovative Idea category and 118 in the Research category. There were 40 Innovative Idea posters accepted (43% acceptance rate) and 40 Research posters accepted (34% acceptance rate).

**Reviewers:**

The following individuals generously donated their time to review poster abstracts. Without their commitment, the poster session would not be possible.

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Ahrens, Chelsey	University of Arkansas
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Baker, Marshall	Oklahoma State University
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Foreman, Elizabeth	Iowa State University
Franke-Dvorak, Tanya	University of Kentucky
Frazier, David	Tarleton State University
Gibson, Courtney	Texas Tech University
Gilliam, Kyle	Texas Tech University
Gorter, Erin	Cal Poly State University, San Luis Obispo
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Hasselquist, Laura	South Dakota State University
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Hock, Gaea	Kansas State University
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Jones, Wash	Prairie View A&M University
Lambert, Misty	Iowa State University
Lawver, Rebecca	Utah State University
Lindner, James	Texas A&M University
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Meyers, Courtney	Texas Tech University
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Murphrey, Theresa	Texas A&M University

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Park, Travis	North Carolina State University
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Radhakrishna, Rama	Pennsylvania State University
Ramsey, Jon	Oklahoma State University
Rank, Bryan	Arkansas Tech University
Roberts, Richie	North Carolina A&T State University
Saucier, Ryan	Sam Houston State University
Solomonson, Jay	Iowa State University
Sorensen, Tyson	Utah State University
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Stewart, Josh	Oregon State University
Swafford, Marshall	Eastern New Mexico University
Swan, Benjamin	California Polytechnic State University - San Luis Obispo
Tarpley, Troy	Texas Tech University
Terry, Rob	Oklahoma State University
Thoron, Andrew	Univeristy of Florida
Ulmer, Jonathan	Kansas State University
Wagner, Sharon	Texas A&M University
Warner, Wendy	North Carolina State University
Warnick, Brian	Utah State University
Wells, Trent	Iowa State University
White, P. Troy	South Dakota State University
Williams, Robert	Texas A&M University - Commerce

# 2018 National AAAE Poster Session Accepted Submissions

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### **#TeachAgTalks: Effective stakeholder communication with podcasts**

Hunter Kaufman & Daniel Foster

The Pennsylvania State University

### **“What do you think?”: Demonstrating Inquiry-Based Instruction Using Wisconsin Fast Plants®**

Mason Jones, Dr. Marshall Baker

Oklahoma State University

### **A Faculty Development Project: Creating a Community of Global Thinking Fellows**

Christopher T. Stripling, Nicole L. P. Stedman, Robert Strong, T. Grady Roberts, Amy Harder, Kim Dooley, James R. Lindner, Lisa Lundy

The University of Tennessee, University of Florida, Texas A&M, University of Florida, University of Florida, Texas A&M, Auburn University, University of Florida

### **Ah-Maize-Ing Adventure: A Corn Focused HILO for Preservice Teachers**

Gaea Hock, Brandie Disberger, Jon Ulmer, R. Bud McKendree

Kansas State University, Michigan State University

### **An Innovative Approach to Providing Student Feedback**

Taylor K. Ruth, Brianna N. Shanholtzer, Blake C. Colclasure

University of Florida

### **Auburn University Agriscience Camp WeAGle: An Exploratory Program for the Recruitment, Instruction, and Development of Future Agriscience Teachers**

Chris Clemons, Trent Wells, William Dodd

Auburn University

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Kathryn L. Teixeira and J. Shane Robinson

Oklahoma State University

### **Back to School: The Development of an Educational Event to Encourage Adoption of Irrigation Management Practices**

Sinclair Dobelbower & Dr. Courtney Meyers

Texas Tech University

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Sarah Warren and Dr. Rebekah Epps

The University of Kentucky

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Jay Whaley, Kellie Enns, Michael Martin

Colorado State University

**Creating a Learning Community of First Generation College Student Veterans**

Meghan Stein, Julie Harlin, Summer Odom, Kelly Essler, Barry Boyd, Lori Moore

Texas A&M University

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Marshall A. Baker, Catherine W. Shoulders, Brian E. Myers

Oklahoma State University, University of Arkansas, University of Florida

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Mingla Charoenmuang, Dr. Hui-Hui Wang, Dr. Neil A. Knobloch, Dr. Roger Tormoehlen

Purdue University

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Christopher J. Eck, Kathryn L Teixeira, and Dr. Robert Terry Jr

Oklahoma State University

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Ms. Sarah D. Warren, Dr. Stacy K. Vincent, Dr. Joan M. Mazur, Dale Dobson

The University of Kentucky

**Enabling Agriculture Teacher Candidate Preparation with Technology and Resources**

Victoria P. Whitley, Travis D. Park, Kevin W. Curry, Jr., Wendy J. Warner, Joy E. Morgan

North Carolina State University

**Enhancing Youth Education with School-Community Partnerships: An Intra-Curricular Approach to Secondary Agricultural Marketing**

Brooke N. Griggeory, Stacy K. Vincent, Daniel W. Kahl, Carol D. Hanley

University of Kentucky

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Whitney Figland; Joey Blackburn

Louisiana State University

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Tiffany Joy Ralston-Ashland; Amy Smith

University of Minnesota

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Chris Eck, Jon Ramsey, John Tummons

Oklahoma State University, University of Missouri

**Improving College Access and Readiness for Underrepresented Students Using Pre-College Experiences**

Marshall Swafford

Eastern New Mexico University

**Improving Underrepresented Students' Persistence in STEM Using Undergraduate Research Programs**

Marshall Swafford, Charles Broz, Darron Smith

Eastern New Mexico University

**In a SNAP: Nutrition Education in Food Desert Communities**

Ms. Eliza Green, Mrs. Kendall M. Wright, Dr. Stacy K. Vincent

University of Kentucky

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Trent Wells; Mark S. Hainline; Steven "Boot" Chumbley

Iowa State University; Texas A & M University-Kingsville

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Jay Solomonson; Trent Wells

Iowa State University

**Introducing Interactive Notebooks into Pre-service Teacher Education**

Ashley McAfee, Jessica M. Blythe

West Virginia University

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D'Angelo, T., Thoron, A., & Roberts, G. T.

University of Florida

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Erin K. Gorter

Cal Poly State University, San Luis Obispo

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Andrew Wilson, Kim Alexander, Kellie Seals

Roscoe Collegiate ISD, Texas A&M University, Texas Tech University

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Ryan P Clarke, Dr. Jon Ramsey, Dr. Rob Terry

Oklahoma State University

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Ashley B. Cromer, Tyson J. Sorensen, Kelsey Hall  
Utah State University

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Kristin Kovar, Emily Deaver, Scott Peterson  
Southwest Minnesota State University

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Kellie Claflin, Josh Stewart  
Oregon State University

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Dr. Courtney Meyers, Dr. Gaea Hock, & Dr. Jeremy Falk  
Texas Tech University, Kansas State University, & University of Idaho

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Kasee L. Smith  
University of Idaho

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D'Angelo, T., Callaham, J., Bunch, J.C., Thoron, A., Ferl, R., & Paul, A.  
University of Florida

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Hailey R. Gates, Catherine W. Shoulders  
University of Arkansas

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Tori E. Summey, Dr. Stacy K Vincent  
University of Kentucky

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Blake C. Colclasure & Keith Schiebel  
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Jay Solomonson; Trent Wells  
Iowa State University

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### **Student Perceptions of a First Time Experience with Peer Teaching in a Meat Science Course**

Kaitlyn Goroski, Shannon Arnold, Jane Ann Boles  
Montana State University

### **[STATE] Agricultural Teachers' Perceptions of Urban and Non-Traditional Agriculture Curriculum & SAEs: An Application of the Theory of Planned Behavior**

Ashley Cromer, Kelsey Hall, & Tyson Sorensen  
Utah State University

### **Utah Agriculture Teachers' Perceptions of Teaching Urban and Non-Traditional Agriculture Content**

Kelsey Hall, Tyson Sorensen, & Ashley Cromer  
Utah State University

### **[STATE] Farmers' Involvement in Farm to School Programming: An Application of the Theory of Planned Behavior**

John L. Hawley, Kelsey Hall, Rebecca Lawver, & Roslynn Brain  
Purdue University Extension & Utah State University

### **A Case Study of the Texas Alliance for Water Conservation's Communication Efforts**

Cassie Godwin, Dr. Courtney Meyers, Sinclair Dobelbower, Dr. Erice Irlbeck, & Dr. Rudy Ritz  
Texas Tech University

### **A Comparison of the Safety Education Exposure Levels of Students Participating in the 2003 and the 2013 Houston Livestock Show & Rodeo Agricultural Mechanics Project Show: Are students more safe 10 years later?**

P. Ryan Saucier, Joe E. Muller, Dwayne Pavelock, Doug Ullrich  
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Taylor K. Ruth, Joy N. Rumble, Alexa J. Lamm, Jason D. Ellis  
University of Florida, Kansas State University

### **Agricultural Education and Mathematics Performance among Secondary Students**

Susan Githua, John C. Ricketts  
Tennessee State University

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Kelsey Sands, Scott Smalley, Mike Retallick  
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Taylor G. Polinard, Andrew C. Thoron, Blake C. Colclasure

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**American Indians: The Under-Underrepresented Population in Agriculture**

Marshall Swafford

Eastern New Mexico University

**An Examination of the Agricultural Mechanics Professional Development Needs of the 2016 National FFA Agricultural Technology and Mechanical Systems Career Development Event FFA Advisors**

P. Ryan Saucier, G. Curtis Langley, Emily A. Riggin

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**An Examination of the Questioning Habits of Pre-Service Teachers when Planning for Student Learning**

Callie Moles, Jessica M. Blythe

West Virginia University

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Amy Harder, Lendel K. Narine, Matt Benge, Berthrude Albert

University of Florida

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Peyton N. Beattie, Shelli D. Rampold, Alexa J. Lamm

University of Florida

**Communicating to the Ages: Influence of Age on [State] Homeowners' Informational Processing Behaviors**

Ashley N. Mcleod, Shelli D. Rampold, Alexa J. Lamm

University of Florida

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Joenelle Futrell, Carley Snider, Marshall A. Baker

Oklahoma State University

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Patterson P. Hilaire, Colton R. Teekell, and Donald M. Johnson

University of Arkansas

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Grant Lee Ermis, Dr. Josh Stewart, & Jalisca Thomason

Oregon State University, University of Phoenix

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Theresa Pesl Murphrey, Holli Leggette, Shannon Norris  
Texas A&M University

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ChrisClemons  
Auburn University

**Exploring Motivations of Volunteers to Teach Agriculture in West Africa**

Haley Clement & Dr. Josh Stewart  
Oregon State University

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Sydney A. Keen, & Erin K. Gorter  
Cal Poly State University, San Luis Obispo

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Bishal Thapa, McKenna Ford, Kasee L. Smith  
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**Help! Determining the FFA and SAE Professional Development Needs of [State] Agriculture Teachers by Years of Teaching Experience**

Krista Courter; Whitney Figland; Joey Blackburn; Kristin Stair; Eric Smith  
Louisiana State University

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Amanda D. Ali, Peyton Beattie, Alexa J. Lamm  
University of Florida

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Kaila Thorn, Rama Radhakrishna, Daniel Tobin  
Pennsylvania State University

**Injuries and Other Accidents Sustained In An Agricultural Mechanics Laboratory by Iowa Secondary Agricultural Education Students**

A. Preston Byrd, Ryan G. Anderson, P. Ryan Saucier  
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Catlin M. Pauley, Aaron J. McKim, and R. Bud McKendree  
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Candy R. Grant, Rachel Hendrix, Kirk Swortzel, and Carla B. Jagger

Mississippi State University

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Michael, Fiorentino, Rama Radhakrishna

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Arogeanae Brown & Dr. Hannah Scherer

Virginia Polytechnic Institute and State University

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Victoria C. Willis, Catherine A. DiBenedetto, Brian E. Myers

Clemson University, University of Florida

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Kalynn Baldock, Theresa Pesl Murphrey

Texas A&M University

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Haley Hensley, Catherine W. Shoulders, Don W. Edgar, Donna L. Graham, George W. Wardlow, and Donald Johnson

University of Arkansas

**The Backyard Citrus Grower and their Level of Knowledge: What Extension can do to Communicate about Citrus Greening**

Peyton N. Beattie, Kelsey M. Tully, Jason D. Ellis, Alexa J. Lamm, Joy N. Rumble

University of Florida, Kansas State University

**The Good, the Bad, and the Ugly: Agricultural Educator Perceptions of Job Attributes**

Brooke Howell, Anna Pratt, Bishal Thapa, Kasee L. Smith

University of Idaho

**University Faculty Perspective on Student Entitlement**

Don Edgar, Donna Graham, Leslie Edgar

University of Arkansas

**Where's the Expert? Understanding the Expertise Gap in Preservice Agricultural Educators**

Lauren Lewis Cline & Dr. Marshall A. Baker  
Oklahoma State University

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## **#TeachAgTalks: Effective stakeholder communication with podcasts**

### **Need for Innovation**

“NO ONE READS THE EMAILS.” (Personal communication agricultural teacher education faculty meeting, 2017). Yet, it is imperative for significant and sustained teacher learning to cultivate effective community of practices (Cho, 2016; Clay & Paulsen, 2016; Hildreth & Kimble, 2004), which is one of the primary responsibilities of <State> University. As we move from the internet of things, to the internet of practice (Ludwig, Tolmie, & Pipek, 2017), connecting in a purposeful way for communication is critical. The vast majority of Americans – 95% - own a cellphone with 77% owning Smartphones (Shearer, 2017). In 2017, the total number of business and consumer emails sent and received per day reached over 269 billion. With a primary stakeholder group of secondary agriculture teachers suffering from a deluge of emails, a more effective communication medium was desired. A podcast is a digital audio file made available for downloading to a computer or mobile device, which can be subscribed to be received automatically. At least 112 million Americans have listened to podcasts and according to the Pew Internet Research Center (2018), there has been substantial increase since 2006 with four- in-ten Americans ages 12 or older have listened to a podcast in 2017. Podcasts grant listeners the ability to receive information in an efficient format while maintaining the freedom of mobility and multitasking.

An undergraduate student worker (a Wildlife and Fisheries Science Management major) investigated, designed, and published #TeachAgTalks as a podcast with weekly episodes of less than 10 minutes to highlight a state-wide weekly email listserv blast. Current students in the major and key stakeholders at significant program events were interviewed and included in the podcast. Utilizing less than \$100 in equipment and free online software, the student produced episodes for subscription on common podcast catchers, such as iTunes and SoundCloud. Challenges that were overcome in the process included gaining familiarity with recording and post-production processes, selecting key information to include while maintaining a 10-minute time boundary, and identifying pathways for publication and distribution. Time constraints and content had to be evaluated in order to meet production demands for a weekly podcast. Best practices and approaches will be reviewed, adjusted, and implemented during future investigations.

### **How It Works**

#TeachAgTalks is a podcast consisting of weekly episodes, no longer than 10 minutes in length, created to highlight and distribute key information from a state-wide weekly email blast. The primary objectives of the #TeachAgTalks podcast are:

1. To effectively distribute the most pertinent information accompanying a weekly statewide email blast to secondary agricultural educators and key agricultural education stakeholders.
2. To serve as an accessible platform to hear unique content from secondary agricultural educators and key agricultural education stakeholders.
3. To explore the implications and effectiveness of a new form of media distribution in the context of school-based agricultural education.

In order for weekly publications to be organized, achievable, and effective, the following 7-day timeline is utilized:

- Days 1 - 3: Key events and pertinent information to include in the episode are identified as far as 1 month ahead of publication date.
  - Scheduling interviews\* with stakeholders and guests takes place during this time.
  - Pertinent information is compiled and ordered in a document for reference during recording, and creation of show notes to accompany the audio recording.
- Days 4 - 5: Recording takes place, utilizing Audacity, a free open-source digital audio editor and recording software. o Post-production takes place simultaneously with recording in order to maximize efficiency, identify, and rectify potential production issues.
- Day 6: Export of audio as an accessible .mp3 file, testing and review, and creation of show notes to accompany the audio recording take place. o Show notes contain more description, relevant links, social media identification, and other pertinent information regarding the weekly podcast topics.
- Day 7: Podcast publication takes place on SoundCloud, a free online audio distribution platform. Upon publication, the show notes and title are added to each episode. *\* Guests can be interviewed remotely, and are currently done so via a free program called Zencaster. All that is required for a guest to “join” a conversation is a link to be sent to them. Separate tracks for each person can be downloaded in .wav or .mp3 format, which are both easily added into the Audacity program.*

### **Implications**

It is critical to take advantage of the increasing accessibility and use of technology. According to the Infinite Dial Study (2018), the United States’ longest running media study, podcasting potential continues to grow, with 53% of Americans listening to online radio at least once a week, and a total online audience 540 million listeners. An audio podcast affords the potential for quick and convenient distribution of information in the agricultural education community in the same online radio format that continues to grow. Podcasting as an advantage that online radio, however, lacks; the ability to subscribe to a podcast allows automatic arrival of media to listeners as it is published. Through podcasting, there is potential to provide audio interviews with stakeholders and professionals as well as create other unique content is either scarce or otherwise unavailable through email, newsletters, social media, and other outlets.

### **Future Plans**

#TeachAgTalks will continue with weekly episodes delivering critical news to secondary agricultural teachers and stakeholders in the field of Pennsylvania agricultural education. Further exploration of various outlets to provide the podcast through will be explored, as well as various styles of content creation and organization, in order to provide the greatest convenience and benefit to target audiences. **Cost and Resources** The only cost of the creation of a weekly podcast was the purchase of a studio quality USB microphone for recording, which was obtained for under \$100. The audio editing software utilized, Audacity, is a free, open-source digital audio editor and recording software. In order to remotely interview guests, an online program called Zencaster was used, with only the requirement of creating a free account. Many resources for royalty-free “podsafe” music exist in order to obtain background tracks and transitions, as long as proper citation of such files is used.

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**“What do you think?”: Demonstrating Inquiry-Based Instruction Using Wisconsin Fast Plants®**

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## **“What do you think?”: Demonstrating Inquiry-Based Instruction Using Wisconsin Fast Plants®**

### **Introduction/Need for Innovation or Idea**

Defined as “the scientific process of active exploration by which we use critical, logical, and creative thinking skills to raise and engage in questions of personal interests” (Llewellyn, 2002, p. 26), inquiry as a method of instruction has been emphasized by science education and agricultural education researchers as an effective means for raising student achievement (Parr & Edwards, 2004; Thoron & Myers, 2011). The 2015 National Assessment of Educational Progress (NAEP) showed that 88% of 12<sup>th</sup>-grade students scored below the proficient level on the science assessment, revealing no significant change from 2009 scores (USDE, 2015). Thus, Oklahoma State University teacher-education faculty recognized the need to introduce pre-service teachers to effective inquiry-based instruction (IBI) strategies in an agriscience context.

There is a seemingly endless amount of activities that can be used within IBI, many of which commonly require increased time for preparation and understanding on behalf of the teacher (Blythe, DiBenedetto, and Myers, 2015; Wolpert-Gawron, 2016). The Fast Plants® life cycle kit and manual can alleviate instructors’ time spent planning and gathering materials and provide tools for teaching a variety of biology lessons using IBI. According to the Fast Plants Manual (2011), “By looking at the life cycle of Fast Plants from the perspective of the stages of growth and development from seed germination to seed production, students can understand the nature of the dependency among organisms and their environment” (p.1).

### **How it Works/Methodology/Program Phases/Steps**

Oklahoma State University’s Methods of Teaching Agricultural Education course introduces pre-service teachers to a variety of methods and strategies for instruction, including inquiry-based instruction. A goal of the course is to demonstrate a useful example of each method to the pre-service teachers. The inquiry-based learning cycle typically must take place over an extended period of time throughout the semester. Under ideal conditions, Fast Plants can complete their life cycle and produce seeds in as little as 40 days (Teaching with Fast Plants, 2011). The Fast Plants life cycle kit can be used to facilitate 12 different inquiry-based activities within the five chapters of the Fast Plants manual on each major stage of plant growth consisting of (a) germination, (b) growth and development, (c) flowering, (d) pollination, and (e) fertilization to seed. Each student in the methods course was able to grow plants in four different containers to provide unique treatments to test plant growth.

During each activity in class, students were given the opportunity to practice observation, experimentation, and data collection and analysis with their plant subjects. With the exception of some germination activities in the first week, the remaining activities could be carried out with the same set of plants. The plants were placed within an indoor, GROWLAB compact garden that included a grow-light, and moisture grid to provide water to plants on the weekends. At the conclusion of the plants’ life cycle, students were given the opportunity to share their findings and experiences from the inquiry activities.

### Results to Date/Implications

In the fall semester of 2016, Oklahoma State University began utilizing the Fast Plants life cycle kit in the Methods of Teaching Agricultural Education laboratory section. Equipment adopted for use by the lab was one Fast Plants life cycle kit, GROWLAB II compact garden, and *Teaching with Fast Plants Manual*. To date, a total of 31 pre-service teachers in two different Teaching Methods courses have used Fast Plants curriculum to conduct nine of the 12 life cycle activities. These activities have given students experience in growing their own plant subjects through an entire life cycle, many of which reported to have little or no experience in plant science based lessons. Pre-service teachers in the course were also assigned to teach using an inquiry-based activity, and many reported in their reflections to be more comfortable with the method as a result of their participation in the Fast Plants activities. At least three students from the Fall 2016 course subsequently utilized the Fast Plants curriculum at their student teaching centers in the spring semester.

### Future Plans/Advice to Others

Faculty involved with the teaching methods course plan to build upon the success of Wisconsin Fast Plants as a model for IBI. Oklahoma State University recommends the use of the Fast Plants curriculum and materials to other universities as an affordable, time-saving way to foster inquiry-based instruction in a plant science context at any time of year. Course instructors should familiarize themselves with the manual activities and lab instructions prior to teaching pre-service teachers. Outdoor planting or greenhouse space is not necessary with the purchase of a grow light or indoor garden laboratory. Course instructors may choose to adapt their lessons based on number of students and schedule for course. Each activity and chapter of the Fast Plants curriculum may stand on its own, so instructors are encouraged to evaluate each activity to determine what is appropriate for their course. Emphasis should be made to pre-service teachers to consider how they would apply the Fast Plants curriculum in a school-based agricultural education setting.

### Costs/Resources Needed

To successfully facilitate the Fast Plants activities, a Wisconsin Fast Plants Life Cycles Kit, Teaching Fast Plants Manual, and Indoor GROWLAB or Plant Light House are recommended. A total budget of just over \$400 is necessary to purchase all the materials for the Fast Plants activities, and an additional \$62.50 is needed to refill the Fast Plants kit each semester. All of the materials used in Oklahoma State University's methods course were purchased through the NASCO catalog. An approximate cost for individual materials is summarized in Table 1.

#### *Approximate Cost for Fast Plants Curriculum from NASCO catalog*

Item	Price
Teaching with Fast Plants Manual	\$55.95
Plant Light House (optional)	\$147.95
GROWLAB II Compact Garden (optional)	\$250.25
Wisconsin Fast Plants –Exploration of Plant Life Cycles Kit	\$99.95
Refill Kit for Wisconsin Fast Plants Kit	\$62.50

*Note. Prices are from NASCO online catalog*

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**A Faculty Development Project: Creating a Community of Global Thinking Fellows**

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## **A Faculty Development Project: Creating a Community of Global Thinking Fellows**

### **Need for Innovation**

Tomorrow's graduates in agriculture will face challenges on a global scale. Preparing them to solve these problems must be a primary goal for colleges of agriculture (National Research Council, 2009). To do so, teaching faculty must be able to teach in a way that encourages and fosters critical thinking. In 2004, higher education associations and leaders of institutional accrediting bodies identified critical thinking as one of the six major intellectual and practical skills which students should possess after obtaining their undergraduate degree (AAC&U, 2007). However, Lauer (2005) indicated faculty expressed difficulty incorporating critical thinking skills into their courses. Moreover, Stedman and Adams (2012) found faculty are not generally knowledgeable about critical thinking. When asked to answer questions related to basic concepts and understanding of critical thinking, faculty often answered these questions incorrectly indicating a lack of knowledge about the concepts of critical thinking (Stedman & Adams, 2012). A gap exists in how faculty are able to teach for critical thinking when they are not knowledgeable about those basic concepts. This project was developed to expand the knowledge and abilities of faculty to implement explicit critical thinking instructional strategies, as well as assist them with challenging their students with complex global problems.

### **Program Phases**

This project provided instructional support for faculty through development and implementation of a Global Thinking Academy (GTA), a capstone international experience, and aiding faculty in the creation and use of scenario-based reusable learning objects (RLOs).

#### **Phase 1 – Global Thinking Academy Planning and Development**

During phase one, the project team developed modules on the following topic areas: (a) critical thinking, (b) teaching for critical thinking, (c) instructional design models, (d) scenario development, (e) digital media to enhance instruction, (f) teaching contentious subjects, (g) global food security and hunger, (h) teaching globally-relevant topics, and (i) using scenario-based RLOs to elicit critical thinking. The project team also worked with an international partner to plan the capstone international field experience and conducted a scouting trip to plan contextually appropriate experiences and make logistical arrangements. Furthermore, GTA Fellows or participants were recruited from the southern region of AAAS. A total of 18 GTA Fellows were selected through a review process conducted by the project team.

#### **Phase 2 – Global Thinking Academy and International Experience**

The GTA began with a face-to-face session and was used to establish expectations for the GTA Fellows and discuss the learning objectives of the academy. After the opening session, faculty returned home and began a 10-week program consisting of asynchronous modules. Each module was in the form of an interactive narrated presentation with supplemental material and assessments. Delivery of the modules was through the learning management system, Canvas. The culminating experience for the GTA Academy was a six-day international field experience to Belize to gather the contextual data (e.g., video, interviews) for developing the scenario-based RLOs. Project team members traveled with the participants during their international field

experience to facilitate their on-site learning and to provide support in capturing the global context for the scenario-based RLOs.

### **Phase 3 –Scenario-based RLO Development and Implementation**

Operationally, this project used the comprehensive and detailed process provided by Wilson and Ralston (2006) for developing and using scenarios. Scenarios are similar to case studies, but much more complex and include many more decision points. This provides a much more fertile foundation for developing and using critical thinking skills. GTA Fellows worked with the project team to develop the scenario-based RLOs. Once developed, the scenario-based RLOs were peer reviewed and posted on the Global Education Lab website for the GTA Fellows to use in their courses. Fellows are required to use three RLOs in a course they are teaching and are currently in the RLO implementation phase of this project.

### **Results to Date**

GTA Fellows mean score on the assessments for the academy modules was 84% with a minimum of 78% and a maximum of 87%. Fellows who scored below the predetermined proficient rate of 80% on individual modules were asked to review the module(s) again and retake the assessment until 80% was obtained on each module. Furthermore, initial analysis of qualitative data suggested GTA Fellows believed the academy modules were beneficial and challenging. Fellows noted the modules required them to think in a higher-order manner. The GTA Fellows also indicated they enjoyed the international experience and have gained a greater understanding of critical thinking instructional strategies as a result of the GTA. However, a few GTA Fellows felt they did not have adequate opportunities to capture their disciplinary area during the international experience. Fellows are currently being evaluated on their use of explicit critical thinking instructional strategies through scenario-based RLOs and the resulting impact of those strategies on the critical thinking abilities of their students.

### **Future plans and Advice to Others**

Once all data have been analyzed, results will be shared on the effectiveness of the GTA. We also plan to disseminate the scenario-based RLOs and develop a best practices guide for integrating international field experiences into critical thinking curriculum.

In regard to advice for others, the project had four GTA Fellows dropout and not participate in the international field experience due to unexpected health and family issues. As a result, we recommend future projects consider designating a small number of alternates to replace individuals who withdraw for health or family issues or are dismissed for failure to complete project requirements. We also recommend health warnings specific to the destination of international experience be included in recruitment materials.

### **Costs/Resources Needed**

The grant obtained from USDA-NIFA was \$642,779 for this project. Approximately, 32% of the direct expenses were for personnel, and 14% was domestic and foreign travel for faculty. Personnel and travel were the main expense of this project.

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*Ah-Maize-Ing Adventure: A Corn Focused HILO for Preservice Teachers*

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## *Ah-Maize-Ing Adventure: A Corn Focused HILO for Preservice Teachers*

### **Introduction/Need for Innovation**

High impact learning opportunities (HILO) can be “defined as activities that purposefully and systematically encourage students to create new knowledge, make connections across curriculum, explore opinions/views/perspectives beyond their own, and engage in critical thinking” (Murphrey, Odom, & Sledd, 2016, p. 162). It is through these high impact experiences that students are pushed to make connections between what they have learned in traditional classrooms to real-world examples (Kuh, 1995; Kuh, 2008).

Agricultural education student interns will soon be entering agricultural education classrooms across the state and nation. As a high school agriculture teacher, they will educate their own students about the agricultural industry. Participating in a HILO will strengthen and diversify the knowledge and experiences of teachers regardless of their agricultural background. Additionally, this experience will model the importance of planning and conducting high quality educational trips (i.e. field trips) for their future students.

### **How it Works/Methods/Steps**

In the past, student interns came to campus for a mid-semester meeting. We wanted to enhance that experience by taking a trip focusing on agricultural education and the agriculture industry. This specific project allowed for the application of corn-focused topics and issues outside the traditional classroom. Student interns explored the corn industry in Kansas during a two-day high impact learning opportunity (HILO). In order to make the most of our time together, we limited the geographic area to the northwest portion of the state. This allowed students to experience a part of the state that many had never traveled to or spent any time in.

We worked in tandem with the Kansas Corn Commission (KCC) to plan this experience. The KCC is committed and progressive in their education outreach activities. One faculty member worked with a contact person at the Kansas Corn Commission to set up the tours and the schedule. Hotel rooms and motor pool vehicles were reserved and meals planned. KCC and Kansas State University branded items (cup and notebook) were ordered to present to the tour hosts and presenters.

Prior to the trip students were assigned to a group to write questions for a specific tour stop. The questions were sent to the presenters ahead of time. They were also provided to the students at each stop to ask them if the presenter did not address them on their own. Students wrote a thank you card for the host prior to the stop and presented a gift and card at the end of each visit. At the end of the first day, students were led in a group reflection to assess their learning. They also evaluated the components of planning an experience for their own students. Open dialog was used to discuss elements of planning a field trip or an extended FFA event such as National FFA Convention.

### **Results to Date/Implications**

The Ah-Maize-Ing Adventure high impact learning opportunity occurred in the spring 2017 semester. Nineteen student teachers and four faculty members participated in the two days of tours, reflections and group bonding.

The tour started with a beginning teacher and ended with an experienced teacher. The corn related tour stops included a farm operation, ethanol plant, and feedlot. We also stopped at a precision agriculture company which was started by community entrepreneurs. This stop included a discussion of the importance of community members for a successful agricultural education program. The stops were planned on purpose to show the progression of corn through the production chain (farm, ethanol plant, feedlot).

Students were asked to reflect on the experience and respond to reflection questions at the end of each day. Students enjoyed the experience and were able to identify ways they could utilize the experience in their future classroom. One student states they learned they should *“utilize the resources around you: seed reps, chemical dealers, grain elevators – hands on exposure is valuable.”* Another student commented, *“[I can] call Kansas Corn for help with tour setup, resources, and for contacts near [my] location.”* Students commented that the experience helped them learn to *“Go out and explore, see other ag industry”* and to *“show students the diversity of ag, hands-on with tours.”* One student commented on the need to *“pre-plan questions [and] prepare thank yous.”*

Students recommended changes for the future HILOs: *“a little bit of down time...[to] ask individual questions”* and *“having a time schedule with structured plan, but then have some wiggle room with time in case something would come up.”* Students also recommended, *“[teach a related lesson] to give a baseline of knowledge and to also help build up the excitement/anticipation.”*

### **Future Plans/Advice to Others**

The HILO was successful because of the partnership between university agricultural education faculty and the commodity group. Assigning students to research and write questions for a specific tour stop insured that questions would be thoughtful and available if needed. The experience helped students visualize how they could plan HILOs for their own students. We plan to do this again every spring as long as the funding is available or we will look for additional partnerships with other commodity groups or the agricultural teacher organization.

There were several challenges with the experience. Students had to drive themselves to the starting point and for some it was over four hours from their student teaching location. They also missed two days of school to participate. One student was not able to join and we did not have an effective way to disseminate missed content. We recommend budgeting more time for reflection and debriefing at the end of each day to “unpack” their experiences and observations. We did allow for one stop at a state landmark, which allowed students to have a break from the information rich stops.

### **Costs/Resources Needed**

We received a grant from the Kansas Corn Commission for the HILO. We spent \$2,316 on hotel rooms (12 rooms x 2 nights), \$717 on two meals, \$1,075 for three motor pool vehicles and fuel, \$808 on corn promotional items, and \$295 on host gifts. The total cost was \$5,211 for the two-day experience. Students were responsible for getting themselves to and from the start/finish location, but the grant covered all remaining expenses.

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**An Innovative Approach to Providing Student Feedback**

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## **An Innovative Approach to Providing Student Feedback**

### **Introduction**

Psychological and educational research demonstrate that feedback facilitates student learning (Darling-Hammond & Bransford, 2005). Characteristics of feedback linked to positive outcomes demonstrate that effective feedback focuses on features of the task, emphasizes learning goals, and adheres to well-defined assessment criteria (Kluger & DeNisi, 1996). Furthermore, effective feedback identifies students' strengths and weaknesses (Darling-Hammond & Bransford, 2005) and provides specific guidance for improvement (Eggen & Kauchak, 2012). The creation of a positive classroom environment in which constructive criticism is the norm can be a difficult endeavor. Through one-on-one and personal interactions with students, teachers can build rapport and social presence that helps establish a supportive learning environment (Rourke, Anderson, Garrison, & Archer, 2001), and adheres to course rigor and high student expectations. The limited face-to-face and personal interactions commonly seen in online learning and blended classrooms (Thomas, West, & Borup, 2017), as well as large enrollment courses (Solis & Turner, 2016), create challenges for instructors to establish high social presence, build student rapport, and offer feedback in a detailed and personalized manner. Video feedback has emerged as one strategy to assist in the personalization of feedback (Borup, West, Thomas, & Graham, 2014). However, some instructors have identified that creating video feedback can be time consuming and nerve-wracking (Gould & Day, 2013). In addition, limited literature on video feedback in post-secondary agricultural learning environments exists. In this innovative idea submission, we describe the free online platform, © Screencast-O-Matic (n.d.), as an efficient, easy to use, and free online platform to provide students detailed and personalized video feedback.

### **How it Works**

To use Screencast-O-Matic, educators simply need to visit the website to create a free user account. Once the account has been created, users are prompted to download the screen recorder before viewing a user-friendly tutorial. When using Screencast-O-Matic, users will have the ability to not only record themselves giving feedback, but also to capture what is on their screen, like a rubric, a video, a written assignment, etc. The program allows users to record their screen, record from their webcam, or record both simultaneously. While recording the feedback, the user can pause their recording and start the recording again at any time. The video can be saved as a file on the computer, a YouTube video, or as an upload to the Screencast-O-Matic account. The audio feedback can be shared with students through email, YouTube, e-learning platforms, etc., which allows students to receive personalized feedback from the educator no matter where they are located. Educators can use this program as an innovative approach to providing student feedback by verbally explaining areas of improvement for the assignment and points assigned on the rubric. This allows learners to receive feedback in multiple modes to address different learning styles. The video feedback also allows learners to hear the tone of their instructor and facilitates the personal presence and rapport between educator and learner.

### **Implications & Results to Date**

Instructors at the University of Florida provided feedback using the Screencast-O-Matic program to students in one online writing course and one mass enrollment speech course with individual laboratory sections. Instructors shared audio feedback for students' assignments created in Screencast-O-Matic using the university's e-learning platform. Students were able to view the

feedback and use it to reflect on their assignment. Instructors and students identified a number of beneficial aspects of the Screencast-O-Matic video feedback. The instructors believed providing students video feedback saved them time because they were able to verbally express their feedback opposed to writing it. The instructor of the online course was able to provide students with more in-depth feedback from a distance, which was a benefit for both the instructor and the student. Feedback using the Screencast-O-Matic program built rapport between the students and instructors by providing a social presence in an online format. The rapport was appreciated by both the instructor and the student. Students reported they enjoyed the personal one-on-one feedback, which was longer and more detailed than the feedback they had received in past courses. Students were provided with more in-depth examples of areas where they could improve and what they did well for the assignment compared to feedback on past assignments. Despite seeing multiple benefits to using Screencast-O-Matic, the instructors identified a few potential challenges to using the program. Instructors must have the proper recording atmosphere and technology to execute this feedback style. This could potentially be a problem for instructors who are not provided with recording technology or do not have a quiet place to record the feedback for students. Students also have to make the time to watch the video in order to receive their feedback. Additionally, not all student learning modalities may benefit from the Screencast-O-Matic feedback style.

#### **Future Plans & Advice to Others**

Screencast-O-Matic is a free and easy-to-use resource available to educators. While the program has currently been used to provide feedback for speeches in a mass enrollment class and writing for an online class, these are only a few of the possible uses of this program. Screencast-O-Matic can provide opportunities to increase instructors' social presence in online and in-person settings for agricultural educators, agricultural communicators, and Extension educators alike. Teacher educators can provide real-time feedback on videos of student teachers in the classroom when they are hundreds of miles away. Agricultural communicators can deliver in-depth, constructive criticism of students' design and videography, which can be difficult to accomplish through writing. Additionally, Extension educators can use the program in adult distance education programs. Regardless of the purpose, Screencast-O-Matic is a helpful tool to facilitate learning in any digital learning environment. However, educators should provide a short, written introduction to the learners that introduces them to the purpose of the video feedback and describes what they should be doing while watching (e.g. taking notes). As educators use the program, they should also be mindful to keep feedback to less than 10 minutes to avoid learner fatigue. Organizing thoughts and running through feedback prior to recording the videos can help to create succinct and effective video feedback the first few times. Finally, sufficient time should be set aside to allow the educator to share and upload the videos.

#### **Costs & Resources**

Resources needed to provide video feedback via Screencast-O-Matic are a computer, internet access, a webcam, and Javascript. Screencast-O-Matic has free and pro program options. The free program allows users to record for 15 minutes, save the video files, and post videos online. However, the free program does keep a watermark on all videos. For \$18/year or \$36/3 year, users can create longer videos, draw on videos, edit videos, and create captions with voice-to-text capabilities without a watermark.

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Auburn University Agriscience Camp WeAGle: An Exploratory Program for the Recruitment,  
Instruction, and Development of Future Agriscience Teachers

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## **Auburn University Agriscience Camp WeAGLe: An Exploratory Program for the Recruitment, Instruction, and Development of Future Agriscience Teachers**

### **Introduction and Need**

Auburn University has developed and initiated a summer immersion opportunity for the enhancement of personal development, leadership skill building, and recreational activities (Connors, Falk, & Epps, 2010) known as the Auburn University Agriscience Immersion Experience. This experience enables twelve schools to identify five potential students each to participate in a two-day teaching experience for the promotion of agriculture education. Four opportunities are held each summer with three schools participating in each program. Innovation in the recruitment of potential teacher candidates is paramount for the continued livelihood of our profession. In 2016, state programs identified 721 (Smith, Lawver, & Foster, 2016) open agriculture education positions at the secondary level, while post-secondary programs strive to educate enough candidates to fill these positions. Post-secondary Agriculture Education programs have historically experienced enrollment, funding, and certification difficulties for future teachers (Smith et al. 2016). This innovative program addresses Research Priority 5, *“How can quality agricultural leadership, education, and communication educational programs be delivered in a cost-effective manner?”* (Thoron, Myers, & Barrick, 2016, p. 43).

### **How it Works**

*Day one* Camp WeAGLe activities include immersion within the equine sciences, beef evaluation and management, poultry science and production, greenhouse management, production, and business operations, meat processing and evaluation, and veterinary science applications. *Day two* participants engage with Auburn University Agriscience Faculty to practice methods of instruction, classroom management, and the development of their teaching demonstrations utilizing the experience from the day one activities. Collaborative learning and experience is gained through student’s interaction with professors and faculty at each of the facilities. Development and implementation of this program relies on support from Auburn University Agriscience Program, College of Agricultural Science, Auburn University Veterinary College, and the College of Education. Alabama high school agriscience programs are eligible to participate in the two-day immersion programs. Each high school program completes an application and faculty and staff at Auburn University review the applications. Once accepted, the secondary program provides information regarding their student’s interest in becoming an agriscience teacher. This interest approach provides a means for tailoring a school’s experience to meet the needs and interest of the prospective teaching candidates. A registration of \$50.00 per participant (\$250.00/school) is collected in advance providing funding for materials, lunch, subsidy for overnight accommodations, and t-shirt. The innovation of this activity, beyond the immersion experience, provides high school students the opportunity for reflection and conversation with Auburn faculty. This discussion time provides insight from students interested in agriscience education for faculty to tailor future programs and programmatic recruitment efforts.

### **Results to Date**

One pilot immersion program was completed during the summer of 2017 at Auburn

University. One school and twelve participants experienced the immersion program and the results were spectacular. Student participants expressed their excitement when asked about CDE experiences, teaching methods, and learning more in depth the requirements for being a successful agriculture teacher. Participants also were supportive of the overnight experience and the application of learned experiences in the agriculture mechanics laboratory. Teacher participants indicated their support and recommendation for broadening the program during the summer of 2018 and supplied their voice of support during statewide meetings. Auburn University faculty in the College of Agricultural Science supported the opportunity to share the benefits and successes of the college while demonstrating their individual programs. Faculty at the Auburn University College of Veterinary sciences have offered in-depth activities for future immersion experiences including; live surgeries, facilities management, and veterinary technologist experiences. The long-term outcomes of this opportunity will demonstrate if immersion opportunities for secondary students interested in agriscience education increase the enrollment, completion, and matriculation within our field.

### **Future Plans**

The future of this innovative program involves expanding the number of secondary schools to twelve increasing participation through the addition of four separate immersion opportunities at Auburn University. During the summer of 2018, 70 students will have the opportunity to engage in the application of teaching and learning while gaining additional educational opportunities. The future for this program includes incorporating advisor professional development to run concurrently with the student immersion activities, increasing the number of undergraduate agriscience majors involved in direct instruction, and new content areas for student activities. The inclusion of agriscience learning kits, curriculum development, training CDE teams, and public relations will be added to the experience as well as the opportunity for a three-day experience. Plans to maintain growth will be accomplished by limiting participation to junior and senior students and no more than one attendance per lifetime. This conclusion is supported by Brown, Terry, and Kelsey (2014) who stating limiting attendance of participants to alleviate facility stress and accommodate more future teachers who to attend and the potential for repetitive activities and experiences. Promotion of this program will occur through the 2017-2018 school year and consist of a one-hour workshop about the immersion experience during the 2017 Auburn Greenhand Conference.

### **Costs**

Operating costs are offset by student registration being collected prior to each immersion experience. Four schools are involved in each immersion experience and thus generate an offset of \$1000.00/experience. Each participant is required to submit a \$50.00 registration fee for subsidized accommodation, materials for activities, transportation, and meals. Costs vary between locations so approximate values are included for one immersion experience: Lodging for five students, \$450.00, meals, \$500.00, materials, \$350.00, transportation, \$100.00. Total net cost per immersion activity is \$1400.00, with \$1000.00 collected in registration fees, for a balance of \$400.00. Additionally, cost offsets from the College of Agricultural Sciences of (\$3000.00) and industry partnerships (\$5000.00) reduce the financial burden.

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**Award Points Program: Utilization of Google Sheets™ Pivot Tables for Student Awards  
Points and Required FFA Activity Credits**

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## **Award Points Program: Utilization of Google Sheets™ Pivot Tables for Student Awards Points and Required FFA Activity Credits**

### **Introduction**

According to the National FFA Organization (2017), “FFA members who take advantage of the many leadership opportunities in FFA become top leaders in the organization” (p. 48). The FFA is a vital component of the comprehensive model for school-based agricultural education (SBAE) programs, which exists to provide experiences in personal, academic, and career areas to build future leaders (National FFA Organization, 2017).

Within the educational framework of the SBAE program at Anderson Union High School, students were required to attend four FFA Activities each semester. The American Association for Agricultural Education (AAAE) outlines standards for SBAE teacher preparation programs as learning goals for graduates of teacher education programs. The standards indicate all teacher education graduates learn to manage a total program in CTE, and develop skills to communicate effectively with parents and students (AAAE Teacher Education Standards Committee, 2017). Therefore, being able to track student attendance at various FFA events and make that information readily available to them, their parents, and their teachers was imperative. To that end, a Points Award Program was created.

Prior to the implementation of the Points Award Program, points were tracked using an Excel spreadsheet saved to a shared computer drive. Each student’s name was listed in a separate row, and every event he or she participated was listed in a separate column. With 150 students and more than 75 events each year, the original spreadsheet became overwhelming and cumbersome. As such, individuals who entered participation points made errors, which affected their overall points and FFA grade. The points system also required two separate categories within the totaled points system and needed to be able to: (a) count the number of activities a student attended, (b) identify which quarter the events were attended, (c) calculate the total activity points for the end of the year awards trip, and (d) provide a list of the top 25 students for the awards trip. Therefore, a ledger-based program was developed.

The initial ledger-based system allowed points to be entered systematically based on the student’s name, and entries could be double-checked by the advisor more efficiently. However, the point tallying was conducted by hand with a group-sort and group-count method, and problems with the program persisted. The problems addressed after the introduction of the initial system included (a) only one person being able to edit at any given time, (b) the process to calculate points included confusing steps, (c) students’ names were being entered incorrectly which split their points between the different versions of the name, and (d) to share results with students, reports had to be printed. This established the need for a more streamlined system.

The Award Points Program was designed using Google Sheets™ and improved the original ledger system by addressing the issue of multiple authors. By utilizing Google Sheets™, points can be entered by any person allowed editing access. Also, because it is web based, points can be added using any electronic device at any FFA activity, thus, updating points as they are achieved. To improve the calculation of points, pivot tables were introduced, which work automatically to tally the points rather than having to manually group-sort and then group-count. Students’ names were uploaded into a master list and a data validation code was added to the master ledger. The master ledger then used a drop-down menu with the students’ names feeding from the master list. Finally, with Google Sheets™ being web based, the pivot tables were embedded in the chapter website, giving parents and students 24-7 access to points.



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**Back to School: The Development of a Water College to Encourage Adoption  
of Irrigation Management Practices**

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# **Back to School: The Development of a Water College to Encourage Adoption of Irrigation Management Practices**

## **Introduction/Need for Innovation**

An estimated \$20 billion worth of the world's food and fiber is produced in the eight states that span from Texas to South Dakota above the Ogallala aquifer (Little, 2009). With approximately 36,080 square miles of the Ogallala aquifer located beneath West Texas, the region's agricultural operations receive much of its water source from the Ogallala aquifer (Guru & Horne, 2000). The necessary and intense use of this water supply combined with the slow recharge rate (Marsh, Peterson, & Williams, 2003) has placed a great emphasis on conserving the water in the Ogallala aquifer.

Established in 2006, the Texas Alliance for Water Conservation (TAWC), is a non-profit organization with the purpose of educating West Texas farmers and ranchers about the most efficient water management techniques and ultimately initiate a behavioral change in how these producers use water for agricultural purposes. To accomplish its purpose, the TAWC uses a variety of communication and educational outlets to inform their target audience about water conservation. These activities include Field Days, Field Walks, board meetings, agricultural conferences, radio programming, and educational tools and information (TAWC, 2016). However, the most popular and largest TAWC event of the year is the Water College. This event is unique in the fact that it is led by producers teaching other producers, just as the TAWC is a producer-led organization. It is innovative in the way these producers are able to tie together aspects of technology, economics, and agriculture in order to educate other producers on best management practices.

The design for this event is drawn from Mezirow's Transformative Learning Theory, which is based on the principle that personal experience is an integral part of the learning process (Mezirow, 1991). This theory suggests that a learner's integration of the experience creates meaning, which leads to change in behavior, mindset, and beliefs (Mezirow, 1991). The Water College is geared toward applying the third dimension of the Transformative Learning Theory, which is to create a change in behavior through epistemic codes and critical reflection (Mezirow, 1991). The goal of the TAWC Water College is to provide a positive learning experience that is conducive to facilitating a change in farmer's and rancher's behavior toward water conservation practices in hopes of increasing conservation technology adoption rates.

## **How it Works**

Water College is an instructional meeting for producers, agricultural businesses, and consultants on the most current irrigation management technologies and research available. Since 2015, this event has been held every January in Lubbock, Texas. Water College is a daylong event and includes breakfast with registration in the morning and lunch with a keynote speaker. Experts discuss a variety of topics including water management in corn, cotton and grain sorghum, research results from TAWC research sites, and implications for cattle ranchers. The event is approved for continuing education credits required to become a certified crop adviser through the American Society of Agronomy. Additionally, Water College features a trade show of exhibits

displayed by local supply companies, farm equipment dealers, farm credit businesses, commodity groups, and state and federal government agencies. Having a trade show in conjunction with the informational presentations allows attendees the chance to learn more about concepts or technologies speakers discuss.

One of the unique aspects of this event is the use of sponsorships from local, regional, and national agricultural organizations and businesses to fund the event. This includes commodity groups, seed companies, irrigation technology companies, and farm equipment dealers. Sponsors can choose from four different levels of sponsorship: Platinum, gold, silver, and bronze level.

### **Results to Date/Implications**

The event has grown in the number of attendees and sponsors since its development in 2015. For the 2017 Water College, the venue had to be moved to a larger facility to accommodate this growth. The number of attendees has risen from approximately 50 in 2015 to almost 200 in 2017. Attendee demographics have mainly been male, middle-aged producers, along with a variety of different agricultural industry members such as crop consultants, representatives from seed companies, and extension agents. As the event grows, it has attracted a more diverse group of attendees and sponsors. As the number of attendees increases, additional space may be necessary to accommodate both the information sessions and the trade show.

### **Future Plans/Advice to Others**

Future plans include incorporating presentations about sustainability, organic farming, soil biology, and more efficient practices for maintaining dryland crops. The TAWC is also beginning Texas Agricultural Water Manager certification program in partnership with Texas A&M AgriLife Extension. This certification program's implementation is an effort to recognize and distinguish producers who are making resourceful decisions with their water application. Water College will be one of the main events where producers can obtain credits required for the certification. Advice to others who want to provide this type of event is to feature speakers who will present the information in an engaging manner and to provide some kind of incentive or encouragement for participants to attend and apply information learned. The TAWC does the latter by offering the continuing education and water manager certification credits, lunch, and by inviting producers to join the project after the event.

### **Costs/Resources Needed**

The primary costs and resources needed for this event are the rental of a venue that will accommodate attendees, a stage for speakers, an area for trade show booths, and an area to serve food. Other costs include the meals, production and printing of event programs, notebooks, handouts, and certificates. Additional costs to consider are speaker fees and travel expenses. Currently, attendees do not pay to attend the event. The costs are paid for through sponsorships from agricultural organizations and businesses.

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**Can you Boot, Scoot, and Boogie? Agricultural Literacy Achieved Through A 5K**

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## **Can you Boot, Scoot, and Boogie? Agricultural Literacy Achieved Through A 5K**

### **Introduction/Need for Innovation**

According to the National Agricultural Education Supply and Demand Study Executive Summary, there were 769.5 agricultural education teaching positions that were left unfilled in 2016 (Smith, Lawver, & Foster, 2017). Of the positions that were occupied, 325 teachers were alternatively certified or non-licensed. In the US there are 101 teacher preparation programs, which graduated only 569 total educators in 2016 who entered School-Based Agricultural Education, leaving a deficit of 200.5 licensed agriculture teachers for our nation (Smith, Lawver, & Foster, 2017). This profound shortage equates to fewer students being empowered to become informed consumers and advocates for the agriculture industry upon entering the workforce. These statistics follow in light of the American Farm Bureau's claim that Americans are at least three generations removed from the farm, with less than 2% of the population actively involved in farming (American Farm Bureau Federation, n.d.).

Agricultural literacy for the US population is essential to maintaining the validity of our industry amidst false accusations, food security concerns, and a disconnect from the production process. One teacher preparation program in Kentucky has developed an event that engages the local community via an annual 5K race that incorporates facts about the agriculture industry as guide points along the race course. In addition, proceeds from the race are placed in an endowed scholarship fund that will provide financial support to pre-service agricultural educators to promote more licensed graduates entering the profession. This idea aligns with Research Priority 5 of the 2016-2020 American Association for Agricultural Education Research Agenda: Efficient and Effective Agricultural Education Programs and Research priority 3 Sufficient Scientific and Professional Workforce That Addresses the Challenges of the 21<sup>st</sup> Century.

### **How it Works/Program Phases/Results to Date**

The Boot, Scoot, and Boogie 5K is an annual race held at the University of Kentucky research farm that attracts serious competitors as well as those interested in a family friendly run/walk. Student volunteers from the Agricultural Education Society host and facilitate the event, setting up the course and distributing prizes. Participants get the chance to interact with the members of the Agricultural Education program who will benefit from the funds raised from registration fees. All profits from the day are placed in an endowed scholarship account to be awarded to students in the program. Recreational activities enhance the race day, with food, music from a DJ, and warm-up exercises from a local fitness coach. Most importantly, participants are provided with educational resources from agricultural interest groups, such as the Beef Council, and are immersed in the importance of agriculture in Kentucky and the US via educational materials posted around the course.

Phase One (One Year Before): the Office of Academic Advancement was contacted to obtain more information about establishing an endowed scholarship for the Agricultural Education department. The department must raise \$25,000 to open the scholarship account.

Phase Two (One Year Before): a university faculty member of the department attended the Kentucky Race Director Symposium to gather resources and organize an officially recognized competitive 5K.

Phase Three (Six Months Before): the date, location, and other logistics of the event are solidified and announced; a goal of \$25,000 for the startup of the scholarship is set.

Phase Four (Three Months Before): undergraduate members of the Agricultural Education Society at the University of Kentucky coordinate and recruit sponsorships (monetary and in kind) from industry groups, community supporters and businesses.

Phase Five (Two Months Before): promotional materials (fliers, postcards, bulletins advertised around the community, and social media posts) are created and distributed.

Phase Six (One Month Before): students in the Curriculum Design course in the Agricultural Education program research and compile agricultural facts and statistics; these are printed on large signs to be posted around the race course to educate participants as they run. Donated awards are collected and recognition medals for class winners are purchased.

Phase Seven (Day Of): volunteers from the Agricultural Education program set up race day equipment, organize awards, and facilitate the event.

The event will host its third annual race in April 2018. In 2017, over 100 participants registered and ran the course, with sponsorships amounting to \$2,000. Currently, the Boot, Scoot, and Boogie 5K has grossed \$7140 towards the scholarship goal. Participation for the fundraising event has been exponentially growing with every year of promotion and success, with a projected participant count of 300 and expected sponsorships of over \$3,000 for 2018.

### **Future Plans/Advice to Others**

Considering the success of the fundraiser thus far, the Boot, Scoot, and Boogie 5K will continue to be promoted and hosted by the Agricultural Education Society at the University of Kentucky with the goal of increasing sponsorships and participants. The end goal is to raise \$100,000 for the endowed scholarship fund to increase enrollment and retention of pre-service agricultural educators in order to decrease the teacher shortage. When planning this event, the coordinator should plan the event according to the optimal weather time of the area, during a peak running season (i.e. mid-April is appropriate for Kentucky). In addition, garnering the support of your local and state running communities through relationship with running groups and exercise clubs will increase participation in the fundraiser. This will also allow the coordinator access to the running community network and the ability to more widely publicize the event.

### **Costs/Resources Needed**

A race of this scale requires detailed planning and adequate resources. The location of the event was provided free of charge by the University on the research farm. Labor is needed throughout the process, from recruiting sponsors to facilitating the event; student volunteers provide the support needed to complete the fundraiser. The costs of the fundraiser are covered by sponsors, who have three tiers of donation possibilities: Bronze (\$100), Gold (\$500), and Platinum (\$1000+). Sponsorships fund promotional materials, awards and medals for race participants, and agricultural literacy materials, such as signs and fliers. Sponsorship in the form of raffle items and donations of products or services from businesses (i.e. sound equipment, tents, refreshments and food, promotional giveaway items, etc.)

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## **Collaboration in Remote Rural America: Success in Improving the Agriculture Workforce**

### **Introduction/Need for Idea**

The average age of the American agriculture producer is nearing 60 years (United States Department of Agriculture, 2012). Attracting a new generation of farmers and ranchers, supported by a new generation of agricultural business leaders is critical. The upcoming workforce must be educated in progressive, sustainable practices. Additionally, post-secondary education has become the gate-keeper for individuals seeking access both middle class status and earnings (Carnevale, Smith & Strohl, 2010). Many of these educational and labor issues are exacerbated in sparsely populated rural areas. Furthermore, post-secondary training is necessary to fill skilled-based trades (Manpower, 2015). Career and Technical Education (CTE) and certifications are one avenue to improve the quality work-force development programs. CTE students were significantly more likely than their non-CTE counterparts to report that they had developed problem-solving, project completion, research, math, college application, work-related, communication, time management, and critical thinking skills during high school (Lekes, et al., 2007). An innovative model of agricultural education was conceived to help close the education and skill gap in many rural areas.

A collaborative team of educators developed a plan to address the educational gap of a sparsely populated area in the West. The goal was to develop an innovative idea to connect students in a regional high school agriculture programs, connect these students to the regional community college and the state's land-grant institution. Research has shown that dual enrollment systems, including concurrent enrollment, increase the efficiency of the post-secondary education system, and increase the rigor of the local high school instruction (Lewis & Overmann, 2008). The team consisted of a local agriculture producers, agriculture teachers and community college coordinators. The overall goal of the program was to incentivize the quality of agricultural education to increase the number of students concurrently enrolled secondary and increase post-secondary agricultural education student credit hours of offered through the regional high schools. The idea developed into a triple accreditation program in the form of: 1) agricultural education certificate program; 2) an Associates of Science (AS) degree program at the regional community college; and 3) a 2+2+2 articulation program with the State Land-Grant Institution.

### **How it Works**

The triple accreditation program innovation included six general steps:

1. A collaborative relationship is established with regional high schools agriculture teachers, community college leaders, local industry leaders, and career technical education leaders to put the idea into motion. A community survey of business and industry leaders was utilized to ascertain the goals of a work/postsecondary ready student. The idea is led by the local high schools, in contrast to many articulation programs. Funding to support idea (both initial and sustained funding over time) is secured.
2. Create new agricultural science certificate at the high school level which include courses identified by local industry leaders as necessary for success. Courses had concurrent

enrollment with transfer agreements with the regional community college (front half of the 2+2+2 articulation).

3. Create new agricultural science Associates of Science (AS) programs through the regional community college and articulated with the state's land-grant transfer agreements (back half of the 2+2+2 articulation).
4. Initiate hybridized instructional system (online, synchronous video, face-to-face) for consistency in quality content delivery for concurrent enrollment courses.
5. Evaluate results of effort and disseminate findings other regional institutions and for state-wide dissemination.

### **Results to Date**

The following results have been achieved thus far in triple accreditation program:

1. The certificate was created and regionally marketed to high school agriculture students. Students were recruited to participate through concurrent enrollment in their local high school. Six courses were offered in the certificate and were eligible for transfer. 12 students have either completed the certificate or are currently enrolled in the program.
2. A hybridized concurrent enrollment course system was created and disseminated regionally. The model was also shared with other leaders in agricultural education in the state for potential replication in other regions. Six high schools participated in the concurrent enrollment course system. One additional high school participated by taking face-to-face classes at the regional community college.
2. Grant and matching local funds were secured in order to initiate program. The program is sustained through regional high schools, community colleges and land-grant institution.
3. During the grant, 71 students were engaged in agriculturally related concurrent course offerings. These 71 student took 223 hours of agriculture-related content through concurrent enrollment. Following grant completion, 336 students taking 1022 concurrent credits in the agriculture certificate (over 2 years).

### **Future Plans/Advice to others**

The key to the program's success in other regions was being able to adapt courses locally while meeting the requirements of the articulation agreement. As other community college regions are exploring how to adapt and establish this program, adaption to their contexts will be critical. A follow up study of the participants of the concurrent enrollment and their success in both work placements and in post-secondary avenues is necessary. Students completing the certificate courses should be tracked to determine their path after completion.

### **Costs/Resources Needed**

A United States Department of Agriculture Challenge Grant was secured to initiate the project. The first three-years of the project required \$186,844 of initial investment and matching funds. Since the completion of the grant, the regional high school programs and community colleges have continued the work and provided all necessary funding. Critical to the success of this project was a collaborative team which worked to improve the quality of education and dedicated time to curriculum development, recruitment, and evaluation.

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## **Creating a Learning Community of First Generation College Student Veterans**

### **Introduction and Need for Innovative Idea**

Incoming students who are also first generation college students and veterans represent a sub-population that pose unique challenges to universities. Ackerman, DiRamio, and Mitchell describe veterans in academic settings as a “population with special needs” (2009, p.12). Veterans are faced with transitional challenges while assimilating into a college campus. Adjusting from the military to academic life makes veterans shift from the “strictly defined structure” with a chain of command, to a “loosely configured campus” (Ackerman et al., 2009, p. 12). While many veterans value the change to a college culture away from the restrictions of the military (i.e., military attire and combat decisions), others struggle with the aspects they were accustomed to (i.e., respect from their peers and positional ranks) (Ryan, Carlstrom, Hughey, & Harris, 2011).

Returning veterans have stated frustrations of being in classes with younger students and find relationships with fellow veterans to be helpful (O’Herrin, 2011). Also, student veterans have similar disadvantages to first generation students including a “lack of ability to navigate the systems and bureaucracy of a college campus” (Vacchi, 2012, p.19).

According to Ackerman et al. (2009, p. 12), veterans “represent a potential campus resource” with their leadership experiences and background in working with difficult challenges. While veterans, like most university level students, are categorized as adult learners (Knowles, Holton, & Swanson, 1994), “there is a widespread lack of knowledge about the unique needs of veterans in higher education...College administrators and professors must update programs and services to better accommodate and support the large number of veterans returning to campus” (Hermann, Raybeck, & Wilson, 2008, p. A99). Learning communities in higher education have been proven to increase, “academic achievements, better retention rates, greater satisfaction with college life, and improve quality of thinking and communicating” (Lenning & Ebbers, 1999, p. 6).

Due to Texas A&M University’s (TAMU) identification as a military-friendly university that attracts many veteran students (Veteran Services Office, 2017), it is imperative that they create programs to reflect student veterans’ unique needs. According to the Veteran Services Office at TAMU, TAMU has a total of 676 undergraduate student veterans, of which 274 are first-generation college students (2017). The purpose of this innovative idea is describe how TAMU created a learning community with an environment that fosters relationships between student veterans and faculty and staff within the College of Agriculture and Life Sciences (AGLS) and equips first generation student veterans with the tools and resources necessary to be a successful student at TAMU. While student veterans do not exclusively exist within colleges of agriculture, this innovative idea connects student sub-populations to faculty and staff within colleges of agriculture through learning communities and individualized mentoring programs. Therefore, this model which caters to a nontraditional population serves as a response to National AAEE Research Agenda Priority 4 to develop meaningful learning environments which meets the needs of a nontraditional audience (Roberts, Harder, & Brashears, 2016).

### **Methodology**

Recruitment of first generation veteran students happened in partnership with TAMU's Office of Veterans Services and academic advisors in TAMU's College of Agriculture and Life Sciences. The student veterans participate in a learning community structured with bi-weekly meetings. At the meetings, speakers focus on topics identified as areas of interest or need by the student veterans.

Each veteran is also paired with a mentor from the College of Agriculture and Life Sciences. The mentoring program includes a monthly interactions that are tailored to the individual student veteran's needs while developing a relationship with an employee of TAMU. As a group, student veterans identify a service project related to the six grand challenges TAMU to be completed at the end of their first year. As this is instructed as a 0-credit or 1-credit course, students are evaluated through participation, speaker evaluations and reflections on a pass/fail basis.

### **Results to Date**

The first cohort of the First Generation Veterans' learning community is eleven students from six colleges enrolled in the year-long program. Four faculty members and one staff member are coordinating this project. Eleven faculty and staff members from have volunteered as mentors for the first year of the program. Topics for fall 2017's meetings, identified by the student veterans, included study skills, TAMU's Veterans Resource Center, TAMU's grand challenges, money management and StrengthsQuest information. All student veterans were retained at the university and in the learning community after their first semester, boasting a 3.2 overall GPA, much higher than the general veteran population GPA.

### **Future Plans**

With successful completion of the first year, a second cohort of the learning community will be recruited for fall 2018. The learning community is currently structured to allow up to 30 veterans per cohort. We anticipate that word of mouth among veterans will increase numbers in the future. The coordinating group of faculty members are currently pursuing corporate sponsors to alleviate the cost of the program on the university. Also, a long-term goal of this program includes having a cohort exclusively of student veterans from the College of Agriculture and Life Sciences.

### **Resources Needed**

Funding for the following items have been identified for the learning community: breakfast for learning community meetings, service project resources, learning assessments including the StrengthsQuest evaluation, recognition of veterans at the College of AGLS awards ceremony, branded clothing and scholarships. A grant was obtained through the Provost's office to cover expenses for the first year. Students also received a \$500 scholarship per semester to help with academic-related costs. The total cost of the program is approximately \$15,000 a year.

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## **Critical Conversations: Using a Video Podcast to Engage Teachers in Philosophical Discussions about Agricultural Education**

### **Need for Innovation**

Despite a multi-decade focus on teacher recruitment and retention, the agricultural education profession continues to grapple with a nationwide teacher shortage (Smith, Lawver, & Foster, 2017). Previous research has focused on a myriad of factors thought to contribute to teacher retention, one of them being teacher satisfaction (Blackburn, Bunch, & Haynes, 2017; Byrd, Anderson, & Paulsen, 2015; Hasselquist, Herndon, & Kitchel, 2017; Sorenson, McKim, & Velez, 2016). Teacher satisfaction can be enhanced by a number of components, including a sense of belonging within the school culture (Hasselquist et al., 2017), strong self-efficacy (Blackburn et al., 2017), achievement of healthy work-life balance (Sorenson et al., 2016), and resource availability (Byrd et al., 2015). However, moving the needle for teachers in any of these areas can be challenging; for example, resource availability, work-life balance, and building relationships with other teachers are dependent on external factors, while building self-efficacy can require considerable time and professional development. Within the nursing profession, Zurmehly (2008) found that autonomy and the opportunity to think critically were positively correlated to job satisfaction. In an effort to encourage high school agriculture teachers to think critically about their profession and empower them to build the autonomy required to engage in professional change, we created a series of video-recorded “Critical Conversations”, which are delivered to agriculture teachers via social media avenues.

### **How It Works**

The Critical Conversations project introduces teachers to contentious issues within agricultural education through video-recorded informal debates between three researchers. The research team created a list of contentious issues, gathered background information on each topic, and met in person to record the conversations. Example topics included the reality of career pathways, the potential impacts of a world without agricultural education, whether agriculture teachers are professionals, and whether agricultural education should be following the three-circle model. One researcher served as moderator, introducing the topic of conversation and guiding the conversation as necessary. Following recording, one researcher edited the videos and posted them to a YouTube channel. Another researcher edited the recordings to create audio podcasts, which were posted to a Podbean channel. Both of these channels were linked to an existing electronic information network for agriculture teachers called [blinded for review], which includes a WordPress site, a Facebook page, an Instagram page, and a Twitter page. The final researcher posted the edited recordings to the various [blinded for review] sites for teachers to consume.

### **Results to Date**

Seven critical conversations were recorded and edited for dissemination to agriculture teachers via [blinded for review]. To date, three of the critical conversations have been disseminated as an integrated component of the [blinded for review] posting schedule. The three critical conversation videos have been viewed a total of 1,956 times, while the podcasts have been listened to a total of 159 times. Comments on the social media posts have indicated teachers’ interest in engaging in the conversation, and have included likes, shares, text comments, and GIF comments. Additionally, one state’s Supervisor of Agricultural Education contacted the researchers and stated, “an agriculture teacher sent me the link and asked for my thoughts. I

watched it and then called her and had a 30-minute conversation with her about it. The video made me think a lot about my own views on the topic, and I hadn't done that before."

#### **Future Plans/Advice to Others**

We plan to continue recording and disseminating critical conversations to high school agriculture teachers through [blinded for review]. We will continue to monitor audience engagement with the two formats, as well as methods of engagement via the different social media sites, to maximize efficiency within the recording and dissemination processes. Should engagement continue to increase, we plan on exploring avenues for sponsorship of the critical conversations in order to fund advertising of the critical conversations and the social media network. Finally, we plan to assess the impact of the critical conversations on teachers' perceptions of autonomy, critical thinking, and job satisfaction.

We advise that agriculture teacher educators encourage their state's teachers to join the [blinded for review] network and engage in the critical conversations. The recordings can guide conversations within statewide professional development for agriculture teachers, strengthening the network of critical thinkers passionate about the future of agricultural education.

We also advise organizations looking for a way to engage members in philosophical discussion utilize these critical conversations as a model of production and dissemination. With minimal startup cost and no recurring cost, this model enables researchers to attempt to improve audience members' autonomy and critical thinking in a manner that is easily consumed.

#### **Costs/Resources Needed**

While the dissemination of the critical conversations was free via the various electronic platforms, equipment was needed to produce the recordings. An i-Pad was used to record videos, while a Swivl was used to record audio. We also utilized a Yeti microphone to improve audio quality on the video. The researchers incurred travel costs to meet in order to record the conversations; however, these could be minimized if paired with an existing conference or event to which all researchers were already travelling. The team uses the software program Audacity to edit all audio for the podcasts. Audacity is a free, open source cross-platform audio software. It takes approximately 45 minutes to review and edit each Critical Conversation podcast. Finally, while approximately 15 minutes every other week must be allocated to post the critical conversations, a free or paid Hootsuite account can streamline the posting process.

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**Developing a LOCAL STEM Project for High School Teachers and Students**

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## **Developing a LOCAL STEM Project for High School Teachers and Students**

### **Need for Innovation**

Land-grant universities have served as a collaborative model of applied research, demonstration work, and integrated education to help the farming communities solve real-world problems since the Morrill Act was passed in 1862 (APLU, 2012). The model continues to be relevant today although the face of the nation's workforce, agriculture, and education are different. K-12 teachers have not been an active community partner in the model despite the important role they had on students' literacy and career interest (NRC, 2009). Therefore, this NIFA grant funded project, **Land-grant Outreach for Community-based Agricultural Learning for Science, Technology, Engineering and Mathematics Education (LOCAL STEM)** developed a localized land-grant model that included high school teachers as local partners. The project leveraged existing capacities of the land-grant university system including a research farm, the county Extension, and university K-12 outreach program by providing a year-long professional development program and developing a continued relationship between the local partners to advance STEM integration through agriculture, food, and natural resources (AFNR) context.

### **How It Works**

The LOCAL STEM project recruited high school agriculture, science, and mathematics teachers from three high schools within 21 miles from Pinney Purdue Agricultural Center (PPAC). Teachers participated in a year-long teacher professional development (TPD) program to increase their integrated STEM teaching capacity. The program included a one-week immersive learning professional development at PPAC and a nine-month professional learning community (PLC). The TPD training was delivered by Purdue faculty members and the farm scientists in the disciplines of agricultural STEM education, physics, chemistry, and engineering. Teachers learned about horticultural and agronomic research studies conducted on the farm as well as educational research from the pedagogical experts. In addition, teachers reviewed a hydroponics curriculum developed by the faculty members as an example of an integration of biology, physics, chemistry, and engineering units in agricultural context. The integrated and immersive learning experiences helped the teachers see the potential of making career and community connections for their students. This one-week training was the first opportunity that helped build and strengthen the relationships between the local partners.

After the training at PPAC, the participant teachers formed a collaborative team and participated in PLC to co-develop an integrated STEM through AFNR lesson plan to solve a design challenge of extending a growing season. The nine-month PLC was structured to help teachers work collaboratively and to continually receive interactive supports from the faculty members and the Extension specialists. Simultaneously, the participant teachers have access to resources and consultation at the local research farm. These lesson plans focused on increasing students' integrated STEM through AFNR content knowledge, agricultural literacy, career interests, and 21<sup>st</sup> century skills. In addition, the integrated STEM through AFNR lesson plans will be shared with the community at the STEM showcase event towards the end of the year-long TPD program.

## **Results to Date**

There were 12 local high school teachers from agriculture, science, and mathematics disciplines who participated in the program. They utilized the research farm as a local resource to develop integrated STEM through AFNR learning experiences for students. Teachers and high school students participated in the farm activities where they networked with local scientists, agricultural professionals, and Extension educators. An agriculture teacher conducted a field trip to help his students learn about the horticultural research studies. In addition, after the research data were collected, produce was no longer needed on the farm. The students then helped harvest tomatoes and donated them to a local food pantry. They also picked pumpkins and sold as a school fundraiser at the local farmers' market for the students to be able to attend the National FFA Convention. Teams of teachers from each school participated in online meetings PLC with STEM education specialists and scientists for the support in the development of integrated agricultural STEM curriculum, ideas about agricultural techniques, and teaching strategies. To date, 19 lesson plans were developed and the teachers reported 351 students participated in the lesson plans. Five integrated STEM projects were developed by 114 students. Fifty-one students participated in five immersive learning experiences at the research farm. Teachers reported 89 students had an increase in agricultural STEM literacy and 52 students were interested in agricultural STEM careers. The developed localized model consisted of the college of agriculture K-12 outreach program, local high school teachers trained in the TPD program, research and consultation from the county Extension specialists, and the experiences and resources offered by the research farm. These elements worked together to contribute to the agricultural STEM literacy and career interests among high school students. The local resources connection allowed the discovery components to occur at the local level without having the participant schools travel to the main campus located further away.

## **Future Plans/Advice to Others**

The success of this model depends on the willingness and the cooperation of the local scientists and the teachers with regular follow-ups. The LOCAL STEM project team recommends setting up checkpoints to monitor implementation and progress. Teachers from the first cohort will serve as leaders for a new cohort of teachers in the second year because they hold similar experiences and can relate to each other. We also learned that teachers need to be interested, committed, and willing to collaborate with other teachers. Moreover, the school principal needs to be supportive of the project and helps teachers navigate the project when other school-related priorities arise (e.g., curriculum mapping). Regarding the team, the local lead teacher needs to be enthusiastic about the project, facilitate communications among the team, and encourage his/her colleagues to work together on the project.

## **Costs and Resources Needed**

The five-day workshop with the total of 40 hours cost approximately \$3,000. The cost included transportation, food, and lodging. The team of pedagogical specialists served as facilitators of the workshop. Each teacher received the stipend of \$1,000 and \$200 for supplies to participate in the curriculum development process at their school. This project is based upon the work supported by the USDA-NIFA PD-STEP grant.

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**Early Field Observations: An in-depth approach of career exploration**

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## **Early Field Observations: An in-depth approach of career exploration**

### **Introduction**

“Agricultural teacher education programs should expose students to and make them aware of the vast array of opportunities and responsibilities related to teaching agricultural education” (Baker, Culbertson, Robinson, & Ramsey, 2017, p. 264). Student requirements vary from program to program; however, most agricultural education teacher preparation programs require early field experiences (EFE) for students throughout the program (Retallick & Miller 2007). According to the Oklahoma State Professional Education Student Handbook, prior to clinical practice, pre-service teachers at Oklahoma State University are required to complete 60 hours of diverse field experiences.

Aiken and Day (1999) recommend the need for alternate EFE practices and identify the use of EFEs to prepare teachers, making them beneficial in exposing students to the profession of teaching. Aiken and Day (1999) also suggest early field experiences be monitored for knowledge acquisition, and specific techniques be observed to ensure the pre-service teacher’s learning objectives parallel those of the teacher preparation institution. Various forms of EFE are integrated into multiple pre-service agricultural education classes at Oklahoma State University and includes four hours of early field observation (EFO) to be completed in the Foundations and Philosophy of Agricultural Education course.

The Early Field Observation Packet is designed to provide structure and guidance to the observation experience, integrating key topics taught in the class, including the characteristics of effective teachers, learning environments, and interactions with learners. Baker et al., (2017) implemented a photovoice early field observation experience, allowing students to capture what they observed in a single picture and reflect upon the observation later with the help of the instructor. The Early Field Observation Packet implemented in this innovation as a succession to the photovoice experience.

### **How it works/methodology/program phases/steps**

Pre-service teachers in the Foundations and Philosophy of Agricultural Education course were guided through their EFO experience with a five-part observation packet. Students were assigned the Early Field Observation assignment during the 3rd week of the class. Using the scripted worksheets, students were instructed to observe, collect artifacts, and reflect upon key elements in the school-based agricultural education (SBAE) program where they conduct an on-site visit.

Part 1 of the packet required students to observe various learning environments for the SBAE program, including classrooms, the agricultural mechanics laboratory, and other learning laboratories (e.g. greenhouse, school farm, etc.). Students were instructed to focus on the following aspects of the learning environment: Is it clean and orderly? Is it arranged in a way to enhance learning? Is there ample space for the number of students in the class? Is the technology up to date? Is equipment in good working condition? Does the environment appear to be safe to use? Students are also asked to consider what they would do differently if the facility were theirs to manage. Students were also required to include photos of the learning environments.

In Part 2, students observed a teacher and rated the teacher based on the top five traits of effective teachers described by Rosenshine and Furst (1971).

In Part 3, students observed the teacher’s classroom management. Students responded to a series of questions based on the teacher’s use of classroom management strategies, including setting expectations, behavior management, positive reinforcement and addressing negative

behaviors. Finally, students were asked if they would make changes to the approach of classroom and behavior management they observed.

In Part 4, the pre-service teachers were charged to look at the topic of instructional planning. To guide their observation, they addressed whether the teacher used routines, provided an interest approach, if visual aides were used, and if they were effective. Students also asked to identify if and how learning was assessed.

In Part 5, pre-service teachers observed student engagement. They assessed the level of interest generated and maintained by the teacher throughout the class period and identified approaches and techniques used to increase or decrease student interest. Part 5 also addressed frequency of questions asked during the lesson. Pre-service teachers tallied the number of questions asked and identified students who answered those questions. They also tracked the cognitive level of questions asked using the Bloom's Taxonomy scale.

After the due date, the instructional team for the class evaluated students' packets using a rubric designed for the assignment. Digital copies were kept on file for later use. One of the last lecture sessions for the course was dedicated to discussing the observation experience. Students were able to compare and contrast their observations and reflections to those of their peers.

### **Results to date/implications**

To date, this EFO packet has been used twice in the Foundations class. Review of completed packets indicates this guided approach is serving its purpose. Course instructors concluded students were able to make strong connections between concepts taught in the class with their field observations. Making these connections during the EFO experience strengthens the bridge between concepts and applications, further setting the stage for courses and experiences to follow in their preparation to become school-based agricultural education teachers.

### **Future plans/advice to others**

Future plans are to continue using this tool within the Foundations class and to analyze information contained in the reports. The packets are rich in quantitative and qualitative data that can provide insight to what pre-service students observe, and how they process those observations. Data from the observation forms provide information about SBAE programs and teachers that might help identify sites and mentors for other pre-service teacher experiences.

We advise others to implement a similar model into teacher preparation programs to track and measure EFOs of future agricultural educators. Future research should be conducted investigating the impact of the EFO on the teacher aspirants, considering the facilities observed, the effectiveness of the teacher, and the overall impact on student learning.

### **Costs/resources needed**

There are no costs for the department associated with this project. Packets are distributed digitally via the course website and students submit their work by posting the completed document using the online submission tool. The only additional costs required of students is transportation to the school where they conduct the observation.

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**Educating First Responders to Assist in an Agricultural Hazardous Situation**

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## **Educating First Responders to Assist in an Agricultural Hazardous Situation**

### **Introduction**

Grain entrapments continue to be a significant and deadly danger on crop farming operations. According to the Purdue Agricultural Confined Space Incident Database (PACSID), grain entrapments have been steadily increasing over the past 10 years (Field, Issa, & Cheng, 2015). Farmers may enter grain storage bins in order to manage their product, and if the grain bin and equipment are not secure, one could find themselves quickly submerged in grain. In fact, it only takes four or five seconds to become helpless in flowing grain, and less than 20 seconds to become completely submerged (Field, B., n.d.). Time is critical when working with a grain entrapment. Firefighters are often the first to arrive on the scene of an entrapment, meaning it is necessary for first responders in rural areas to receive adequate training on rescuing a victim. Volunteer departments are often the most proximal to the farm, as well as often being underequipped and undertrained for the event.

In order to meet the needs of an ever-growing population, grain operations will be pushed to a level of efficiency that can create potentially hazardous environments. Farmers and first responders must understand the risks encountered on grain operations, as well as the specific rescue equipment needed for accidents on these farms. The innovative idea proposed here utilizes educational outreach trainings and materials to aid first responders in developing life-saving skills that are exclusive to accidents within the agricultural industry, while also exploring new techniques and products available to first responders and farmers. This idea aligns with Research Priority Two of the 2016-2020 American Association for Agricultural Education Research Agenda: New Technologies, Practices, and Products Adoption Decisions (Lindner, Rodriguez, Strong, Jones, & Layfield, 2016).

### **How it Works/Methodology**

Researchers and firefighters worked in unity to create a comprehensive analysis of Grain Rescue Tubes, a life-saving device that allows first responders to move grain away from an entrapped victim to prevent further engulfment and extract them from the bin. The Grain Bin Entrapment project provided the funds to purchase the 10 most commonly used grain rescue tubes that are popularly utilized by first responders; these tubes were analyzed for physical characteristics (i.e. weight and type of material), ease of operation (e.g. storage space needed), and time to rescue the individual (from rescue truck - to bin - to human rescue). In addition, supplemental materials were purchased that are used to aid firefighters in the rescue process, including drill-powered handheld augers, rope and pulley systems, and grain walking shoes. The process of purchasing this equipment was used as an educational tool to assist first responders in making the best decisions for their program when dealing with grain entrapments. Only materials that would be available to these departments for purchase were used in the exercise.

A training at the end of harvest season on a farm site in Central Kentucky was conducted for community-led partner, the Dixie Fire Fighters Association (a training cohort, representing fire fighters in a 12-county region). Community members, firefighters, representatives from companies selling entrapment equipment, experts in rescue, grain bin manufacturers, legislatures,

and agricultural educators were in attendance to assist, educate, evaluate, and collect feedback on the equipment sampled. The comprehensive training session included real-world scenarios that a firefighter might encounter. Utilizing all 10 rescue grain tubes, the fire fighters engaged in a grain entrapment rescue mission with live and mannequin humans to represent conscious and unconscious victims. Prior to each rescue scenario, each team of fire fighters were provided with 15-minutes to review the next rescue tube and determine a plan for implementation. Agricultural educators and experienced rescue personnel provided feedback and correction to first responders as they navigated the scenarios. Data collected from the event was compiled into a comprehensive manual that will serve as a guide to the equipment and rescue strategies. This manual is being distributed to fire departments and farmers across the country to allow others in crop producing areas to make informed decisions when investing in rescue equipment.

### **Results to Date/Implications**

This innovative idea was first established through a collaboration of the Dixie Regional Firefighters Association, the Kentucky Department of Agriculture – Agricultural Education Division, the Southeast Center for Agricultural Health and Injury Prevention (SCAHIP) and the University of Kentucky Agricultural Education program. Following the initial trainings, the Dixie Firefighters and the Kentucky Department of Agriculture obtained comfortability to provide similar trainings for rural fire departments across the state who might encounter a grain entrapment. The travelling training program for community-led fire departments have developed into local partnerships supporting farmers. The information collected is being developed into an informational guide so all communities in eight southern states will have to assist in their rescue equipment purchasing decisions.

### **Future Plans/Advice to Others**

It is the desire of the researchers that the informational guide and manual be available for teachers throughout the United States through web and agriculture media approaches. The monitor of the manual is necessary, to maintain validity as the industry continues to expand. As new rescue devices are developed, and revised, further assessment should be done to keep record of the comparative effectiveness of various equipment, as well as a guide for proper use. The innovative project hopes to educate first responders to increase trainings on entrapments; utilize agricultural education to assist in best practices for delivery; and allocate funds to providing equipment needed to rescue a victim.

### **Cost/Resources Needed**

One of the deterring factors in purchasing a grain rescue tube is cost. This innovative idea required the use of 10 grain entrapment safety devices to make the best judgment of what device best serves a community's need; thus, the agricultural education program at the University of Kentucky received a grant of \$28,000 to purchase materials from distributors (including shipping and processing fees); compensate employees of the project; and cover travel expenditures. The location for the training, consisting of filled grain bins, was voluntarily contributed by a farmer located in the central region of Kentucky for grain production.

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**Enabling Agriculture Teacher Candidate Preparation with Technology and Resources**

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## **Enabling Agriculture Teacher Candidate Preparation with Technology and Resources**

### **Introduction/ Need for Innovation**

Agriculture teachers have access to a variety of agricultural laboratories to support the development of conceptual skills, procedural skills, and personal skills (Phipps, Osborne, Dyer, & Ball, 2008). These laboratories include agricultural mechanics laboratories, livestock feeding facilities, greenhouses, land laboratories, horticulture facilities, and aquaculture laboratories (Franklin, 2008; Shoulders & Myers, 2012; Young & Edwards, 2005). In a national study, Shoulders and Myers (2012) reported over half of agriculture teachers use their laboratory facilities more than once per week. With frequent usage, how are preservice agriculture teachers prepared to utilize laboratory facilities and the related laboratory equipment in their instruction?

Ball and Knobloch (2005) examined the instructional strategies introduced and reinforced in teaching methods courses and found a variety of teaching methods, but nothing specific to laboratory instruction. A review of two teacher preparation courses at North Carolina State University concluded preservice students' micro-teachings had limited use of laboratory equipment, technology, and realia. In response, the department launched the "Agriculture Teaching Resource Room" for teacher candidates at all stages of their undergraduate and student teaching program.

### **How It Works**

After recent departmental renovations, a former office space of approximately 12 feet by 12 feet was transformed into the Agriculture Teaching Resource Room. To determine which items were necessary to make available to preservice teachers, the program leader reviewed the Agricultural Education Blueprint competencies used by teachers in the state. The room is stocked with technology and resources available in most North Carolina agriculture classrooms and is accessible to preservice teachers during normal business hours. Preservice teachers have the option of trying out equipment in the resource room or can check-out equipment for further practice or teaching experiences. A list of all materials found in the room is also posted on the door for quick reference. Inside the room, there is a check-out sheet where students record the date and item they are checking out and returning. For easy navigation of stored items, labels are posted on cabinet doors to help students locate equipment and supplies without having to rummage through the cabinet. Storage containers and boxes within the cabinets are labeled with contents for more search aids. Also, step-by-step instructions are posted near the stationary equipment such as the laminating machine, copier, and smart board providing self-guided instruction on how to use the technology.

### **Results to Date/Implications**

The Agriculture Teaching Resource Room was introduced to preservice teachers in Fall 2016. As a result, there was an increase in the use of realia and laboratory materials in micro-teaching lessons in both the sophomore introduction and senior methods course. The most

commonly used resources have been ear tags and applicators, vet wrap kits, and elastrators and bands. A professional development workshop was conducted by departmental faculty in November 2016 to acquaint students to some of the equipment, specifically probeware and microscopes.

### **Future Plans/Advice to Others**

In the future, a more thorough orientation to the resource room will be provided in agricultural education courses requiring a microteaching experience. Students were informed of the room during class, however, most students were not fully aware of all the equipment and supplies available to them. It is required that preservice students incorporate equipment, realia, or technology into at least one of their microteaching experiences. Due to the value of the equipment, it is important to maintain a detailed inventory and a well-considered check out and return policy. To provide the most realistic experience for student teachers in preparation for field experiences, the room should be setup in such a way that most closely replicates a classroom environment. The future of the Agriculture Teaching Resource Room is a more realistic model of a high school classroom with a more spacious design.

### **Costs/Resources Needed**

Fortunately, the cost of the room renovation was the responsibility of the university. To get the resource room up and running, funds were used from Educational Technology Fund allocated to the department. Time is an important cost to consider during start-up. The [University] room utilized the time of faculty for collection of initial inventory and a graduate student for setup and organization, totaling approximately 40 hours of planning and labor. Machines such as a laminator, copy machine, computer, and smart board are included in the room because they are valuable machines that teachers should be able to utilize in order to enhance their lesson prep and delivery. If students are expected to utilize technology to teach, they should practice with tools beyond a simple white board. For purposes of teaching evaluation and reflection, camcorders, GoPros, recording microphones and a miniature studio film set including a green screen and lighting are available for students. Recording equipment can be used to record micro-teachings or to create unique instructional materials. The inventory continues to grow as students donate extra materials they have from previous lessons or assignments. Accepting donated resources is an advised, cost effective practice for growing the stock of resources.

Agricultural education involves using content specific tools to supplement curricula and provide genuine hands-on learning experiences. It is imperative for agricultural education students to have access to agricultural tools and realia that can be used to facilitate student learning such as soil test kits, band castrators, and ear taggers. Inquiry teaching is more meaningful when teacher candidates practice facilitating labs with real microscopes, beakers, and test tubes, all tools found in the room. Early exposure to the integration of equipment, technology, and realia will encourage preservice students to seek instructional resources to be used throughout the student teaching experience and in their future teaching career.

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**Enhancing Youth Education with School-Community Partnerships: An Intra-Curricular Approach to Secondary Agricultural Marketing**

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## **Enhancing Youth Education with School-Community Partnerships: An Intra-Curricular Approach to Secondary Agricultural Marketing Need for Innovation Idea**

The Appalachia region of Kentucky is recognized as the highest distressed area within the Appalachian Regional Commission (Thorne, Tickamyer & Thorne, 2004). Haaga (2004) reported Kentucky as the lowest state, of the 13-state region, in college completion (13.7%) and highest for high school dropout (37.5%). As a result, the researchers sought to develop a curriculum that could assist in this community deficiency, through agricultural education.

Durden and Ellis (2003) note student motivation improves significantly when content is delivered in a uniquely empowering way, leading to improved attendance and high academic performance. One approach to doing so is by developing positive youth and adult relationships. Hastings, Barrett, Barbuto Jr., and Bell (2010) found youth and community engagement leads to youth ownership, empowerment, and confidence. In addition, youth gained community awareness along with a change in attitudes and perceptions. Multiple studies examining the same phenomena in a variety of contexts noticed similar results (Camino & Zeldin, 2002; Jarrett, Sullivan & Watkins, 2005; Bird, Martin, Tummons & Ball, 2010). An innovative agri-marketing curriculum has since been created to utilize the idea of school-community partnerships to foster motivation, interest, and awareness of entrepreneurship opportunities for youth in resource-depleted communities of Kentucky.

### **How It Works**

The University of Kentucky is implementing a school-community partnership approach to assist the poorest counties in the Appalachian region - all of which are in the poorest counties in the nation (Census Bureau, 2010). This approach entails secondary agricultural students enrolled in an agri-business course to partner with an agricultural business in their community.

From fall of 2016 to the summer of 2017, the project leadership team developed an agri-marketing curriculum with the assistance of a curriculum panel. In addition, a representative from the Kentucky Department of Education, Division of Career and Technical Education was included to ensure the curriculum aligned with current educational standards. The project team met with the Kentucky Association of Agricultural Educators (KAAE) and the Kentucky Small Business Development Center (KSBDC) to determine five secondary agriculture programs and five community agri-businesses for curriculum implementation. These participants were selected due to unemployment and poverty rates within their county. A two-day professional training in the summer of 2017 provided teachers and businesses with materials and methodological practices needed for the curriculum. Teachers began teaching in the 2017-2018 academic year.

The agri-marketing curriculum was created to connect secondary youth with adults in their community while using an authentic context. Students will work in groups of three with their selected agri-business to develop a thorough marketing plan by the completion of the curriculum. Thus, the curriculum will explore topics essential to creating a marketing plan within nine fundamental units. Each unit builds upon the previous with frequent overlap and reference to other subjects due to the meshing nature of a marketing plan. As students complete a unit and its corresponding summative assessment, they will have prepared a portion of the marketing plan. The curriculum is anticipated to consume 85 instructional days to fully implement.

To obtain the required information needed to develop the marketing plans, students will combine their learning from classroom instruction as well as learning attained from their interactions with the community agri-business partner and SBDC representative. Students will

visit their school's partnered agri-business at least twice during the duration of the curriculum. Schools and business owners are encouraged to work together on numerous, additional occasions for students to increase their interaction with their community partners.

Regarding evaluation, the end of course exam is the students' efficacy in compiling the previously completed portions of the marketing plan into one comprehensive marketing plan which will be presented to the partnered agri-business. The University of Kentucky project research team is providing on-going visits for support and observations throughout implementation. Also, a teacher log survey is sent to each teacher every two weeks to document feedback as they progress with the curriculum project. Students will also compete in the Kentucky FFA Marketing Plan competition, providing the opportunity to assess the effectiveness in preparing the students for the competition against other schools.

### **Results to Date**

The two-day workshop on the execution of the agri-marketing curriculum marked the completion of the curriculum writing and the beginning of implementation. There were four themes present in the teacher feedback following the workshop: the project provides for relevance to the students, a connection to the community, a variety of activities, and a future possibility of extending and continuing the project after the pilot year is over.

Four of the five selected agricultural educators began teaching the agri-marketing curriculum in their classrooms August 2017. These teachers are half-way through the content and students are continuously developing their marketing plans. The last educator is on a block academic schedule; therefore, this teacher began the curriculum in January 2018. There are 90 students between the five classrooms who are receiving instruction. Students and local business partners have met twice thus far. Ongoing evaluation efforts by the project team are being done.

### **Future Plans**

It is the desire of the project leadership team to further evaluate the agri-marketing curriculum by expanding the study throughout the United States with a 5-year federal School to Work grant allocation. Upon completion of the research studies of the curriculum, an interactive and electronic textbook will be drafted that assists secondary classroom teachers with the vital content knowledge and activities to be utilized within all agricultural classrooms. With collaborations among the SBDC, the National FFA Organization, and the National Association of Agricultural Educators (NAAE), it is the overall desire that professional development workshops can assist teachers across the nation in developing interactive methods to teach entrepreneurship which aids the communities in which their programs arise.

### **Cost/Resources Needed**

The budget is approximately divided as follows: personnel \$58,960 (44%), workshop supplies \$1,340 (1%), university travel \$4,020 (3%), and participant support \$30,820 (23%). Salary is included for university faculty and staff to ensure the overarching goal and objectives are achieved. Travel funding is provided to assist the leadership team with helping the teachers implement the curriculum. Stipends for teachers and business owners are provided to encourage participation and teachers are provided an allowance for teaching materials, supplies and field trip expenses to the business. Each business will receive funding to implement the designed plans as well as funding to hire one of the students, as an intern, to facilitate the actions items of the accepted agri-marketing plan.

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## **Flip the Script! Implementing Team-Based Learning in a Post-Secondary Agricultural Mechanics Course**

### **Introduction**

A variety of instructional approaches exist that could be implemented to provide students with the opportunity to develop and refine higher-order thinking skills (Allen, Donham, & Bernhardt, 2011; Hanson, 2006). Of all the instructional strategies available to teachers, Team-Based Learning (TBL) may provide the best framework for cognitive development, as well as building critical thinking skills (Michealsen & Sweet, 2012).

Team-Based Learning (TBL) is a student-centered instructional approach that shifts instruction away from a traditional lecture based format (Nieder, Parmalee, Stolfi, & Hudes, 2005; Artz, Jacobs, & Boessen, 2016). In a TBL formatted course, students take on the responsibility of learning conceptual knowledge outside of class time, and spend more time applying that knowledge in class (Michaelsen, Knight, & Fink, 2004). Essentially, TBL is formatted to provide students with both conceptual and procedural knowledge (Michaelsen & Sweet, 2008). TBL follows the framework of a flipped classroom where students acquire the conceptual knowledge before class, allowing class time to be utilized for application of knowledge (Wallace, Walker, & Braseby, 2014).

In a TBL course the instructor's primary role shifts from dispensing content/information to facilitating the overall instructional process. The students move from being passive learners to taking on the responsibility of learning conceptual knowledge before class, so that they will be a valuable team member for in-class work (Michaelsen & Sweet, 2008). For TBL to be implemented properly there are four essential elements to consider: (a) Groups-formation/management of teams, (b) Accountability-students must be held responsible for the effort given on individual and team work, (c) Feedback- Students must receive frequent/timely feedback, and (d) Assignment design-Team work must promote both learning and team development (Michaelsen & Sweet, 2008). If TBL is implemented properly classroom experiences/environment can be much more enjoyable for both student and instructor (Sibley & Ostafichuk, 2013).

### **How it Works**

At the beginning of the course students will be broken into groups or teams that are permanent for the remainder of the course. These teams are designed to put all students on equal playing grounds and reduce preexisting relationships (Michaelsen & Sweet, 2008). Typically, a TBL course is broken down into 5-7 modules that usually require 2 weeks or longer to complete (Michaelsen, Davidson, & Major, 2014). The material taught from these modules build from simple concepts to more complex skills (Michaelsen, Knight, & Fink, 2004). At the beginning of each new structured module the students complete pre-class tasks (i.e., reading). Once the class has begun, students will be assessed individually over the material that they completed before class for content knowledge retention using an IRAT (Individual Readiness Assurance Test) and also in teams when they take their TRAT (Team Readiness Assurance Test). After the IRAT and TRATs the remaining in class period can be devoted to a short summary of the content covered

to make sure all questions are being answered. The remaining portion of the class (application portion) is devoted to the students completing application exercises in teams. The application exercises are designed off the premise known as the 4's. These include: (a) significant problem, (b) same problem, (c) specific choice, and (d) simultaneous reporting. Each team completes the same application exercises that present all 4's within a class period (Michaelsen et al., 2004; Sibley & Ostafichuk, 2013; Michaelsen, Davidson, & Major, 2014). This allows the students to apply the course content to real-world problems (Michaelsen, et al., 2004).

### **Results to Date/Implications**

A TBL formatted course was piloted in an agricultural mechanics independent study course during the fall 2017 semester with a group of three students. The students completed six modules covering small gas engines, each taking a week to complete. The modules consisted of safety, 4-cycle theory & fuel systems, tool and parts ID, ignition/electrical systems, cooling/lubrication & governor system, and finally troubleshooting. The students completed a reading over each module before class, and took their IRAT and TRATs in class. This particular part of the course was taught in sequential order by engine system. The modules were in sequential order by engine break down to try and help the students understand how each of the systems works together. Most of the time of this course was dedicated to the application exercise (disassembly/reassembly of the small engine). The final module, troubleshooting, was used as their final individual/team problem solving exercise. The students in this course averaged 82.1% on all IRATs and averaged 97.5% on all TRATs.

### **Future plans/Advice to others**

Future plans include implementing TBL in a regularly scheduled agricultural mechanics course at [State] State University. The current agricultural mechanics course at [State] State University will be redesigned into TBL consisting of three units: Small Gas Engines, Agricultural Structures, and Electricity. It is advised that teams be purposefully divided based on some criteria to allow for equality amongst members. For functionality and practicality, teams should be contained to six members. It is also advised that before teams take their TRATs a review of material and content be covered to ensure mastery and proper application.

### **Costs/resources needed**

The main cost attributed to implementing TBL is the scoring system for the IRAT/TRATs. Traditionally, IF-AT (Immediate Feedback Assessment Technique) "scratch off" forms are used to give immediate feedback to students on their IRAT/TRATs. Using the IF-AT forms allows for real time feedback on their answers and allows them to receive partial credit. This real time feedback, also allows the students to appeal any questions which they have failed. However, the IF-AT cards do have some limitations. When ordering the IF-AT forms your must order consist of a minimum of 500 IF-AT forms, which costs \$115.00 for 25 questions/4 answer choices per card. A computer based alternative, GradeCam, however could be more cost effective. GradeCam still provides immediate feedback on wrong answers, and the students can appeal wrong answers. GradeCam cost's is free for an unlimited number of students, as long as the IRAT and TRAT's are limited to 10 questions.

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**Food Matters: From Farm to Medical Student**

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## **Food Matters: From Farm to Medical Student**

### **Introduction/Need for Innovative Idea**

Across the nation, public interest in food and agriculture is on the rise. Heightened interest in food-related education programs, foodie movements, farmers markets, community gardens, microbreweries, food marketing tactics, and the like has been observed and documented (Bond et al, 2015; Pingali, 2010; Todd, 2014). While exciting, this increased interest has prompted additional questions about agricultural and food production as it relates to health, environment, and economy (Enns et al, 2016).

Often formal initiatives related to agriculture and food systems education target school-age children (Mercier, 2015). However, educational efforts targeting a greater range of individuals, particularly those with decision-making capacity as consumers, or who serve in helping professions, are necessary to ensure an informed citizenry. Recognizing that many factors including geographic location, occupation, political ideology, family background, education, and life experiences influence how an individual thinks about agriculture and food (Anderson, Velez & Thompson, 2014; Specht, McKim & Rutherford, 2014), it is critical that educational efforts are well-designed to strategically achieve certain objectives.

Medical doctors and healthcare providers are one such audience that could benefit from agricultural and food systems education. Although western medicine is traditionally siloed from food production, many modern pharmaceuticals have roots in plant-based compounds. Further, there is evidence showing favorable health impacts of nutrition education within the medical field (Katch, 2017). This “farm to pharma” approach is the essence of a course, created by physician Kate Shafto, MD and chef Jenny Breen, MPH. In response to a knowledge gap identified among medical students, a course was designed to provide clinically-relevant, food-based nutrition education for integration into healthcare professionals’ training programs (Kolhmeier et al, 2015). Teaching doctors, and in turn, patients, to approach food source education and nutrition is one step toward preventive medicine and healing.

### **How It Works**

Food Matters is a University of Minnesota course that teaches agriculture and nutrition concepts and facilitates connections between producers and health providers. The half-semester course was first piloted in 2015 with 20 medical students and has since been expanded to multiple sessions per semester. Students in health-related professional programs may choose to complete the course as an elective. The course is taught off-campus, in the CSA warehouse and teaching kitchen of The Good Acre, a Twin Cities-based food hub. This facility includes a commercial kitchen, classroom space, greenhouses, and a large refrigerated warehouse.

The course is divided into six educational units, including: lifestyle’s role in health & healthcare, impact of diet on obesity/chronic diseases, acute vs chronic illness paradigm of healthcare, macro nutrients (carb/fat/protein), food and diabetes/metabolic syndrome, fructose/glucose metabolism, and the gut microbiome. Units emphasize self-care and lifestyle choices which may

impact one's role as a healthcare provider. Additionally, each unit involves a farm-fresh menu prepared by students in the course.

A typical 3-hour class session begins with discussion of the week's readings and assignments, before the weekly health topic and menu is introduced. This portion of class occurs in a traditional classroom space. Students then move into the teaching kitchen space, where they observe a cooking demonstration and prepare the weekly menu at assigned cooking stations. Time allotted for weekly cooking and lesson schedule depends on menu items and cooking times needed.

### **Results/Implications**

Analysis of student narratives collected at the conclusion of each course reveals promising outcomes for the course. Outcomes include: increased familiarity with food production practices, possess a framework through which to convey food-related information to patients, bolstered student wellness and resilience, emphasizing a lifestyle of wellness, food as an essential contributor to health and disease and an instrumental component of the patient encounter. In addition, there were some less anticipated outcomes that resulted from the course, including an appreciation for mindfulness, awareness of the value of self-care, and improved well-being. The experiential nature of the course helped to "level the playing field" among students and they were able to connect with one another and the content through food, which was relevant and applicable to all (Breen et al, 2016).

### **Future Plans**

Future plans include further adapting course curriculum and format for multiple audiences, including health practitioners in clinical and hospital settings, care teams in long term care facilities, residency curriculums in Internal Medicine & Family Medicine at University of Minnesota, University of Minnesota Extension food and nutrition educators, and community programs - particularly those affiliated with hunger and food access focus (Breen et al, 2016). With increased exposure throughout local, regional, and national university and medical communities, the course could serve as a model to others who aim to offer something similar.

### **Costs/Resources/Advice to Others**

To successfully implement a course like this, finding an appropriate facility is key. The Good Acre offered a large classroom space and large commercial kitchen space. It was helpful to have it located in close proximity to campus. Facility rental and menu costs were estimated at approximately \$200 per week for each 20 student class. Costs have been offset by grants, tuition, and a course materials fee (\$150 per student). Instructor costs were approximately \$3,000 per course. Additionally, the instructor(s) must have extensive knowledge of agriculture, food production, nutrition, and medicine. Teaching assistants are valuable assets to provide teaching kitchen support, complete grocery shopping, and assist with setup and cleanup. Menus must be designed to meet course objectives and use seasonal produce, while being mindful of cultural sensitivity and student diet restrictions.

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**Highlighting the Traditional Path to Teacher Certification: A Pre-Interview Experience**

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### **Introduction/Need for Innovation or Idea**

Secondary school administrators are charged with identifying and hiring school-based agricultural education instructors and FFA advisors. In an era of limited supply and high demand (Smith, Lawver, & Foster, 2017), combined with a host of pathways to certification (Camp, 2000), the hiring decision can be complex. Robinson and Baker (2013) found principals were unable to identify certification pathway based solely on a resume. To that end, the agricultural education departments at two universities worked to equip pre-service teachers with the human capital needed to distinguish their preparation and traditional pathway to certification. To facilitate skill acquisition, departments developed a semester long course to serve the last-minute needs of teacher aspirants. The mid-term component of the semester long course is the innovation featured in this abstract. Specifically, instructors provided students a pre-interview experience with school superintendents who have previously served as school-based agricultural education (SBAE) instructors and FFA Advisors.

Hammond, Chung, and Frelow (2002) described different perspectives teacher education programs had on preparing teacher aspirants for the classroom. Teacher aspirants complete a diverse set of experiences and coursework designed to help prepare them to be agricultural educators. Roberts and Dyer (2004) suggested agricultural teacher candidates receive additional coursework or experiences focusing on the development of personal qualities. Furthermore, students come to “each new task or problem [with] a set of skills, performance standards, and values” (Krumboltz, Mitchell, & Jones, 1976, p. 73). To ensure teacher aspirants are equipped for success, the departments developed a mid-term seminar that takes place during the student teaching internship, with a focus on preparing students for future SBAE jobs. A highlight of the seminar was a simulated interview with a school superintendent. According to Bandura (1986) “the aspect of self-efficacy that is most germane to how much is accomplished is people’s perceived perseverant capabilities” (p. 371). Lent, Brown, & Hackett (2000) identified multiple barriers and variables to obtaining a chosen career, some within ones’ control, and others that are uncontrollable. Allowing students to experience a simulated interview with school principals and superintendents allows for better performance and self-efficacy when the time comes for an actual interview. In addition, aspirants are encouraged to maximize what is within their control i.e., highlighting pre-clinical and clinical experiences on the resume. Notations, such as theses combined with purposeful cover letters serve to differentiate a traditional path via an agricultural education teacher preparation program versus many of the alternative pathways that Camp (2000) identifies in the supply and demand of school-based agricultural education teachers.

### **How it Works/Methodology/Program Phases/Steps**

To better prepare teacher aspirants to highlight the traditional pathway to certification, instructors taught a session focused on Resume Development prior to the student teaching internship. The session specifically tailored the resume to fit a school-based agricultural education program. Student teachers were instructed to include information featuring high school attended and pre-clinical teaching experience so the resume would reflect requirements unique to traditional entry into the profession. These resumes, along with a professional photo of each teacher candidate, are featured on agricultural education departmental student teaching websites.

School superintendents with personal experience as a school based agricultural educator offered their insight and expertise regarding resume development and interview tips. Administrators interviewed teacher candidates and provided feedback on the resume and candidate interview performance. Prior to the mid-term seminar, teacher aspirants were provided a job description and assigned a school to research. The research is to result in the development of a cover letter that can be shared with the superintendent of the assigned school during the pre-interview experience.

### **Results to Date/Implications**

Upon completion of their service conducting interviews, the superintendents were asked to reflect upon and evaluate their experiences. They considered the activity to be beneficial to student teachers and considered it to be an appropriate activity in preparing students for entry into the career of teaching school-based agricultural education. Student teachers who participated concurred. One student commented, “I appreciated having the opportunity to speak to an actual school administrator who understood the intricacies of agricultural education and how that program should fit within the overall district program” (Personal Communication, October 15, 2017). School administrators found value in the opportunity as a way to “try out” different questions for use in future job interviews (Personal Communication, February 20, 2015). This feedback supports the practice of informing and training school administrators to recognize the difference between certification pathways when reviewing resumes (Robinson & Baker, 2013).

### **Future Plans/Advice to Others**

The departments will continue the mid-term seminar for pre-service teachers prior to entering the profession. Teacher educators should seek out school administrators who have service as a school-based agricultural educator. The perspective can provide valuable insight to teacher aspirants as they prepare for entry into the career of teaching agricultural education. Expanding the time frame for the interview process and coaching from the superintendents and administrators would offer even more benefit. One participant reflected, “I would say that the one downfall to the mock interview was the time that was allotted” (Personal Communication, October 20, 2017). This comment aligns with another student who said, “Twenty minutes was way too short of a time. He [the interviewer] felt rushed. I felt rushed, and it just felt a little hard to get what all he wanted to ask me” (Personal Communication, October 17, 2017).

### **Costs/Resources Needed**

This activity is a component of a 3-credit hour course required for pre-service teachers’ enrollment during the student teaching semester. Students are responsible for the cost associated with the course and university fees. A meal was provided so administrators and students could continue to discuss employment strategies. True to the college experience, pizza for 20 people was served at a cost of \$150.00. The school principals and superintendents donate their time as service to the department.

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**Improving College Access and Readiness for  
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## **Improving College Access and Readiness for Underrepresented Students Using Pre-College Experiences**

### **Introduction**

It is a commonly held feeling among educators that there is a lack of alignment in curriculum, standards and assessments between high school and higher education (Bailey, Hughes & Karp, 2002). This has negative impacts on students, especially upperclassmen, as they transition to college and careers. Nearly 60% of first-year college students discover, while fully eligible to attend college, they are not academically prepared for higher education (National Center for Public Policy and Higher Education, 2009). Specifically, in New Mexico 32% of high school students were found to possess college ready skills in math and science (Winograd & Sallee, 2011). The problem is exacerbated with minorities and students from low socioeconomic backgrounds (Balfanz & Legters, 2004). However, engaging students in experiences prior to college enrollment, which engage students in a university- like setting, can mitigate the college-readiness challenges (Porter, 2003).

Engaging underrepresented students in pre-college experiences, like dual enrollment, provide high school students the opportunity to complete postsecondary courses on their high school campus, university campus, or online. Dual enrollment programs offer students the chance to earn college credit in high school, provide financial savings, allow them to expand their course offerings in agriculture, and offer them early access to college. Students' participation in dual enrollment courses plays a significant role in degree persistence, especially for those students who continued their enrollment in postsecondary education without a break of more than one semester (Swanson, 2008). The quality and breadth of the high school course of study produces the greatest influence upon students' future college persistence and degree attainment (Adelman, 1999). Participation in dual enrollment can shorten the time required to graduate with a degree in agriculture, reducing overall costs to families and students of postsecondary education (Porter, 2003).

### **How it Works**

This project, sponsored by a United States Department of Agriculture Higher Education Challenge Grant (USDA-HEC) Program sought to increase college access and readiness of underrepresented students. This project was a collaborative effort between the Agricultural Science program and the Office of Distance Education at Eastern New Mexico University. High school students in New Mexico are able to complete seven agriculture courses at Eastern New Mexico University. Courses are offered in two modalities: 1) taught by the high school agriculture teacher, serving as a university adjunct or 2) in a hybrid model where students complete their assessments online while their agriculture teacher facilitates course content and laboratory activities in the high school setting.

Through the three-year project, the following steps were taken to accomplish the three objectives set forth the project staff:

*Objective 1: Develop new online dual enrollment offerings and refine current offerings to increase course quality.* To accomplish this objective, the project staff, in conjunction with agriculture faculty and distance education experts, developed a new horticulture-based, hybrid dual enrollment course. In addition, all existing hybrid-model courses were evaluated using the Quality Matters® (QM) online course evaluation program.

*Objective 2: Prepare secondary agriculture teachers to effectively deliver hybrid model dual enrollment courses.* To meet this objective, project staff provided individualized and group-based professional development programming to secondary agriculture teachers in New Mexico. Professional training focused on curriculum content, technology implementation, and experiential teaching methods.

*Objective 3: Increase the enrollment in the Eastern New Mexico University agriculture dual enrollment program.* With the assistance of undergraduate researchers, the project staff made on-site visits to secondary agriculture programs throughout New Mexico along with presentations at state-wide events including the State FFA Convention and New Mexico agriculture teachers conference. Descriptions of the program and potential benefits were presented to teachers and students to serve as recruiting information to build enrollment.

### **Results to Date**

The project was successfully implemented and all three objectives were met. One new course was offered and all existing courses were subjected to QM review and revisions were made. Additionally, QM concepts were applied to the non-online courses and content and delivery improvements were made as well. Over 50 on-site visits to schools throughout the state were made along with presentations at the State FFA Convention in addition to the New Mexico agriculture teachers conference and district FFA events. Student enrollment in the dual enrollment program increased by over 40%, with 25% of the growth attributed to minority students and, over the three-year life of the project, school participation in the program increased by 100% to include 52 of the 87 secondary agriculture programs in New Mexico.

### **Conclusions/Future Plans**

This project has provided Eastern New Mexico University with the tools necessary to build the infrastructure to engage underrepresented students in pre-college experiences that support college access and readiness. Project participants have clearly stated the positive impact of their experiences and communicated their favorable opinion of the project in supporting their education and career goals. Given the success of this project, planning has already begun to seek additional funding in the form of a project extension with the USDA-HEC Grant Program.

### **Costs**

This project was funded by a grant from the United States Department of Agriculture's Higher Education Challenge Grant Program. The grant provided a total budget of \$149,137.

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**Improving Underrepresented Students' Persistence in STEM  
Using Undergraduate Research Programs**

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## **Improving Underrepresented Students' Persistence in STEM Using Undergraduate Research Programs**

### **Introduction**

While the number of Hispanic students enrolling in STEM fields is on the rise (Crisp & Nora, 2012) disproportionately low numbers of Hispanics persist in STEM majors (Young, 2005). Of the Hispanic students who began college in 2004 as STEM majors, only 16% completed a STEM degree by 2009 (Institute for Higher Education Policy, 2010). Documented environmental factors contributing to Hispanic student attrition in STEM fields include financial instability, family responsibilities, and full-time work commitment (Crisp & Nora). Hispanic students have positive attitudes and aspirations for STEM majors (Crisp & Nora) however, interest in mathematics and science have been shown to weaken as academic achievement in those classes decline (Peng, Wright, & Hill, 1995). Student satisfaction with the quality of instruction along with enjoyable coursework have been cited as leading factors in degree attainment (Barton, 2003; Eimers, 2001).

### **How it Works**

This project, sponsored by the United States Department of Agriculture Hispanic Serving Institution (USDA-HSI) Educational Grant Program sought to increase the persistence of underrepresented students in STEM majors. Engaging underrepresented students in experiential learning opportunities in an undergraduate research program focused on sustainable agriculture, human nutrition, and healthy food preparation served as the foundation. Participating in undergraduate research programs, similar to this project, increase minority students' persistence in STEM majors (Herrera & Hurtado, 2011).

The project was a collaborative effort between the Agricultural Science, Human Nutrition, and Culinary Arts programs at Eastern New Mexico University. Participating undergraduates were employed in a variety of capacities in the greenhouse research facility, aquaculture laboratory, food science and culinary arts laboratories, and the Child Development Center at Eastern New Mexico University. Undergraduate students participated in projects focused on aquaculture and food research and production along with nutrition science and food and meal preparation and presentation.

Through the two-year project, the following steps have been taken to accomplish the three objectives set forth by the project staff:

*Objective 1: Provide research assistantships and support to undergraduates enrolled in the Agricultural Science, Human Nutrition, and Culinary Arts programs at Eastern New Mexico University*

To accomplish this objective, funding was secured for 10 undergraduate students for on-campus jobs focused on aquaculture and vegetable production, human nutrition science, and farm-to-table meal development and preparation.

*Objective 2: Provide students with “hands-on” experiences that train the students to accomplish and master experimental processes from sustainable agriculture, human nutrition, to food preparation.* Participating students, under the supervision and mentorship of university faculty, participated in research-based production projects in aquaculture and horticulture, experiments in nutrition science and focus group analysis of food products.

*Objective 3: To provide training in laboratory research procedures by engaging underrepresented students in research training programs.* To accomplish this objective, participating students enrolled in laboratory-based courses to develop the research and production skills needed for sustainable agriculture and farm-to-table initiatives.

### **Results to Date**

The project was successfully offered and undergraduate students were actively engaged in the research and production components. Undergraduate students completed research projects focused on vegetable production, vegetable acceptance by Pre-K students, and economic impacts of environmentally controlled aquaculture production in educational settings. Participating students presented their research at the Eastern New Mexico University student research symposium and the required USDA-HSI project directors’ meetings. To date, all underrepresented students participating in the project are currently enrolled in their major or have successfully completed requirements for graduation. Recently graduated students have either secured employment or have been accepted to post-graduate studies.

### **Conclusions/Future Plans**

This project has provided Eastern New Mexico University with the tools necessary to build the infrastructure to engage underrepresented students in research-based experiential learning programs that support persistence in STEM degrees. This project has proven to be successful in providing underrepresented students the financial support and quality educational experiences that support college persistence. Project participants have clearly stated the positive impact of their experiences and communicated their favorable opinion of the project in supporting their higher education and career goals. Given the success of this project, planning has already begun to seek additional funding in the form of a project extension with the USDA-HSI Educational Grant Program.

### **Costs**

This project was funded by a grant from the United States Department of Agriculture’s Hispanic Serving Institutions Educational Grants Program. The grant provided a total budget of \$249,980. Budgetary breakdown included specific funds for student employment, travel stipends for students presenting research, and supplies associated with conducting student research.

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**In a SNAP: Nutrition Education in Food Desert Communities**

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## **In a SNAP: Nutrition Education in Food Desert Communities**

### **Introduction/Need for Innovation or Idea**

In 2016, 16.5% of American households were located in a food desert (USDA, 2017). A food desert is a geographic area lacking access to healthy and affordable food in the form of full service supermarkets or grocery stores. The majority of food deserts are also in areas with high poverty rates (Jiao, Moudon, Ulmer, Hurvitz, & Drewnowski, 2012). Studies report correlations between food deserts and increased risk for various health conditions and diseases, obesity, and a decreased understanding of nutritional knowledge (Thomsen, Nayga, Alviola, Rouse, & Heather, 2016; Wright, Donley, Gualtieri, & Strickhouser, 2016). These risks are present for people of all ages (Thomsen et. al, 2016). In addition, studies indicate that children who live in food deserts tend to have poor academic performance and score lower on IQ tests (Florence, Asbridge, & Veugelers, 2008; Frndak, 2014; Reed, Dancy, Holm, Wilbur, & Fogg, 2013).

While providing access to healthy and affordable food to all citizens is vital to solving the issues related to food deserts, it is not the full solution to these issues. To combat the negative effects of a food desert on a community, it is important to ensure fresh and healthy food *and* nutritional agricultural education programs are available to those residents to foster a culture of incorporating healthy foods into their diets (Frndak, 2014). Furthermore, participation in agricultural education programs that focus on food production fosters a preference for consuming vegetables when compared with students not in agricultural programs (Duncan, Collins, Fuhrman, Knauff, & Berle, 2016). Additionally, residents of the communities in a food desert must serve as advocates for themselves in the development of such educational programs (Block, Chavez, Allen, & Ramirez, 2012). Thus, community based food projects present a unique opportunity for educational programs and food activism to occur in food deserts (Born, 2013). Due to a large portion of the community being located in a food desert, the “In a SNAP” program was developed to address this issue (USDA, 2017). “In a SNAP” is a collaboration between the University of Kentucky, FoodChain, and Elmwood Stock Farm.

### **How It Works/Methodology**

“In a SNAP” was conducted between June and August of 2017 and functioned as a true collaboration between a University of Kentucky agricultural education faculty, an agricultural education undergraduate, Elmwood Stock Farm, and FoodChain, by using the strengths of each partner to bring fresh food to the members of the community living in a food desert. The purpose of this project was to provide local, healthy, and affordable food while simultaneously educating the community about the importance of nutrition, food production, and food consumption. This was achieved by selling five-dollar grab-bags stocked with local vegetables and informational pieces. Additional educational programming, designed by the agricultural education undergraduate, instructed consumers on how to properly prepare the produce and the health benefits associated with consuming the specific ingredients. The distribution point for the grab-bags was a weekly Farmer’s Market located in the center of a Lexington food desert. Located next to a bus stop in a residential area, the market provided high accessibility to residents in the food desert.

The five-dollar grab-bags were priced artificially low due to the produce being surplus products from a local farm. Before the start of the Farmer’s Market season, a survey was

conducted to gauge the interests of community members for the types of produce in the grab-bags. Results allowed FoodChain to cater to consumer demand by requested specific types of produce from Elmwood Stock Farm. Workers at FoodChain stuffed grab-bags and added recipe and nutrition information cards. Each week, fliers advertising the grab-bags were posted within the servicing neighborhood. Live tastings, product giveaways, and demonstrations occurred at the booth to provide agricultural education programming to community members. Each week, inventory of the bags was taken and recorded to determine overall results and success of the program. All proceeds from “In a SNAP” will be reinvested in the program for 2018.

### **Results**

During this 16-week program, 113 grab bags were sold to community members for five dollars each. Thirteen bags were sold to non-neighborhood members for \$12, for a total of 126 grab-bags sold. On average, seven bags were sold per week to neighborhood members and one bag was sold per week to non-neighborhood members. In total, 1,008 pounds of produce were packaged and sold for \$641. A recipe card for at least one type of produce in the grab bag was included each week. Four giveaways were held, each time giving an item which could be using in the preparation or consumption of the produce (i.e., knife-sharpener, salad dressing). Tastings were held three times and included fresh produce and recipes utilizing the produce. Local extension agents presented additional programming on two occasions. As awareness of the program increased, community members who were physically unable to visit the market began placing orders with FoodChain to deliver grab-bags and nutritional education materials to their homes. Thus, the program created additional opportunities for agricultural education to occur in non-traditional settings.

### **Future Plans and Advice**

The program plans to introduce the use of an electronic benefit transfer (EBT) machine to assist in making healthy, local, and fresh products more accessible. The grab-bag booth will serve as an EBT checkpoint, allowing the members of the community to use their SNAP benefits to purchase the grab bags and other products being sold in the Farmer’s Market. Allotting time to ensure the equipment is functional and all state requirements are met before the start of the program is important as it proved to be a challenge this year. Branding for the program should be increased to raise awareness and participation in the program.

### **Costs/Resources Needed**

“In a SNAP” was awarded \$3,500 through a University of Kentucky undergraduate service grant. The undergraduate student who coordinated this program was given a stipend of \$1,000.00, which covered all labor costs. The student worked approximately 15 hours each week for 16 weeks. Professional printing costs (i.e., fliers, yard signs, stickers) used for marketing the program totaled \$779.81. The yard signs and stickers were purchased in June and utilized for the duration of the project, while new fliers were developed each week. Programmatic costs (i.e., recipe cards, giveaways, popsicle molds, ingredients for tastings, gift certificates for guest chefs) totaled \$914.40. The materials for the set up at the Farmer’s Market (i.e., tent, tables, table cloths), collectively cost \$502.77. While it was unable to be used in this season, the EBT machine needed to accept SNAP benefits was purchased for use next year at a cost of \$300.00. In total, \$3,496.98 was spent on this program. The money that was raised will be reinvested in the program in 2018.

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**Incorporating Fire Safety Training into Preservice Teacher  
Laboratory Safety Instructional Practices**

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# **Incorporating Fire Safety Training into Preservice Teacher Laboratory Safety Instructional Practices**

## **Introduction**

Safety is of the utmost priority in agricultural education laboratory environments (McKim & Saucier, 2011a; McKim & Saucier, 2011b; McKim & Saucier, 2013; Phipps, Osborne, Dyer, & Ball, 2008). This is particularly true in agricultural mechanics laboratories, where dangers can range anywhere from sharp edges on new saw blades to the risk of flammable gasoline vapors (Phipps et al., 2008; Saucier, Vincent, & Anderson, 2014). Such hazards can be minimized when teachers are aware of, and practice, safe procedures. Knowledge in appropriate maintenance and use of safety equipment is crucial in ensuring a safe working environment for agricultural education teachers and students (Phipps et al., 2008; Saucier & McKim, 2011b).

The Methods of Teaching Agricultural Mechanics (AGEDS 488) course at Iowa State University (ISU) serves as the agricultural mechanics content course for preservice teachers. Throughout the course, students receive instruction in a variety of topics, including teaching principles, technical skills, and laboratory management and safety, all within the context of agricultural mechanics. Much attention is paid to the laboratory management component, especially safety, as the course progresses each semester. As indicated by prior agricultural mechanics education scholars (McKim & Saucier, 2011a; McKim & Saucier, 2011b; McKim & Saucier, 2013; Saucier et al., 2014), laboratory management includes a wide variety of safety-related functions, and teachers must be prepared to address such challenges. As safety-related equipment can range from eye and ear protection to fire suppressing equipment, such as fire extinguishers, typically found within agricultural mechanics laboratories, preservice and inservice teachers should be competent to ensure that quality safety equipment is available at all times (McKim & Saucier, 2011a; McKim & Saucier, 2011b; McKim & Saucier, 2013; Saucier et al., 2014). Perhaps a fire safety training session for preservice teachers would help to address at least some of these competency needs.

## **How it Works**

During the Fall 2017 semester, the AGEDS 488 course instructor contacted the ISU Environmental Health and Safety Services (EH & S) staff and requested assistance in providing fire safety instruction. The course instructor specifically asked that the EH & S staff members provide hands-on instruction for the AGEDS 488 students. As the EH & S provides numerous educational opportunities related to fire safety (ISU, 2017), two staff members volunteered to provide a two-hour-long fire theory and safety and fire extinguisher use training program. A training session date was agreed upon by the course instructor and the EH & S staff members.

During the two-hour training session, 10 AGEDS 488 students were provided both classroom-based instruction in fire theory and safety as well as hands-on instruction in fire extinguisher use. During the classroom-based instruction portion, topics such as the fire triangle, electrical safety, and laboratory fire safety equipment usage were covered using an EH & S staff member-created PowerPoint presentation and a question-and-answer session. The subsequent hands-on training portion required the students to use water-shooting fire extinguishers to

suppress a fire ignited on a portable, propane-powered module. The portable fire module used water-sensitive sensors located at the base of the flames. As a group, students were instructed to aim at the sensors near the base of the flames, mimicking extinguishing a fire in a real-life scenario.

Individually, each student practiced using a fire extinguisher at least once. Some students were able to quench the flames quickly, while others struggled to douse the flames at first. Between each fire extinguisher use attempt, an EH & S staff member re-ignited the fire module. Each student was given as much time as needed to practice with their fire extinguisher, and several students volunteered to attempt the procedures several times. The course instructor and graduate teaching assistant participated as well, as neither of them had used an actual fire extinguisher before. In one instance, a fire extinguisher malfunctioned and failed to spray properly, providing an opportunity to discuss how to prevent and solve fire extinguisher-related issues, such as a loss of internal propellant, and so forth. At the conclusion of the training session, the EH & S staff members de-briefed the students, course instructor, and graduate teaching assistant and asked for any clarifying questions about the training session's topics.

### **Implications**

Anecdotally, the AGEDS 488 students reported that they thoroughly enjoyed the opportunity to receive instruction in fire safety training, particularly in how to properly use a fire extinguisher to suppress a real fire. Most of the students acknowledged that they had never used a fire extinguisher before and suggested that this activity be replicated in future semesters of the AGEDS 488. The EH & S staff members indicated their willingness to perform training sessions for future AGEDS 488 offerings.

### **Future Plans & Advice to Others**

Saucier et al. (2014) noted that being able to properly use and maintain safety equipment (e.g., fire extinguishers) is important in managing an agricultural mechanics laboratory. As such, the AGEDS 488 course instructor intends to continue providing fire safety training to each semester's students and he recommends that other agricultural education teacher preparation programs consider implementing a similar practice somewhere within their required coursework. In accordance with preparing preservice teachers to safely and effectively manage agricultural mechanics laboratory environments, the AGEDS 488 course instructor intends to implement other forms of safety training, such as cardiopulmonary resuscitation (CPR) training, in future semesters as well.

### **Costs**

The ISU EH & S staff members provided the fire safety training session at no charge. If a teacher preparation program desired to purchase the supplies used during the hands-on fire extinguisher training, however, it could be expected that each water-shooting fire extinguisher would cost approximately \$100.00 while the portable, propane-powered fire module would cost approximately \$600.00. A tank of propane would be needed to fuel the fire module, which would be expected to cost approximately \$50.00.

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**Integrating FaceTime into Student Supervised Agricultural Experience  
Visitation and Observation Practices**

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# **Integrating FaceTime into Student Supervised Agricultural Experience Visitation and Observation Practices**

## **Introduction**

The implementation and oversight of Supervised Agricultural Experience (SAE) programs is, philosophically, a significant duty of agricultural education teachers (Phipps, Osborne, Dyer, & Ball, 2008; Rank & Retallick, 2016). As SAE programs grant students occasions to apply content from school-based agricultural education (SBAE) coursework into real-world situations and projects, such educational opportunities provide for stimulating personal and professional growth in numerous settings (Phipps et al., 2008; Rank & Retallick, 2016). Moreover, the diversity of SAE program types offered can positively contribute to the educational development of individual students, particularly in the realms of soft and technical skill development, recordkeeping, and enhancing academic concept understanding (National FFA Organization, 2017). However, a core element to the success of SAE programs is a competent teacher who is active in the entire SAE process (Phipps et al., 2008; Rubenstein & Thoron, 2015; Rubenstein, Thoron, Colclasure, & Gordon, 2016).

Rubenstein et al. (2016) described that the process of adequate and appropriate supervision was “a foundation for successful SAE development and implementation” (p. 229). Interestingly, while Rubenstein and Thoron (2015) described that teachers play a pivotal role in SAE program success, many programs devote the least effort and time to SAE programming (Shoulders & Toland, 2017). Significant issues within this area of SBAE, particularly with teacher supervision of SAE programs, have been documented for several decades, as Osborne (1988) detailed several problems within the supervisory process, including travel funding, planning and prioritization of activities, as well as other issues. However, as SAE program supervision often involves considerable time and effort on the part of teachers (Phipps et al., 2008), perhaps the use of technology could help to play a role in reducing this time commitment, as well as providing enhanced flexibility on the parts of both teachers and students.

## **How it Works**

The agricultural education teacher at [HIGH SCHOOL] began conducting a majority of his SAE visits virtually via Apple Inc.’s FaceTime application five years ago. This idea was developed and implemented after travel funds for SAE visits were eliminated due to budgetary issues. While a strong need still existed to conduct appropriate on-site visits, the teacher sought out various alternatives to keep this essential component of the SAE program viable. While meeting with the FFA chapter officer team, it was suggested to try the FaceTime application for conducting SAE visits at a distance. The teacher tested the application with the current year’s FFA chapter officer team and, based upon student feedback, found it to be an effective and suitable alternative for replacing most traditional on-site visits. Currently, almost all SAE visits conducted at [HIGH SCHOOL] are done via FaceTime or a similar type of application.

Since all students at [HIGH SCHOOL] are required to conduct and maintain an SAE project and are required to have a minimum of one supervised visit each semester, the teacher was cautious when executing this idea, as there have consistently been in excess of 80 students

enrolled in the SBAE program each year. The SBAE program purchased two Apple Inc. iPads to utilize for SAE visits (the FaceTime application is factory installed). One iPad would be at the school for the teacher's use, while the other would be loaned to the student to take to his or her project site on the day of the visit. Students would sign up for their SAE visit day at the beginning of each semester and would then be responsible to checking out and returning the iPad before and after the visit. All visits took place after school hours, typically between 3:30 and 5:00 P.M., but while the teacher was still at the school. The visits would last for approximately 10 to 15 minutes, giving students enough time to showcase their projects, answer any questions from the teacher, and receive any other pertinent information. If possible, the teacher would speak with parents/guardians or employers regarding the student's project and progress. Because most students already had access to a FaceTime-compatible device (e.g., a smart phone) to utilize for their visit and didn't require the use of the SBAE program's iPad, multiple student visits could be conducted each day. The primary limitations that were sometimes present were a lack of reliable Internet service or availability of smart phone technology.

### **Implications**

By conducting SAE visits via FaceTime, virtually all travel costs associated with supervisory visits have been eliminated, resulting in an annual savings of approximately \$1,000.00. Some on-site SAE visits are still conducted, either due to the nature of the project or by special request from either the student, parent, or employer; however, these visits are not frequent occurrences. Anecdotally, both the students and the teacher enjoy the flexibility and time savings these FaceTime visits have afforded, all the while still providing supervision and guidance for students' SAE projects.

### **Future Plans & Advice to Others**

This method of supervisory visits will likely continue into the foreseeable future. As additional technologies and applications continue to become available and more widespread, other opportunities may be explored. Currently, the use of this type of technology isn't limited to the FaceTime application or Apple Inc. devices. Additional applications, such as Skype™ or Zoom, present similar opportunities to users who may not have access to an iPad or iPhone. These additional applications are free and web-based, as a prospective user would only need to have access to a web-enabled device and Internet access to conduct a similar process. If Internet access is an issue, data plans may be need to be purchased for the device to be used.

### **Costs**

The SBAE program at [HIGH SCHOOL] purchased two 128-gigabyte (GB) iPads at \$430.00 each in order implement the activities described previously. In addition to each iPad, screen protectors and heavy-duty hard-shelled cases were purchased to protect the hardware, which added \$200.00 to cost. The final costs for all hardware was approximately \$1,060.00. Data packages could be purchased through a selected cell phone carrier at an additional cost, which range in cost from \$20.00 per month for two GB of data to \$100.00 per month for 18 GBs. Because many students at [HIGH SCHOOL] already had smartphones as well as an adequate data plan, the teacher chose to not purchase a cell phone carrier-based data package for the iPads.

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**Introducing Interactive Notebooks into Pre-service Teacher Education**

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### **Introduction/need for innovation or idea**

Over the course of the last decade interactive notebooks have become a staple in primary and secondary classrooms allowing students to engage in learning through a process of gathering information and self-reflection (Waldman & Crippen, 2009). Though the implementation of interactive notebooks varies depending on grade level and content, the benefits are based in providing students a variety of strategies to create a personal and organized record of learning. Interactive notebooks are thought to be one way for teachers to accommodate different learning styles and abilities, while planning, conducting and assessing student learning. The idea of the interactive notebook originated at the Teachers' Curriculum Institute (TCI). According to TCI (2010), interactive student notebooks make note-taking an active and engaging process where students use their multiple intelligences to make their learning experience fun and exciting. These instructional strategies are based on a variety of important theories, including Understanding by Design (Wiggins & McTighe, 2005), Multiple Intelligences (Gardner, 1993), Cooperative Instruction (Marzano, Pickering, & Pollock, 2001), and Spiral Curriculum (Bruner, 1960).

Though these notebooks have been a part of many classrooms, pre-service teachers are rarely introduced or taught these strategies within the course of their teacher training. Most teachers report learning about interactive notebooks from blogs, Pinterest, or other online resources. Implementing interactive notebooks into pre-service classes can help prepare future educators with a variety of interactive learning strategies they could implement with their students.

### **How it works/methodology/program phases/steps**

This innovation is fairly simple and can be easily modified to meet your teaching style, resources, and your student's needs (Chesbro, 2006). The bases for all interactive notebooks centers around 3 main learning activities: *In* activities, which activate prior knowledge and create motivation for learning, *Through* activities, which allow the teacher to direct student learning, and *Out* activities, which focus on student reflection (Waldman & Crippen, 2009). There are many ways to incorporate all 3 types of learning activities into an interactive notebook. The requirements should vary based on the content, the learning levels of students, the teaching methods used within the course and teacher preference.

There are two general types of notebooks to consider when developing your own requirements for a notebook. Most secondary uses of interactive notebooks are some variation or combination of the two varieties.

1. Handout Notebook – This is the most basic notebook and is a collection of handouts used throughout the course. Most post-secondary students can create this on their own, but by providing structure and direction, pre-service teachers can learn how to build the supports needed by primary and secondary students. To make the Handout Notebook more relevant to secondary education, it is best to: (a) provide a variety of note taking strategies including items like outlines, concept maps and foldable notes, (b) create sections based on content or type of activity. For example, you may want a section for Bell Ringers, or for Laboratory activities, or for assignments. (c) Provide opportunities for students to use color (either paper or writing tools) within their note strategies. (d) Provide a table of contents for sections which will have high number of pages.

2. Traditional Science Interactive Notebook - This is a spiral notebook which assigns specific purposes to both a right hand and a left hand side (Endacott, 2007). The right hand side is used for the teacher-directed activities, which include notes, handouts, readings or any other source of information. The left hand side is a space for student reflection, processing, and expression of the right hand sides' content, in the student-directed different forms such as Venn diagrams, concept maps, graphic organizers, diagrams, poems, or songs. The left -side page of the notebook is where the students move beyond regular classroom instruction, allowing them to fully digest the lesson for better understanding (Wist, 2006).

### **Results to date/implications**

Over the course of the last 4 years, 3 different variations on the types of notebooks discussed above have been implanted in 4 [Department] pre-service teacher courses at [University]. They pre-service teachers have included the notebooks as one of the most positive tools they have developed while at [University] in the end-of-course evaluations for each of the courses. Additionally, students have implemented a variety of the strategies throughout their teaching internships and their cooperating teachers have indicated that students responded positively. Recent graduates have also reported that they have implemented interactive notebooks in their classrooms, and have received positive responses from their peer-teachers and administration.

### **Future plans/advice to others**

Interactive notebooks will continue to be a staple of [department] courses at [university] because of the positive feedback from the programs teacher graduates. The first piece of advice is you have to believe in the importance of the notebooks purpose in your class. If you don't make it a priority the students at the post-secondary level won't have the incentive to use their notebooks to their utmost benefit. The second piece of advice is you also must keep up with your teacher version of the notebook. It aids in helping those students who may miss a class and it provides a model for your students. When using this innovation make sure to incorporate many types of notes, handouts, and foldables so pre-service teachers can truly experience how variety and creativity within interactive notebooks can help them develop strategies for their future classrooms.

Some students will struggle with the semi-open instructions which come with some aspects of interactive notebooks, such as freedom to design, write or paste items in ways that the teacher has provided. Many want to make it identical to the teacher sample or what they would consider perfect. You may have to push them out of their comfort zone – it isn't a college students comfort zone to be creating with color and glue sticks. They often take it very seriously and strive to create a perfect version. It is important to stress that these notebooks are learning tools, and not pieces of artwork, and to refocus students on the importance of functionality and learning rather than aesthetics.

### **Costs/resources needed**

To implement this activity there are only a few resources needed by both the student and instructor. The students would have to purchase their own supplies for their personal notebook. Depending on which style required this could be a 3-ring binder with dividers, a spiral bound or a journal. As the instructor you will need to provide the handouts, glue sticks, colored pencils/crayons/markers, rubrics and requirements.

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**Navigating Careers: Recruitment Program For Early Career Educators**

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## **Navigating Careers: Recruitment Program For Early Career Educators**

### **Introduction**

Since 2009, enrollment in teacher preparation programs across all content areas has dropped from nearly 725,518 to 465,536 in enrollment (Aragon, 2016). The shortage of school-based agriculture education (SBAE) teachers across the United States cannot meet the current demand to fill the open positions. Many of the open positions are because current SBAE are leaving the profession, expansion of existing programs, and the development of new programs. The shortage of school-based agricultural education (SBAE) teachers has been a concern since the 1920s, with data suggesting deterioration in the profession since the 1960s (Camp, 2000; Foster, Lawver, & Smith, 2016).

Growing efforts are focused on recruitment of qualified pre-service agriculture teachers (Ball & Torres, 2010). Many factors contribute to why students pursue careers in agricultural education. Factors that may influence the decision to teach may include prior teaching and learning experiences, the self-perception of teaching, and the intrinsic value of teaching agriculture (Marx, et. al., 2017). While many other factors contribute to why students are interested in teaching SBAE, there is a growing push for teacher preparation programs to develop a recruitment plan. Marx et. al., (2017) recommended that recruitment strategies target demographics related to agriculture through exposure of pre-service teacher programs. The University of Florida Agricultural Education & Communication (AEC) Department has created a comprehensive recruitment program that exposes students in SBAE programs to the pre-service teacher program.

### **How It Works**

The recruitment program is composed of three main programs, which include the Agricultural Education Institute, the annual Teach Ag signing event, and the creation on the Florida Ag Ed Day. The first part of the recruitment program is the University of Florida Agricultural Education Institute, held at the FFA State Convention. The Agricultural Education Institute is a series of workshops where rising high school juniors or seniors who have an interest in pursuing a degree in agricultural education upon graduation may attend. The Agricultural Education Institute is hosted twice on campus- once in the fall and again in the spring. Students enroll by having their FFA Advisor register them for the Agricultural Education Institute. When students arrive at the convention, they will receive various academic resources, college preparation information about the AEC Department, and direct links to faculty within the department through a series of hands-on workshops. In the various workshops, students will have the opportunity to reflect on the impact that agricultural educators make on a daily basis. The students discuss the characteristics that make a great agricultural educator, while reflecting on the reasons why they are interested in the profession.

The second component of the recruitment program is the Teach Ag signing event, where students sign their letter of intent into the profession. Once students have signed their letter of intent and are “Tagged to Teach Ag,” they receive recognition on stage at the Florida FFA State Convention. The students that sign their letter of intent are invited to the University of Florida-Gainesville campus with the Agricultural Education Institute. These students will also meet twice over the next year- once in the fall and again in the spring. While on campus, students will meet with professors within the department to explore life on campus, look at what opportunities are available for students majoring in the Agricultural Education and Communication

Department, and look at how to be a successful candidate when applying to the University of Florida.

The third component to the recruitment program has been to modify the Agricultural Education Career Development Event (CDE). This CDE was started nearly five years ago, with the intent to provide students with the skills necessary to be an agricultural educator. In previous years, this CDE was held in conflict with a plethora of other CDE's, while not being hosted within the AEC Department. As part of the recruitment program, the University of Florida has collaborated with the State FFA staff to host the CDE with the help of faculty, staff, and current students. The Agricultural Education CDE is held in conjunction with the fall meeting for Agricultural Education Institute for the "Florida Ag Ed Day". When students come to compete on campus, the students are exposed to the opportunities that this career will have for them.

### **Results**

The Agricultural Education Institute had nearly 125 participants at the last FFA State Convention, with growing numbers over the last several years. The past Teach Ag signing event included nearly 50 students signing their letter of intent to enter the profession. With revamping the Agricultural Education CDE towards the Florida Teach Ag Day, there has been an increase in participation in this CDE. Throughout the semester, we were able to have more participants join us on campus to visit the AEC Department. Therefore, we University of Florida faculty have been able to interact more with prospective students. Numerous past participants of the Agricultural Education Institute are now current students within the department at the University of Florida. While we cannot conclude that these programs have specifically impacted enrollment, the Agricultural Education cohort has jumped from 12 students to 32 students enrolled.

### **Future Plans**

Over the next few years, the department aims to increase participation in each of these recruitment programs. The department would like to host past participants of these recruitment programs to speak with prospective students about the opportunities that are available to them at the University of Florida. Other plans include to increase more teacher buy-in into these recruitment programs, gather additional funding to expand these programs, and to work with National FFA create a national Agricultural Education CDE so that more students are encouraged to participate.

### **Resources Needed**

The cost for implementing all three components of the recruitment program varies. Some costs associated with the program include travel expenses, time, and buying various workshop materials. The recruitment programs rely on support from agricultural educators and state FFA association staff in these efforts. The program is also grateful to have help from University of Florida faculty, staff, and graduate assistants to help with the recruitment programs.

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(INNOVATIVE IDEA)

**On the Road Again: Agriculture Teacher Industry Tours as Professional Development to Promote Career Pathway Preparation**

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## **On the Road Again: Agriculture Teacher Industry Tours as Professional Development to Promote Career Pathway Preparation**

### **Introduction/Need for Innovation**

Teachers have a right to professional development (PD). It is “something they deserve as dedicated and hardworking individuals” (Guskey, 2002, p. 1). To facilitate PD among California teachers of school-based agricultural education (SBAE), state leadership developed a continuum of PD events including a “Road Show.” Modeled after the circuit Chatauqua and demonstration trains (Scott, 1962; Tozier, 1943), the “Road Show” takes workshops on the road to teachers who meet in a centralized location based upon their geographical region. The focus of this innovation was the South Coast Region along the central and south coasts of California. At this particular “Road Show,” the current format provided little involvement from outside industry and most workshops focused on increasing pedagogical content knowledge and expertise in managing agriculture programs. Within the region, no current formalized opportunity existed to expose teachers to career opportunities available to their students.

If teachers of SBAE seek to produce college and career ready students who will enter the workforce in high-skill, high-wage jobs, they must have an understanding of the types of careers available within their local area. Teachers may vicariously experience these types of careers through being a member of the local community, but according to the National Dissemination Center for Career and Technical Education (NDCCTE) (2000) providing an opportunity to experience them via a tour allows teachers to “gain first-hand knowledge of the workplace in order to create authentic learning experiences for their students” (p. 4). Sorensen, Tarpley and Warnick (2010) discovered teachers of SBAE in Utah showed preference to tours as a method of inservice delivery. Further, visits and tours were identified as items of importance in regard to technical knowledge acquisition in aquaculture among teachers of SBAE in the Northeastern United States (Wingenbach, Gartin, & Lawrence, 1998).

In an effort to strengthen the annual PD activity, teachers suggested reformatting the annual “Road Show” activity in 2017 by taking the event on the road. The goal of the activity was to link teachers of SBAE with local industry leaders with potentiality to employ students from local programs. Emphasis was placed on exposing teachers to careers so they may use knowledge gained to influence their own instruction in preparing students for high-skill, high-wage jobs within the industry sector of Agricultural, Forestry, and Natural Resources (AFNR).

### **How it works**

The purpose of the 2017 “Road Show” was to take teachers into local businesses which may potentially employ students graduating from their Career and Technical Education (CTE) pathway programs. Coordination of the event involved planning, management on the tour, and follow up after the event. Tour stops were reserved two months prior to the event. STEM fields, and those revolving around the food sciences and more technological fields are in higher demand for careers in the local geographical area (California Community Colleges Chancellor’s Office (CCCCO), 2017), thus tour locations were selected which reflected career opportunities within these pathways. The tour included three locations: (1) Central Coast Creamery (CCC)-an artisan cheese facility where conversations focused on food sciences; (2) Firestone Walker (FW)-a craft brewery which concentrated on fermentation science careers and construction careers due to the

brewery's current expansion project; and (3) Trelleborg Sealing Solutions (TSS)-a medical silicone manufacturing facility which focused on careers in engineering and fabrication.

Participants met at a central location, on a week day in December, and were divided between two tour buses. Within each bus, teachers were further divided to facilitate ease of tours at each stop. The buses rotated between the first two stops (CCC and TSS) and then ended together at FW. The final stop also included lunch and a raffle. Buses departed back to the original tour pick-up location. Total time of the event was 6 hours and covered 21 miles. An electronic survey was distributed to all participants the day after the event and asked them to rate each of the three tour stops, the meal, and transportation on a five-point Likert-type scale (5 = very satisfactory, 0 = not satisfactory).

### **Results to Date**

In attendance were 74 teachers of SBAE, 1 program director, and 1 state consultant for agricultural education. Forty-eight (64.9%) participated in the evaluation which revealed preference of the tour stops in the order of CCC ( $M = 4.65$ ), FW ( $M = 4.42$ ), and TSS ( $M = 3.94$ ) on a 5-point Likert-type scale (5 = very satisfactory, 0=not satisfactory). Teachers ranked transportation the most favorable ( $M = 4.87$ ), and meals the least favorable ( $M = 3.28$ ). Teachers indicated they were enthusiastic about taking content learned back to their classrooms to discuss unique career opportunities and pathways with their students; particularly within the area of food science. Further, teachers were excited to have time to spend together in a relaxed, non-competitive environment as well as be "provided with something educational instead of having to be the provider."

### **Future Plans**

It was recommended by the advisory committee of the South Coast Region to investigate the possibility of a second tour during December 2018. The advisory committee, which includes secondary and post-secondary agriculture teachers as well as industry partners, has suggested we focus the tour in a different county and follow the same format of three tours and a lunch activity. It was also suggested that one stop be a local community college creating a new agriculture program to further explore connections between students and career pathway opportunities post-secondary. One industry partner has already volunteered to host the meal and a bank of locations has been collected for reference. The South Coast Region supervisor is responsible for researching the feasibility of a 2018 tour. It is anticipated that numbers will increase slightly during 2018 due to the overall success of the initial event.

### **Costs**

Costs to conduct the Road Show included transportation, meals, and tour charges at two venues (CCC and FW). In addition to lunch and tours, teachers received a pad folio, pen, tasting glass, and bottle opener. For this event, which included 74 teachers, 1 program director, and 1 state consultant for agricultural education, the total cost was \$5798.90 or approximately \$76.30 per participant. Individual teachers were charged \$20 per person, for a total income of \$1,520. The remaining \$4,278.90 was absorbed by the South Coast Region as a component of the state agriculture professional development contract.

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Partnerships Provide an Apprenticeship Experience

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## Partnerships Provide an Apprenticeship Experience

### Introduction

Soft skills and STEM fields are topics of great interest in education and in the labor market. Soft skills are the attitudes and behaviors that lead to successful social interactions (Davis & Muir, 2004). These interactions include teamwork, communication, leadership, and problem solving (Ritter, 2018). STEM is commonly known as science, technology, engineering, and math, and it refers to a multitude of jobs that require specific knowledge and skill-sets. The supply of individuals with such knowledge and skills is not keeping up with the retirement of skilled STEM workers (Fifolt & Searby, 2010) or the increase of STEM related careers ("The Bayer Facts of Science Education XVI: "US STEM Workforce Shortage--Myth or Reality? Fortune 1000 Talent Recruiters on the Debate", 2014). The Bayer Corporation (2014) reported that workers with 2-year STEM degrees were in higher demand than workers without a STEM degree, and that workers with 4-year STEM degrees were in greatest demand. The dilemma facing public education is how to best equip graduates to be college and career ready, possessing both the soft and technical skills necessary to succeed in the STEM workplace or in college. To meet these challenges, the Roscoe Collegiate Independent School District in rural west Texas has brought public education and private business into collaborative and mutually beneficial partnerships. These partnerships afford students the opportunity to work in a business as paid apprentices, thus exposing students to actual workforce problems that require both soft and technical skills. Apprenticeship opportunities have been established through a collaborative partnership with the local bar association, local industry, and innovative, non-profit businesses. These public-private partnerships have provided the opportunity for students to grow in the fields of large and small animal veterinary work, welding, and drone flight which have very specific and local agricultural applications.

### How it Works

Students entering their junior or senior year of high school are eligible for placement into a paid, student apprenticeship. Students are made aware of the apprenticeship opportunities during the latter part of their sophomore year. They apply and interview for the apprenticeship that interests them and that falls in line with their educational pathway. Students work as apprentices during the summer, and depending on performance and availability, students may have the opportunity to continue the apprenticeship throughout the school year.

Students are paid by the businesses. Because these are paid student apprenticeships, students do not need to hold a part-time job as many students do in high school. This creates a true employer-employee relationship, thus avoiding the contrived feeling sometimes associated with non-paid apprenticeships.

Roscoe Collegiate 8<sup>th</sup>-11<sup>th</sup> grade students take classes to prepare for industry-recognized certification in the field in which they will work (certified veterinary assistant, FAA remote pilot license, various welding certifications, and Autodesk Inventor). When they have completed seat and instruction time, they test for their certification (before their senior year), so most of the students entering an apprenticeship hold an industry-recognized certification. Since students have already proven that they have technical skills, the business partners can count on them to make a positive contribution to the business. The genuine work experiences along with the

employer-employee experiences provide the student with great opportunities to practice both technical and soft skills.

Students are briefed on the expectations of the work environment that they will be entering. They are given assignments to complete throughout their apprenticeship experience that facilitate metacognitive reflection and reflection on their use of technical and soft skills.

#### Results to Date

The paid apprenticeship program was implemented during the summer of 2017 and has continued throughout the 2017-2018 school year. Three law apprentices worked in law offices during the summer. Four drone apprentices flew agriculture-related commercial missions throughout the school year. One veterinary apprentice worked for a neighboring veterinary clinic during the summer, and another veterinary apprentice has worked with the school's partner veterinary clinic during the school year. Both have had hands-on experience with large animals including bovine embryology work. Four other apprentices are researching and creating a new crypto currency and growing micro-greens for a local venture capitalist. Each of these apprentices has made formal and informal presentations concerning their apprenticeship experiences. During the spring semester, the apprentices presented their work experiences to the student body in order to encourage the younger students to consider the apprenticeship for which they might apply during their junior or senior year. Although no soft nor technical skills evaluation has been used to measure improvement of skills, the anecdotal consensus through observations of mentors, teachers, and visiting schools is that the apprentices are better prepared for college and career than the average junior college graduate.

#### Future Plans

Students and business partners need to be better prepared for the apprenticeship experience. A preliminary orientation piece is being developed that will address workplace and apprenticeship challenges and opportunities in general. The school district was awarded a TEX<sup>2</sup> grant which will pay teachers a stipend to serve as externs in local industry including the public-private partnerships that already exist. In addition to the possibility of forming more partnerships, this effort will aid the district in producing orientation materials, reflections materials, and evaluation instruments that are specifically tied to the work of the apprentice. The school district is working to develop a soft skills curriculum and evaluation piece (Ritter, 2018) that will provide students and partners with a guide for learning/teaching and provide the district with better data concerning the acquisition of soft skills. The school district will work to closely tie each student's capstone research to the student's apprenticeship experience as well as his/her educational pathway.

#### Resources Needed

Human capital and collaborative spirits (open minds) are the resources in greatest demand for this project to succeed. The school district has worked for two years to get the structure and partnerships in place to be able to provide paid student apprenticeships. Patience has been a necessary resource. One huge lesson that the district has learned is that in order to collaborate, each party must begin with open minds and explore how to do what is best for students. In order to pay students, businesses must be profitable. The school district doesn't pay, so the costs are minimal, but the educational gains are tremendous.

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**Principles of Project Design and Fabrication Taught as an Intensive Weekend Course**

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### **Principles of Project Design and Fabrication Taught as an Intensive Weekend Course**

#### **Introduction/Need for Innovation or Idea**

Metal fabrication projects provide excellent opportunities for teachers and students to take advantage of the three major aspects of school-based agricultural education (SBAE). Student-built projects designed and constructed as part the agricultural mechanics classroom and laboratory experience provided unique opportunity for students to apply knowledge and skills. The educational value of supervised agricultural experiences (SAE) has been well documented in agricultural education literature (Roberts & Harlin, 2007). Agricultural mechanics entrepreneurial SAEs require students to maintain a record of earning and expenditures for the business model of their choosing. Several states across the country use agricultural mechanics project shows allowing students to display their work and compete for awards and scholarships. These project also provide opportunities for students to establish a rapport with community members, local producers, and businesses by allowing them to construct high quality, unique projects while earning revenue for themselves and the program (Phipps, 1972).

According to Blackburn, Robinson, and Fields (2015), the national average of mechanized agricultural coursework in pre-service SBAE teacher certification degree programs is 4-6 hours. This amount of coursework is small given the high number of SBAE programs offering the Ag-Power and Technology career pathway (Rasty, Anderson, & Paulsen, 2017). With such limitations, teacher educators must use innovative approaches to prepare their students to effectively teach about and supervise agricultural mechanics projects. To better prepare teacher aspirants to deliver mechanized agriculture curriculum, the agricultural education program at Oklahoma State University developed a one-credit-hour, weekend course. The Design and Fabrication course provided an intensive learning experience designed to highlight the knowledge and skills needed to implement a project-based approach to instruction in the context of mechanized agriculture.

#### **How it Works/Methodology/Program Phases/Steps**

The Design and Fabrication course focused on concepts and skills needed to instruct pre-service teachers a method of teaching through student-built, mechanized agricultural projects. The course included aspects of design and planning, (including scale drawings, bill of materials, etc.) as well as leading and supervising the construction of an actual project. The one-credit-hour course promoted the use of Agricultural Mechanics Entrepreneur SAEs by emphasizing record keeping through the use of project-based learning.

The course, composed of 15 contact hours taught on a Friday evening and the following Saturday, was delivered in four primary segments of instruction. The first segment consisted of laboratory management, including laboratory safety, budgeting basics, and equipment selection. The second segment of instruction covered basics of project planning and drafting. The instructor demonstrated these skills and participants were given the opportunity to practice methods of scaled drawing and basic computer-aided design techniques. The development of this skillset is essential in the planning process of student project-based learning. The third segment highlighted the planning phase of the project. Once students were introduced and replicated the design of the

project to be constructed, they were shown how to access resources needed to plan details of the project including an itemized bill of materials. The final segment of instruction was used to construct the project. For this particular class, the project was a single-axle utility trailer. The instructional focus during this segment was not to improve students' skills, but to demonstrate and experience the project construction teaching method. At the conclusion of the course, each student developed a project record book that included a description of the project, accurate set of blueprints, an itemized budget, a bill of materials, safety and tool information, and photos of the construction process.

### **Results to Date/Implications**

Eighteen students took the course during the spring 2017 semester. Feedback from students was positive and provided ideas for improvements to be made when course is offered in the future. The design of the course went beyond teaching students basic concepts of agricultural mechanics course work. Rather, it developed pre-service teachers' appreciation for well-rounded agricultural mechanics programs by providing an experience with the project construction teaching method.

### **Future Plans/Advice to Others**

A goal of the agricultural education program Oklahoma State University is to continue to expand skillsets and abilities of pre-service SBAE teachers by providing them well-rounded and diversified education in technical agriculture and teaching methods. The program will continue to offer this and similar weekend courses on annual basis. Faculty recognize intensive, one-credit-hour, weekend courses can be used to introduce technical agriculture content, present innovative teaching methods, address new problems, issues and opportunities, and to provide other unique experiences not be included in the degree program. In doing so, teacher education faculty should partner with faculty from other disciplines and connect with experts in various fields of agriculture. Making extra efforts to promote courses offered in this way is important, especially if they are not listed in the course catalog.

### **Costs/Resources Needed**

Specialized facilities were needed to teach the Project Design and Construction course. For a variety of reasons, the course was taught at a local high school rather than on campus. The high school facility had a classroom, meeting the needs for content instruction and application activities associated with design and planning. The laboratory had equipment and supplies needed to construct the project. The following equipment and tools were used: Miller 251 gas metal arc welder, oxy/fuel cutting and welding assembly, 14" abrasive chop saw, various right angle grinders, a cordless drill, and a standard socket/ratchet set. Blueprints and materials lists were based on those found in the *Red Wing Steel Works 6x10 Utility Trailer* instruction booklet. Costs associated for the course vary based on the project chosen. For the 6' by 10' utility trailer constructed in the spring 2017 course, total costs for materials was \$1064.66. To compensate for costs associated with consumable materials and equipment wear, the Oklahoma State University agricultural education program paid the host SBAE program an additional \$200.

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**Providing Professional Development to Educational Professionals for Unmanned Aerial Vehicles (UAVs) in Agriculture**

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## **Providing Professional Development to Educational Professionals for Unmanned Aerial Vehicles (UAVs) in Agriculture**

### **Introduction: Need for Innovation**

Unmanned aerial vehicles (UAVs), also called drones, have been used commercially since the early 1980s. Today however, practical application for UAVs are expanding faster than ever in a variety of industries. UAV technology has given the agriculture industry the possibility of a technological makeover. Specifically, UAVs give the opportunity for improved crop supervision, soil and field analyses, and the ability to more closely and timely monitor crops (Mazur & Wisniewski, 2016). In order to keep up with increasing demands, agriculture has to utilize every technology available to the industry. Based on a global report published by PricewaterhouseCoopers (PWC), the market of UAVs in agriculture is estimated at \$32.4 billion (Mazur & Wisniewski, 2016). UAVs will allow individual farms to be highly data-driven, which will lead to an increase in productivity and yields. Due to the low cost, UAVs can be used for better crop management practices. Despite the growth in technology and opportunities to utilize UAV in agricultural practices, there is little being done to prepare students for careers utilizing this technology.

### **Methodology/How it Works**

This innovative idea was implement through two professional development workshops for educational professionals in the state of Utah. A workshop titled “Incorporating Drones into my Classroom: Drones in Agriculture” was advertised to educational professionals through several listservs provided by the state office of education. The interest level from across the state was more than expected, with the first workshop acquiring a waitlist of over 70 individuals, which resulted in the workshop being offered a second time to accommodate the interest. The 8-hour workshop consisted of three different sessions presenting different topics. The first session focused on exploring various career opportunities in agriculture utilizing UAVs. The second session included presentations about rules, regulations, and licensing of drones. The third session of the workshop focused on integrating drones in the classroom. Educational professionals learned about various UAV models available for the classroom; each participant received a classroom UAV and hands on training with flying it. After completing all sessions of the workshop, participants were asked to complete a survey to determine gains in knowledge, confidence and importance of UAVs. Participants were asked to rate on a scale of 1 (*very low*) to 5 (*very high*) on the overall knowledge, importance of, confidence in use of UAVs before and after completing the workshop.

### **Results to Date**

In total, 86 educational professionals participated in the workshops. Of those, 69 participants completed the survey. The majority of the participants were male ( $n = 49$ , 56.9%). Years of teaching experience ranged from one year to 33. Participants in the workshops consisted of elementary school teachers, secondary school teachers, 4H extension leaders, and guidance counselors. Participants represented a variety of disciplines including agricultural education, engineering and technology education, college and career awareness, general science, and computer science. Participants represented 13 different counties in Utah, spread

geographically across the entire state. Participants expressed their excitement to be able to take their knowledge to the classroom. Results of the survey were positive with statistically significant gains in knowledge ( $\Delta M = 2.33$  ( $n = 68$ )  $t = 27.60$ ,  $p = .000$ ), importance ( $\Delta M = 2.25$  ( $n = 68$ ),  $t = 16.53$ ,  $p = .000$ ), and confidence ( $\Delta M = 2.01$  ( $n = 68$ ),  $t = 18.95$ ,  $p = .000$ ).

### Future Plans

Future plans include the delivery of more drone curriculum workshops for Career and Technical Education teachers in Utah. Grant funding is currently being sought to develop a professional development program that meets the needs of educators in the state. One of future goals is to develop a Career Development Event (CDE) where FFA members apply their knowledge and skills about UAVs and agriculture to solve real-world problems (e.g., pest identification using UAVs) in a competitive context. This event will enable students to demonstrate skills, such as collecting data, design and maintenance, and flying. Additionally, Utah State University has developed a course that allows students to receive FAA remote pilot certification. This course is currently being offered as Dual Enrollment credit so high school teachers can offer this training to their students through their CTE courses. Finally, professional development and curriculum development specifically with school-based agricultural educators is needed so plans are in place to continue to develop teachers and curriculum.

### Cost and Resources Needed

Funding for this project was supported by a USDA-NIFA grant. Grant funding supported the cost of the UAVs for the workshop; travel for the administrative faculty involved in the project; and a graduate student assistant for assessment, planning and development of the workshops and curriculum. Each participant paid a registration fee of \$20, which ensured commitment and abetted the cost of lunch for the day. UAVs were ordered from PARROT, which provides an education discount to both the university and individual teachers seeking classroom sets. This workshop utilized the MiniDrones by PARROT, specifically the Mambo Fly model. PARROT has numerous options available based on age and skill level. Each Mambo Fly costs approximately \$100 each without any accessories (cannon, camera, grabbing claw). In total, the cost to conduct the two workshops and supply the participants with drones was approximately \$9,000. Plus the cost of faculty salaries and a graduate student to help facilitate the workshops. It should be noted that hosting a similar workshop would not be required to provide every teacher and/or educational professional with a drone.

### Conclusion/Need for Research

Of the 86 participants, 61 (89.7%) identified that they worked in a school located in an urban or an urban cluster community. It is a possibility that UAV's in agriculture may be an opportunity to engage urban as well as rural populations of students in production agriculture. We recommend that more workshops on UAV's in agriculture be offered to agriculture teachers, specifically in urban areas. By educating those who play a role in students' career decisions, more students from urban backgrounds can be prepared for careers in AFNR areas. The experiences from these workshops has been positive. Future research should include identification of barriers (e.g., liability issues) as well as the means teachers and districts are using to overcome them.

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## **Providing Teaching Opportunities through Student Mentoring and River Monitoring Introduction/Need for Innovation**

College students pursuing agricultural education need “extensive and intensely supervised clinical work integrated with course work using pedagogies that link theory and practice” as a critical component of a successful teacher education program (Darling-Hammond, 2006, p. 1). Creating clinical work experiences that are engaging and significant to the agricultural education student throughout their college career, beyond traditional education courses, is challenging.

Within the context of clinical experiences, the concept of mentoring has been shown to be meaningful. For example, the power of mentoring, where the agricultural education student serves as the mentor, building relationships with students with a shared goal, provides a multitude of benefits to the mentor, as well as the mentee (Amaral & Vala, 2009; Salzman & Strobel, 2011). Agricultural education students need experience building relationships to aid in their future career as an agricultural educator. Jacobi (1991) identified fifteen characteristics of mentoring relationships through a review of the mentoring literature. Examples include advice/guidance, role model, acceptance/support/encouragement, socialization, stimulate acquisition of knowledge, and training/instruction. When specifically examining the mentoring of middle and high school students, Catalano, Hawkins, Berglund, Pollard, & Arthur (2002) recommend a focus on developing the knowledge, competencies, and confidence needed to successfully undertake their responsibilities.

Coupling mentoring with service-learning adds a unique component to the learning experience. Service-learning is a type of experiential learning that stems from a sense of civic responsibility, gives students direct control of the learning process and is a means of developing skills transferable to the workplace (Robinson & Torres, 2007). Providing agriculture students with the skills to improve and maintain water quality through a service-learning project, coupled with hands-on mentoring and monitoring, will promote a long-lasting conservation ethic and better prepare students for the workplace.

### **How it Works**

A grant was funded through the [State] Environment and Natural Resources Trust Fund (ENRTF) to facilitate a partnership between [University], area public schools, and state agencies. For this experience, [University] agricultural education undergraduates served as the mentors to high school and middle school students while promoting stewardship of clean waters through river monitoring. During Activity 1, twenty-four agricultural education students took a semester long course that taught water quality content and mentoring techniques to undergraduate students. This course is unique in that it includes travel to area schools and monitoring at the river during the semester. One hundred forty-three students were involved fall 2016 and another 139 in spring 2017. Working in small groups, students learned protocols and acquired hands-on experience with test kits and meters during the mentoring activities. The next day, all students traveled to the Redwood River to monitor ten different parameters at three sites: one site as the river comes into town, one site in the middle of town, and a third site as the river leaves town. During Activity 2, agricultural education students attended a workshop on “Ag and Water Quality” to learn scientific principles, issues related to river water quality, connect with local state agency personnel, and learn protocols for the [State] Pollution Control Agency ([X]PCA) Citizen Stream Monitoring program (CSMP). The agricultural education students then visited

with local FFA members and two high school science classes to promote environmental stewardship and clean water with the ultimate goal of students adopting a site for the Citizen Stream Monitoring program (CSMP).

### **Results to Date/Implications**

Evaluation of Activity 1 using pre-post content quizzes showed significantly improved scores on the post-content quiz at all grade levels, compared to the pre-test for both fall and spring. This reinforces the importance of linking theory and practice as the agricultural education students were able to increase their content knowledge through clinical teaching experience. A Civic Engagement Survey indicated that students at all levels value water conservation efforts; 100% of students at all grade levels agreed that water conservation is important and most students indicated that they felt a responsibility to help conserve and improve water quality in their communities. This is an important finding as the agricultural education students go into the classroom with a more complete understanding of the significance of water quality in [State]. There was also a significantly higher score for Civic Engagement for students at all three grade levels (73% for 7<sup>th</sup> grade, 82.1% for 10<sup>th</sup> grade, 97.4% for college) compared to a 10<sup>th</sup> grade control group (48.5%) not involved in the project. This indicates that through these clinical experiences, agricultural education students gained both content knowledge and a sense of civic responsibility and were able to successfully pass this information on to younger students. Evaluation of Activity 2 showed improved scores on the post-content quiz for 100% of participants. These scores indicate that agricultural education students recognized how agriculture practices potentially impact water quality, which is information that can be shared with their future students. In addition, one student volunteered for the CSMP and adopted a river site to monitor long term.

Agricultural education students see value in this experience based on comments from end of semester surveys. As stated by one student: “It benefits me because it is a learning experience on teaching a group of students which relates to my major in [Agricultural] education.”

### **Future Plans/Advice to Others**

Agricultural education students will continue to enroll in the course as part of their teacher education program at [University]. Therefore, Activity 1 of the project will continue in the future. This project has one university class of mentors, three high school classes and three middle school classes, but could be easily scaled down to reduce costs and complexity. This is a novel mentoring approach to learning material and allows undergraduates to gain knowledge and confidence, as well as develop skills transferable to their future jobs as teachers. The civic engagement component connects real world agricultural issues to the classroom.

### **Costs/Resources Needed**

A [State] ENRTF grant provided funds to purchase enough equipment (\$7000) so that students could be mentored in 13 small groups (one university student with two high school and two middle school students) and allow redundancy (two different groups measured the same parameters) which allowed for evaluation of the quality of the data. Ten different water quality parameters were measured (dissolved oxygen, temperature, pH, turbidity, flow, ammonia, nitrate, phosphate, alkalinity and coliform bacteria). The other cost for the project was busses to transport students for mentoring, and transporting students to the river for monitoring day (~ \$1200 per semester). Bussing costs could be offset by charging a small ‘Lab Fee’ for undergraduates enrolled in the course.

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**Reflection as Assessment: Using Flipgrid© for Formative Assessment**

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## **Reflection as Assessment: Using Flipgrid© for Formative Assessments**

### **Introduction / Need for Innovation**

Assessments in education serve multiple purposes including helping students understand their learning and evaluating teaching practices (Bain, 2004). While methods and modes of assessment vary widely across disciplines and instructors, the objectives of assessment should go beyond traditional concepts of testing and performance-based grading (Bransford, Brown, & Cocking, 2000). Good teaching requires that teachers formatively evaluate how and what students learn, not simply rate and rank their efforts using performance-based grading (Bain, 2004). Good teachers also seek constant feedback from students to evaluate teaching practices and promote a constant restructuring of how we think about teaching (Bain, 2004; Fink, 2003).

We make meaning of experiences through critical reflection, which results in active and transformative learning (Fink, 2003; Mezirow, 1997). Mezirow (1997) identified four processes for learning; elaborating an existing point of view, establishing a new point of view, transforming our own point of view, and transforming our ethnocentric habit of mind by becoming aware and critically reflective of generalized biases. As a function of the learning process in a teacher education program, we often encourage teacher candidates to re-think their own points of view and transform potential biases so they may become more effective educators. Additionally, we are constantly striving to create an active learning environment and have been specifically focused on the feedback loop between students and instructors within our program.

### **How it Works**

We implemented Flipgrid© technology in a graduate-level agriculture teacher education course to foster critical reflection among our students. We sought to provide a unique platform for critical reflection to encourage transformative learning, measure what and how students were learning, as well as evaluate our own pedagogical practices. Flipgrid© is a video discussion platform where topics are added, presumably by the teacher, and discussion and discourse takes place through students' posted 90-second video responses. There is no login required for students, however, teachers do need to register for a free account. With the account, teachers then create a grid for the class and topics for which students should respond. Teachers need access to a web browser to create and manage the grids and topics. The teacher provides the students with a unique code for each topic in order to post their responses.

### **Results to Date / Implications**

There was positive feedback from students and the instructor on integrating Flipgrid© into the agriculture teacher education course. The students responded to weekly prompts and received feedback from the instructor via email. The weekly responses provided a chance for the instructor to check-in with students on how they were processing and applying the information in

class. It also allowed for one-on-one feedback in a unique way and time efficient matter. The Flipgrid© reflections allowed the instructor increased ability to check in with students and provide support beyond content understanding.

At the end of the term, students shared their thoughts regarding reflection through Flipgrid©. Overall, the majority (71%) of the course participants enjoyed using Flipgrid© and 86% saw the benefit in using Flipgrid© to reflect. One student noted the impact of prompts on their ability to reflect, “Prompts such as what we utilized in our Flipgrids help me organize my thoughts in a meaningful way.” Another student referenced the 90-second time constraint in the free version of Flipgrid© as being beneficial for verbal reflection, because “...it forced me to articulate my thoughts and words and really focus on what I wanted to get across.” Other students noted that by reflecting out loud, they were able to elaborate and transform their existing points of view.

Students also shared other thoughts regarding reflection. One of the students appreciated the ability to reflect verbally but did not think that 90 seconds was long enough to do so on Flipgrid©. Other students shared that they appreciated being able to self-reflect, for instance one student stated, “I self-reflect quite frequently. I am constantly looking for ways to improve myself. This ‘gets the juices flowing’ before talking about my reflections out loud.”

#### **Future Plans / Advice to Others**

We plan on continuing integrating Flipgrid© into agriculture teacher education courses as a form of reflection. By providing the reflection opportunity as part of a graduate-level agriculture teacher education course, students were able to practice thinking critically and reflecting and the instructor had the opportunity to assess students’ application of content knowledge and gain a formative understanding of students’ progress in the course. Flipgrid© could also be used for a variety of other formative assessments. For example, students who were learning how to give instructions to a class could record themselves providing directions to receive individual feedback from the instructor. Students indicated it took multiple tries to record the short videos and were slightly frustrated at the beginning. However, their attitudes improved over the course of the term as their familiarity with the platform increased.

#### **Costs / Resources Needed**

Flipgrid© has multiple pricing options (“Flipgrid. Ignite Classroom Discussion.,” 2018.), but we chose the free version which was adequate for our needs. However, a single educator could activate a classroom account for \$65.00 annually which would provide more options and features. Participants do need access to a digital recording device (i.e., cell phone, tablet, laptop) to record and view responses.

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**Scanning the Crowd: Using Plickers to Conduct Formative Assessments  
of Student Learning**

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# Scanning the Crowd: Using Plickers to Conduct Formative Assessments of Student Learning

## Introduction/Need for Innovation

Formative assessments are useful to teachers as a method to gauge student learning, plan for future instruction, and receive feedback from groups (Arends, 2015). The use of classroom response systems (CRS) can assist in gathering instant feedback to a variety of questions (Deal, 2007) and therefore serve as a tool for formative assessment. Plickers (Plickers.com, n.d.) is one such type of CRS for classroom application that does not require students to use a device, but rather hold up a piece of paper.

## How it works

Instructors must first sign up for a free account on Plickers.com and download the free app onto a smartphone or tablet. On the website, instructors create classes with rosters of students. These students are assigned a specific Plicker number that corresponds to the physical Plicker card. The students use these cards in class to provide responses to questions.

Within each class on the website, instructors create a library of questions. These questions are limited to no more than four response options so typical questions are multiple choice and true/false. After the questions are created, instructors add them to a queue. These questions are then available through the app for the class session(s). Questions can be created and added to the queue directly through the app if necessary.

On the day instructors plan to use Plickers in class, they login to their instructor account on the classroom computer and select “Live View”. This will display the question and response options for students once that question has been selected in the app. Students provide their response by holding their card in the appropriate orientation so their selected response option is pointed up. The instructor then uses the app on a smartphone or tablet to scan the cards. As each student’s card is scanned a checkmark appears on the computer screen next to it. Once all the cards have been scanned, the instructor closes the scan and the answers are recorded. The instructor can then select “Graph” in the “Live View” so students can see the overall results with no names attached. The instructor can reference the questions later via the website to see how specific students answered each question.

## Results to Date/Implications

Plickers were used in a course at Texas Tech University in Spring 2017 as a way to gather feedback and stimulate discussion. During the semester, the cards were integrated in five specific class sessions and multiple questions were asked during each. At the end of the semester, students were asked to provide anonymous responses as to whether they enjoyed using the Plickers in class and if they should be used in the future. The responses were overwhelmingly positive as demonstrated in the following quotes:

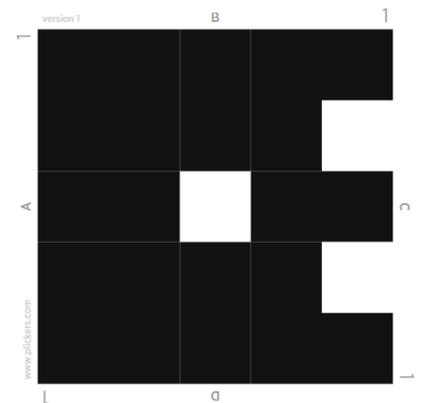


Figure 1. Example of a Plicker card.

- “Loved the plickers! They were a fun thing to do throughout the class.”
- “I really liked the Plickers! I think it was very useful to allow the students to feel like we can provide input without taking too much time for everyone.”
- “I loved them and I liked looking at the end of results when we were done throughout the class.”
- “I wish we used them more.”
- “I think the plickers were really cool! I liked using them and thought they were a good instrument to add to class.”
- “They were easy to use and fun to get instant polls. Use more!”

Beyond this class, teacher educators have also demonstrated how Plickers could be effectively integrated in the high school classroom. Pre-service high school teachers were taught how to use Plickers and have used them in several situations where technology integration is difficult such as a meat locker, a metals lab, a livestock feedlot, and a classroom where cell phones are not permitted.

### **Future Plans/Advice to Others**

As the students suggested, Plickers will be used more often in the post-secondary level course and will be integrated in additional courses. Plickers can be taught to pre-service teachers in 15 minutes, including a demonstration and activity. This active engagement strategy does have some limitations. The response options are limited to no more than four pre-determined answers. This does constrain the types of questions that can be asked. Another feature of Plickers is the ability for instructors to set one answer as the “correct” option; however, this is not required if the responses will not be graded. This was the approach taken in the class at [university] to encourage discussions about the responses and not declare one as the best option.

The Plickers are available in sets of 40 or 63 so class size needs to be a consideration. For classes that have more than 63 students, the Plickers could be shared in pairs or groups. Students can also keep the card in their notebook rather than picking one up at the start of each class period. Depending on the size of the room, some rescans of the cards might be necessary to ensure all students have replied. Also, the time needed to scan the cards should be considered when integrating them into the class period. Finally, because holding up the cards with the correct response can be cumbersome, students can write the response options (A, B, C, D) on the back of the cards to assist them when they hold up the card to provide their answer.

### **Costs/Resources Needed**

The use of this innovative idea can be free. No charge is associated with starting an account on Plickers.com or downloading the app (available for both Apple and Android devices). Multiple options of Plickers card sets can be downloaded for free from the Plickers.com website. A more durable, laminated set can be purchased from Amazon for \$20. The other required technology is a smartphone or tablet with camera and Internet access. The room in which the class is taught also needs an instructor computer with Internet access in order to display the questions and results.

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**Solving the Interactive Video Puzzle: EdPuzzle as a Platform for Content Delivery**

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## **Solving the Interactive Video Puzzle: EdPuzzle as a Platform for Content Delivery**

### **Introduction/Need for Innovation**

Students increasingly desire visual content to help them learn (Carr, 2014). Researchers have examined formats for visual teaching content and have found that students prefer to learn through videos rather than still images (Baker, 2016). It has also been concluded that video content has a more prominent impact on student knowledge when used in an interactive format (Zhang, Zhou, Briggs, & Nunamaker, 2006). Creating meaningful video content can take time and technological expertise, which is one of the biggest barriers to teachers utilizing this method of teaching for secondary and post-secondary instruction (Baker, 2016). Agricultural educators desire a useful platform for delivering video content (Rutherford, 2014), and have a large workload which prohibits them from having additional time to create course materials (Torres, Ulmer, & Aschenbrener, 2008). The EdPuzzle tool ([www.edpuzzle.com](http://www.edpuzzle.com)) is an online service that allows teachers to easily embed interactive components to pre-existing video content.

### **How it Works**

The EdPuzzle tool allows instructors to create an interactive video module by uploading video content from an existing file or from any publically available YouTube video. The tool allows teachers to place multiple choice or short answer questions at any point during the video, or add additional audio or text comments. At the determined time for each interactive component, the video pauses and the student must attend to the question or comment before continuing to view the video. EdPuzzle can also be set to prevent students from skipping or fast forwarding the video. In addition, the tool allows the teacher to set the days and times the video module is available to students, a due date for completion, and records which students have started and completed the module.

Teachers deliver the video content to students by adding student email addresses to classes within the EdPuzzle system, and email a link to the students with a username and password which allows them to access secure class content. Student information is collected in the teacher EdPuzzle portal, including scores and choice selections on each multiple choice quiz questions, student answers to short answer questions, embedded in the video and class summary scores for each module.

The EdPuzzle platform also allows teachers to search from previously created video modules. There are currently more than 200 agricultural education related video modules created on EdPuzzle. As agricultural educators begin to use EdPuzzle more often, more agricultural education videos will be available to teachers with little input required.

### **Results to Date/Implications**

EdPuzzle was used as a platform for delivering content in both the on-campus and high-school sections a dual-credit agricultural education course in Spring and Fall of 2017. Students enrolled in the on-campus ( $n = 6$ ) and high-school ( $n = 48$ ) sections had the opportunity to complete the eight course modules in the EdPuzzle system. The course instructor created video content using PowerPoint and/or Camtasia software, then uploaded the video into the EdPuzzle

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content area, and added interactive components. Modules contained between seven and twelve interactive components each. Results on the video module quiz questions were scored by the EdPuzzle platform and checked for accuracy. All student quizzes scored through the system were accurately recorded.

The instructor noted the ease of use and time-savings allowed by using the platform. Students reported their assessment of the platform on the course assessment. A high-school student enrolled in the class for dual-credit said, “having the quizzes in the video really helped me to pay attention, I kind of zone out on most videos I watch for classes.” One of the on-campus students noted:

I wish I had more online classes using something like the interactive videos, I liked that it was allowing me to think, and then having me put in my answers to the questions made me accountable. I also liked that the modules were open for a week or so and let me do them when I had time.

Overall, the use of EdPuzzle has been determined to be a successful online video platform for the class that was easy to implement and engaging for students.

### **Future Plans/Advice to Others**

We plan to continue to use EdPuzzle as the exclusive delivery platform for delivery of online asynchronous content in this dual-credit course. Our plans include the expansion of EdPuzzle as the delivery model for a new dual-credit class in the fall. In addition, we have identified several videos we currently incorporate in other on-campus classes, and will be importing them into the EdPuzzle system so students can benefit from interactive learning in all of our courses.

Some important considerations for others include the limitations of using EdPuzzle. Currently, the only type of self-scored question allowed by EdPuzzle is multiple choice. Care should be taken to ensure that other forms of assessment are being used to encourage higher-order thinking for content. Another consideration is important for teachers who have a block on using YouTube in their school. By embedding a YouTube video in an EdPuzzle presentation, students are able to access it even if the school firewall would normally block YouTube content. Teachers should take care to ensure their administration knows which videos are being used, and their tie to the objectives of their courses.

### **Costs/Resources Needed**

EdPuzzle is completely free of charge to students and teachers for all video module features. The company provides an online gradebook program and a student tracking program separate from the video module features that they offer to districts on a contract basis. In order to access the content, students need access to a computer, tablet, or smartphone with internet access. Teachers require minimal training to be able to use the system, complete training videos are available on the EdPuzzle website.

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**STEM Curriculum in Space Plant Course Content for Agriscience Educators**

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## **STEM Curriculum in Space Plant Course Content for Agriscience Educators**

### **Introduction**

Within the next generation of researchers, NASA plans to conduct a human manned expedition to Mars. Scientists at University of Florida have explored how these important experiments can play a crucial role with life on Earth using both ground and airspace studies (Paul et al., 2017, p. 1). Taking care of plants during long duration missions, such as a journey to Mars, is important for Advanced Life Support (ALS) systems. Being able to monitor and predict plant health is an important aspect of growing crops. One of the ways scientists are able to measure plant health involves utilizing Normalized Difference Vegetation Index (NDVI) imaging to gather data relating to near-infrared exposure on plant physiology (Nouri et al., 2017).

With new data being gathered and analyzed from space plant research, grant funding from NASA has asked the University of Florida to develop STEM curriculum for public school use, specifically for agriscience educators. Curriculum for the Space Plant course is outlined around the Dick and Carey model, which is broken up into nine instructional components (Dick, Carey, & Carey, 2005). The curriculum also utilizes the ETL model to assist with sequencing STEM instruction. STEM curriculum, such as this program, will offer students access to technologies that are being applied in post-secondary research and by agronomists who currently use NDVI technologies using GPS and drone field monitoring.

### **How It Works**

The purpose of the Space Plant course is to provide an educational opportunity in exploring plant response to abiotic stress and extreme environments using the scientific method. The Space Plant course is a hybrid online course, specifically designed for high school agriscience educators interested in integrating STEM curriculum into their classroom. After completing the course, learners will demonstrate the knowledge and skills to successfully utilize NDVI imaging. In order to access the curriculum, agriscience teacher contact the University of Florida Space plant lab for the curriculum. The University of Florida mails out the curriculum with a classroom set of the NDVI camera lab kits for use up to three weeks before mailing back the NDVI imaging systems. The curriculum includes a teacher manual, which contains a series of lesson plans that are aligned to state CTE standards relating to Agricultural Foundations and Horticulture courses.

The curriculum is broken into six modules, each containing 15-20 minute instructional video clips. Each module contains a specific learning objectives, essential questions, and additional resources. The modules cover a range of topics relating to photosynthesis and cellular respiration, plant responses to light, and use of NDVI technology in abiotic environments such as space or Antarctica. Learners utilize the lab aides in certain modules. In these particular modules, the learners will be able to utilize the lab aid kits to collect data on the plant health. It is anticipated that this technology be used to design experiments in school greenhouses. Learners may complete additional assignments that are provided to the instructor if the instructor feels that more instruction is needed.

### **Results**

To date, the instructional videos and most instructional resources have been developed for the course. The curriculum was presented to agriscience educators at the 2018 Mid-Winter Conference. Agriscience educators were given the opportunity to try out the NDVI imaging systems at the conference. At the conference, program feedback showed that agriscience educators were highly interested in utilizing the curriculum. Many agriscience educators stated that the curriculum was an excellent way to integrate STEM concepts that are embedded in the state CTE standards. We currently have 20 NDVI lab aid kits created and ready to send out to agriscience programs. It is anticipated to have the final course modified and begin implementing the curriculum by March of 2018.

### **Future Plans**

The program designer aims to share this curriculum at other teacher professional development conferences. We would also like to have more professional development workshops in the future. Future workshops for agriscience educators will demonstrate how to successfully use the STEM curriculum in their specific classroom setting. Agriscience educators will be able to effectively use the course content at the end of the professional development workshop. The program designer is planning to create a survey on teacher and student satisfaction of the curriculum, which will be a key tool in redesigning the course over the next several years. The course designer aims to have this curriculum in other content areas, such as Biology or Environmental Science courses. We are anticipating to have more grant funding to purchase more lab kits and expand the curriculum.

As more information becomes available from future research at the University of Florida, the course designer has plans to add additional modules with learning objectives and essential questions. Researchers from the University of Florida will be conducting additional research in Antarctica from January to March of 2018. NDVI images gathered from Antarctica will be added to this curriculum in the future. Because we have a limited amount of lab kits available for students to use the imaging systems, the course designer plans to make a Flickr account in which agriscience teachers can access. The images collected from NDVI technology will be available online if an agriscience teacher is unable to get the NDVI lab kits in time. We are hoping to make a web-based inquiry website where students can share the images they collect with other agriscience classrooms. As time progresses, supplemental materials will be evaluated for their effectiveness in the classroom. Revisions will be made in accordance to the course mission and learning objectives.

### **Resources Needed**

Course takers will need to have access to the course materials, which is free for the instructor to access once they have contacted the program. Instructors will have access to the NDVI lab aid kits, which will include the NDVI cameras, data collection sheets, and teacher resources if needed once they contact the University of Florida Space Plant Program. NDVI lab aid kits cost an estimated \$25 each, which is covered by grant funding from NASA. A classroom supply will be given for free for agriscience instructors interested in utilizing the lab aid kits. Shipping the lab aid kits to and from classrooms is covered by grant funding, so there is no cost at all for agriscience teachers to use this curriculum.

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## **Tagged to Teach Ag Day: An Immersive Recruitment Event for Agricultural Education**

### **Introduction**

In 2017, the lack of agriculture teacher candidates willing and able to become employed in school-based agricultural education (SBAE) programs resulted in the loss of 73 SBAE programs and 98.5 teaching positions across 27 states (Smith, Lawver, & Foster, 2017). Post-secondary agricultural education degree programs work toward meeting the need of supplying the nation with SBAE teachers in order to reduce these program losses. However, university enrollment numbers have decreased over the past two years (Jaschik, 2017). In a review of the 2017 *Survey of Admission Directors*, Jaschik (2017) reported only 34% of colleges met new student enrollment targets by May 1, down from 42% two years prior. Additionally, academic programs for agricultural disciplines “are still not producing enough graduates to keep up with the need for qualified professionals at the entry level and at further career stages” (STEM Food and Ag Council, 2014, p.14). Between 2006 and 2009, the number of license-eligible agricultural education graduates decreased by 21% (Kantrovich, 2010). This decline in qualified graduates could signal further difficulties in maintaining the sustainability of secondary agricultural education across the nation.

While state data has not been aggregated, the NAAE region in which [University’s] agricultural education graduates commonly seek employment experienced a total of 20 unfilled teaching positions, resulting in eight program closures (Smith et al., 2017). In light of these numbers, successful recruitment into agricultural education degree programs is paramount for the continuation of the industry. Previous recruitment efforts made by the university’s [Agricultural Education Department] have focused on print materials, electronic communication with potential recruits, and one-on-one campus meetings with visiting students. However, in September of 2017, a new recruitment event was introduced to specifically address the needs of the agricultural education field. In conjunction with the National Association of Agricultural Educators’ 2017 National Teach Ag Day, [Agricultural Education Department] implemented Tagged To Teach Ag Day, a recruitment event designed to allow prospective students to experience a day in the life of an agricultural education major at [University].

### **How It Works**

[University] hosted this recruitment event for the agricultural education degree program in conjunction with the National Teach Ag Day. The event was offered to all high school SBAE students in [State] and advertised through emails sent to all [State] SBAE teachers, as well as through [State]’s public Agricultural Education and FFA Facebook pages. The event took place at [University] and allowed students to tour campus, attend two classes available to agricultural education majors, participate in a workshop focusing on the roles and responsibilities of agriculture teachers, and discuss topics such as campus engagement, financial aid, program requirements, and college culture with undergraduates, graduates, and faculty of the [Agricultural Education Department] through a one-on-one speed networking event. The students also participated in two group meals during the event; for breakfast, faculty members and graduate students cooked and served pancakes and sausage to participants, During lunch,

faculty and current students led groups of participants to three off-campus restaurants of their choosing, allowing students to experience a taste of off-campus culture. During both meals, faculty and students interacted with participants via informal conversations within small groups.

### **Results/Implications**

Eighteen participants were asked during informal conversations about their intent to become an agriculture teacher, become an agricultural education major, and become a student at [University] during the breakfast. The majority of students indicated were committed to becoming agriculture teachers in the future, while four had been “tagged” by their teachers and had not considered it before. Eight intended on doing that through attaining agricultural education degree, mentioning routes of alternative certification after majoring in other agricultural disciplines like poultry science, agricultural business, and animal science. Very few of the participants actually considered attending [University], commonly stating distance and price as major deterrents.

As the day progressed, students vocalized further interest in both the degree program and the profession as a result of the event. However, the greatest change was seen in participants’ attitudes toward attending [University]. Students commented on the helpfulness of the financial aid and scholarship information, as well as the friendliness of the students, staff, and faculty. While no formal data was collected to empirically assess the success of the events, anecdotal evidence left the faculty and current students with a positive impression of the event on participants’ perceptions of the university and agricultural education.

### **Future Plans**

Based on informal conversations with the students who participated in the event, Tagged to Teach Ag Day at [University] was enjoyable and impactful, and the faculty hope to see an increase in attendance in the coming years. However, according to Kealy and Rockel (1987), the success of a recruitment event cannot be accurately measured by the number of students in attendance or by how much enrollment numbers change from year to year, but through positive shifts in perceptions regarding an institution. Therefore, in future implementations of this event, pre- and post-tests will be administered to capture participants’ perceptions of campus climate. Elliot and Healy (2001) surmised that campus climate can strongly influence how satisfied a student is with their educational experience and ultimately lead to matriculation.

### **Resources Needed**

Because the recruitment event being hosted on campus, overall costs were kept low. [University] was able to reserve rooms for workshops and networking events that provided adequate space at no charge. The cost of providing both breakfast and lunch for the students was the only major financial charge; the [Agricultural Education Department] supplied \$500 from its recruitment funds for meals. The event relied heavily on the help of undergraduate and graduate students, as well as faculty and staff who volunteered their time and talent to lead student groups, facilitate workshops, participate during networking events, prepare meals, and open their classrooms.

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## **The Use of Virtual Reality Simulations in Agricultural Education**

Submitted to:  
American Association for Agricultural Education  
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Innovative Idea Poster

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### **Introduction/Need for Innovation or idea**

Technology is becoming a necessity in classrooms across the U.S. as it allows curriculum to push past situational barriers and creates opportunities for learners to achieve a broadened scope of the topics they are being introduced to. Studies have shown that the inclusion of such technologies promotes engagement in students through active and collaborative learning, as well as student interaction (Merchant, Z., Goetz, E., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T, 2014).

Perhaps chief among present innovations matching technological advancement and learner-centered education is Virtual Reality programming (Merchant & Goetz, 2014). Virtual reality remains at the forefront of technological advancement within industry and education, being largely utilized in medicine, automotive, aerospace, and entertainment fields. VR technology follows three key principles: immersion, interaction, and imagination (Merchant, Z., Goetz, E., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T., 2014). It can be described from the human-centered perspective as “a medium composed of interactive computer simulations that sense the participant’s position and actions and replace or augment the feedback to one or more senses, giving the feeling of being mentally immersed or present in the simulation” (Sherman & Craig). This ability of the VR technology to transport a participating individual into a simulated reality opens the doors to implementation within educational demonstrations that otherwise couldn’t take place within the context of a traditional classroom. Within agricultural classrooms, VR has the ability to take students on "virtual field trips" where they gain experiences they might not otherwise be introduced to in class due to the safety risk or logistical barriers. However, while proven to be beneficial, VR technology is not currently being utilized to its full extent within agricultural education contexts as research regarding the integration of such programming is lacking.

Just as VR is well documented for its use within medical procedure training because it allows for errors to be made without risk of detrimental consequences, VR can also be a pivotal component of agricultural safety education. Students can enter and react to potentially hazardous situations where they learn from their mistakes and reinforce valuable safety concepts without the fear of injury. This can be especially useful in curriculum interventions regarding tractor rollover safety and prevention. Simulations involving a student's own ability to navigate a tractor through lifelike obstacles on the farm provides the opportunity to stress the importance of preventative measures such as the use of cost-effective rollover protective structures (CROPS) on tractors.

### **How it works/ methodology/program phases/steps**

The University of Kentucky’s College of Agriculture, in partnership with the College of Engineering and College of Public Health, take advantage of today's high end virtual reality technology to give students an opportunity to learn about a common agricultural safety issue with an unusual and innovative approach. The researchers have created a virtual simulation program, where students are put behind the wheel of a virtual tractor, and face some of the everyday obstacles of an average farmer. The program uses the Oculus headset and sensors to place participants into the virtual world that the researchers have created. Once immersed, participants can make observations of their entire surroundings with a 360-degree view. They then use the Microsoft steering wheel and foot pedals to control the tractor and drive through a virtually simulated pasture. Once participants have completed their virtual simulation, a survey with Likert type scales will be administered to inquire about their experiences.

This innovative idea takes advantage of the growing interest in virtual reality to increase success in the classroom. Students are presented with an alternative method of

learning, which in turn can increase student engagement and interest in the topic being presented. Allowing students to explore a simulated world with the potential hazards and obstacles they face working on a farm, creates opportunities for them to realize their risk of having a roll over tragedy without the physical danger present. More specifically, the VRCROPS program was designed to provide students within a traditional classroom setting the opportunity to view and experience scenarios outside the scope of their physical environment and into simulated environments they might not otherwise be able to experience.

### **Results to date/implications**

A beta program has been established and field-tested by various teachers, students, professors and community members. Feedback has been taken and implemented to make the program more effective. To date, there is a running program that captures the importance of tractor safety, specifically in avoiding rollovers and placing an importance on the use of CROPS.

### **Future plans/advice to others**

The VRCROPS simulation is still in the developmental stage, but it is receiving positive feedback from participants regarding its impact and overall purpose. With the input received thus far, the VRCROPS research team plans to enhance the virtually simulated farm environment by expanding the exploration area, increasing the number of hazards present, and improving the authenticity of the simulated tractor's responses while increasing the program's overall quality.

In an effort to continue improvements and progression toward full curriculum integration of the VRCROPS program, surveys will be administered to students and teachers in attendance at agriculturally related conferences, such as the National FFA Convention, following their involvement in a simulated tractor driving experience. Completed surveys will then be analyzed on the basis of three categories: quality of the virtually simulated environment, perceived risk and severity, and tractor operation self-efficacy. The VRCROPS research team plans to synthesize the results of the surveys to finalize the virtual simulation program and implement it into an already established CROPS curriculum intervention for youth in Appalachia. More research will then be conducted to explore the broader implication of VR technology within agricultural education.

### **Costs/resources needed**

Expenses for the creation of the VRCROPS program were provided through a larger, nationally-funded CROPS research grant. Costs associated with this system included the following: VR Ready laptop (\$1300), Oculus VR System (\$399), G920 gaming handle system (\$299), and Unity VR software (Free for personal license).

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**Using a Student Exchange Program to Foster New Agricultural Experiences for Students**

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## Introduction

Experiential learning has had a long history of being a foundational method of instruction in all components of the complete school-based agricultural education (SBAE) program (Baker, Robinson, & Kolb, 2012; Roberts, 2016). One common method of experiential learning in SBAE is through field-based experiences. High impact, field-based experiences encourage students to create new knowledge, connect concepts across curricula, and explore varying perspectives beyond their own (Murphrey, Odom, & Sledd, 2016). In post-secondary agricultural education, field-based experiences, such as travel abroad programs, have been shown to improve students' content knowledge of region-specific agriculture, increase students' sensitivity to other cultures, and grow students both personally and professionally (Bruening, Lopez, McCormick, & Dominguez, 2002). Providing SBAE students high impact experiences, such as traveling abroad, presents many learning opportunities, but is realistically challenging to implement. This innovative idea provided SBAE programs a cost-effective and sensible solution to meet this need. The *FFA Chapter Exchange* program partners two SBAE programs, which are located in different regions of the United States, to "exchange" students for a short duration.

## How it Works

The Vernon-Verona-Sherrill FFA Chapter, located in New York, has organized a series of student exchanges across the nation. Each "exchange" is unique in design, but typically involves trading three to eight students with another SBAE program for a duration of three to eight days. The time of year the exchange occurs can vary according to the needs of the SBAE programs involved, but previous exchanges have taken place during the school year, during a break in the school year, and over the summer.

During the exchange program, each host chapter provides visiting students learning experiences within their region-specific agriculture and culture. Previous exchange programs have given students the opportunity to experience agricultural operations that are far different from those seen within students' home surroundings. Each host program is responsible for organizing activities that it deems to best represent the region and are responsible for any fees associated with the unique experiences. Host programs are also responsible for organizing sleeping arrangements. Past exchanges have used host families that agree to take-in visiting students for the duration of the experience.

## Implications & Results to Date

To date, six student exchanges have taken place that included the states of Wisconsin, Tennessee, Connecticut, New York, North Carolina, and Florida. Each exchange has been highly successful in providing students unique and rich learning experiences that exposed them to region-specific agricultural operations and cultural diversity. Examples of learning experiences included having students tour or work within strawberry operations, citrus groves, peanut farms, large-scale cattle ranches, maple syrup operations, and urban agriculture. Most exchanges allowed students to be immersed in another SBAE program in which they were able to witness the diversity of agricultural education programs (e.g. membership characteristics, size, scope, focus). Previous exchange students reported that they created life-long memories and have

remained in close contact with their host families. Furthermore, some previous exchange students even reported that this experience was the first time in which they traveled outside of their home state. One student reported seeing the ocean for the first time, while another student reported visiting a farm for the first time. The exchanges allowed all participants to be exposed to people who were different than themselves. Being exposed to new experiences, exploring new areas, and working with new people, prepared students for the adult world.

### **Future Plans & Advice to Others**

The Vernon-Verona-Sherrill FFA Chapter plans on continuing the *FFA Chapter Exchange* program. The chapter is eager to establish new collaborations with SBAE programs from areas around the country that are home to unique agricultural operations. Although each exchange program is designed specifically for the chapters involved, advice is offered that comes with experience in organizing and managing such programs. It is hoped that an exchange network is created that can expand the scope of this program to many chapters. It is suggested that exchanges be approached with caution. Ensure that school administration and parents from both schools fully understand what is occurring and approve the exchange. It may be helpful to offer administrators detailed itineraries, contact information, and permission slips. The use of technology, such as internet video calls, can allow students and parents to meet host families prior to travel. Having students make consistent contact (i.e. a daily phone call) with home during the exchange is also recommended. It is recommended by the researcher that programs require students to complete various reflection activities (e.g. daily journaling) during the experience to align with components of experiential learning (Kolb, 1984). Lastly, the researcher recommends that further research be conducted that examines student outcomes from exchange experiences.

### **Costs & Resources**

The cost of conducting an *FFA Chapter Exchange* can vary tremendously. Travel costs are usually the largest expense, especially if the exchange requires plane travel. The Vernon-Verona-Sherrill FFA Alumni has established a scholarship fund to offset students' travel expenses. As discussed above, the host chapter is responsible for costs associated with experiences they provide to visiting students. It is recommended that chapters take advantage of existing networks they have within their local communities to seek cost-effective activities. Host families are also a great resource to this program. It is recommended to find quality host families and to be very appreciate of their time and effort as they ensure that each student's experience is positive. Lastly, the most important resource is the other SBAE program in which the exchange occurs. Networking and establishing good relations with agriculture teachers throughout the nation can create many opportunities for future student exchanges.

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**Using Drone Technology to Enhance Student Motivation and Engagement in a Dual-credit  
Agricultural Mechanics Course**

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# **Using Drone Technology to Enhance Student Motivation and Engagement in a Dual-credit Agricultural Mechanics Course**

## **Introduction**

School-based agricultural education (SBAE) has been identified as a prominent context area for the integration of science, technology, engineering, and mathematics (STEM) content (Haynes, Robinson, Edwards, & Key, 2012; Parr, Edwards, & Leising, 2006). As such, SBAE remains a flexible vehicle for the delivery of many different subject areas that employ many STEM facets, such as natural resource and environmental science, plant science, and agricultural technology and mechanical systems (Phipps, Osborne, Dyer, & Ball, 2008). Focusing on agricultural technology and mechanical systems (i.e., agricultural mechanics), this instructional area alone has a significant history of inclusion within SBAE programs (Burris, Robinson, & Terry, 2005; Wells, Perry, Anderson, Shultz, & Paulsen, 2013), and includes numerous content areas, including machinery and equipment systems, power systems, advanced agricultural technologies, and more (McCubbins, Anderson, Paulsen, & Wells, 2016; Shultz, Anderson, Shultz, & Paulsen, 2014). This diversity can provide numerous teaching and learning opportunities for both teachers and students, particularly as changes in available technologies and techniques continue to expand.

Shultz et al. (2014) indicated that many agricultural education teachers regarded soil and water management topics (e.g., global positioning systems, using surveying equipment, etc.) as important to teach. Interestingly, Shultz et al. (2014) reported that, overall, teachers did not express a great degree of competence in teaching soil and water management topics. McCubbins et al. (2016) noted that many teachers reported an inadequate supply of tools and equipment available to teach the content within this particular skill area. Based upon these prior findings, it is conceivable to conclude that soil and water management skills, including surveying, are important for inclusion into agricultural mechanics curricula, but perhaps investment in the tools, equipment, training background, and, perhaps even curricula, necessary to provide instruction in these topics is lacking. Moreover, it could be postulated that lacking adequate resources could result in substandard or obsolete curricula that lacks engagement on the parts of students. Perhaps a new method of addressing soil and water management skills, particularly one that contextually emphasizes STEM content and one that could increase student motivation engagement, could be useful.

## **How it Works**

The land surveying unit taught in the dual-credit agricultural mechanics course [HIGH SCHOOL] utilized content designed by agricultural education teachers in the early 1990's. It consisted of concepts related to land measurement, using surveying equipment, and introductory profile and differential leveling activities using dumpy levels. The content was, as perceived by the teacher and students, outdated. Many students were, anecdotally, disengaged through this unit, citing it as their least favorite component of their dual-credit course. Moreover, students indicated that the information throughout this unit was archaic, indicating frequent boredom due to the lack of rigor and relevance. While many of the skills taught within this content area are often still utilized within certain contexts of agricultural mechanics, the students were desirous of

a new, exciting, and innovative approach to learning these concepts. In an attempt to modernize the surveying content and increase student motivation and engagement, the SBAE program at [HIGH SCHOOL] purchased four mini-drones and a professional DJI Phantom 3 Advanced Quadcopter Drone with a 2.7K HD video camera to use within the course.

The agricultural education teacher at [HIGH SCHOOL] utilized the mini-drones as an interest approach for the surveying unit. The mini-drones were used to introduce the concept of drone technology and spark further interest through racing. Afterward, the students conducted an inquiry-based activity during which they researched various uses of unmanned aerial vehicles (UAV) and their potential applications within the agricultural industry. This segued into the teacher-developed lesson on the acceptable and safe use of drones within soil and water management and engineering, as well as the relationship to the prior surveying content covered. The students were then able to apply the concepts learned in this unit by learning to operate the professional drone during their agricultural mechanics course.

### **Implications**

Anecdotally, student engagement and motivation improved dramatically when the drones were first introduced within the curricula. The teacher indicated that the students showed excitement about using this technology and it easily became one of the most popular components of the course, as indicated by the course evaluations. Furthermore, student exam scores in the surveying component of the course also showed significant increases over prior years' scores.

### **Future Plans & Advice to Others**

The teacher at [HIGH SCHOOL] plans to continue utilizing drone technology within the agricultural mechanics course, but is also working on developing curricula in order to incorporate the use of drones in additional coursework. Specifically, these other courses include the Environmental Science and Agricultural Leadership and Communications courses. Future goals include incorporating a drone-mounted camera into a wildlife ecology unit within Environmental Science as well as into the video production unit in Agricultural Leadership and Communications courses. However, caution should be taken to ensure compliance with laws and regulations surrounding UAVs, as mandated by the Federal Aviation Administration (FAA).

### **Costs**

The cost of the DJI Phantom 3 Advanced Quadcopter Drone with a 2.7K HD video camera was approximately \$1,000. Additional requirements include a modern, Wi-Fi enabled device to utilize as the controller/monitor. A personal iPad or smartphone, in conjunction with the free downloadable app from DJI, can be used as such. If one is not available, a 32-gigabyte (GB) iPad may be purchased for around \$330.00. The purchase of an additional battery (\$130), as well as spare set of propellers (\$20 per set) for the drone, is recommended as well. The mini-drones cost approximately \$20 each. While their use served as an effective interest approach and were fun to utilize for practice flights, the skill and procedures used to operate them were considerably different than the professional UAV. The mini-drones didn't appear to adequately prepare many students to fly the Phantom 3, and perhaps should not be recommended for such.

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## **Student Perceptions of a First Time Experience with Peer Teaching in a Meat Science Course**

### **Introduction and Need for Research**

One of the many challenges facing instructors today is understanding how their chosen teaching methods impact student knowledge, success and retention of the subject matter. Research states students have preferred learning styles and will excel at a greater level if the instructor teaches as the students prefer to learn (Chew, 2016). However, for many instructors, this is not always feasible due to lack of resources, time, or pedagogical background. Estep, Roberts and Carter (2012) reported that improving the learning of undergraduate students relies on the quality and type of teaching methods presented. Peer teaching has been found to improve student involvement, engagement, active learning, and leadership within and beyond the classroom experience (Estep, Roberts & Carter, 2012). In this study, a Meat Science course previously taught using instructor lecture as the sole teaching strategy for 16 years examined student perceptions of implementing peer teaching in the classroom for the first time.

### **Conceptual Framework**

Anderson (2016) stated, “Learners who are engaged, motivated, and willing to take responsibility for their learning will achieve more than learners who undertake a minimum amount of learning and do not engage with learning opportunities,” (p. 53). Student-centered learning is one approach used to improve student engagement that focuses on work done outside of the classroom, group discussions, presentations, and peer teaching (Lehman, 2011; Stevenson & Harris, 2014; Wright, 2011). Through peer teaching, students are given the ability to share their knowledge of a topic and create an inclusive classroom atmosphere, as all must participate either in the audience or as the peer teacher. Estep and Roberts (2011) found that decision making, problem solving, and leadership are critical for a student-centered approach. As a peer teacher, students are exposed to each of these concepts as they make decisions about how and what to teach. Stevenson and Harris (2014) stated that, “The deepest learning occurs in the absence of the instructor” (p. 103). The peer teaching method offers a way to engage each student as pillars for one another’s learning. To become a mini-expert, students must research extensively on their topic and thus, learn more about it (Johnson, et al., 2016). This approach provides students a stage for engagement. The “teachers” are engaged during the lesson as they present and the audience is more likely to remain attentive while listening to their peers (Courneya, Pratt, & Collins, 2008).

### **Purpose and Objectives**

This study aligned with the AAAE National Research Agenda Research Priority 4: Meaningful, Engaged Learning in All Environments. The purpose of the study was to assess students’ perspectives regarding the implementation of peer teaching in a Meat Science course at [state] State University in the spring of 2017. The objectives were: 1.) Describe students’ academic rank, major, and learning styles 2.) Describe the students’ knowledge change using peer teaching, 3.) Describe students’ perceptions of peer teaching, and 4.) Compare differences in student quiz performance using peer teaching to years that did not utilize peer teaching.

### **Methodology**

The sample was students (N=33) in a Meat Science course in the spring of 2017. An outline of expectations for a 10 minute peer teaching session was provided to students on the first day of class as they were randomly assigned a topic to teach. Peer teaching sessions were taught over a 4 week period. Survey methodology was utilized as students received two questionnaires. Learning styles were assessed at the beginning of the semester using the VARK survey

(Fleming, 2012) to examine any differences in perceptions towards peer teaching. Successive information relating to peer teaching was gathered through a post-pre questionnaire to gain a more accurate measure of knowledge (Taylor-Powell & Renner, 2000). The post-pre questionnaire was administered after all peer teaching topics were completed and asked students to rate their level of knowledge before and after peer teaching, positive and negative perceptions of the experience, and retention of information. All data was entered into Excel and analyzed using descriptive statistics. Content analysis was conducted on written answers which included coding of similarities and differences into themes (Hsieh & Shannon, 2005).

### Results

Usable data was provided by 31 students for a response rate of 93.94%. Students ranged from one sophomore, eight juniors (26%) and 22 seniors (71%). The dominant major represented was Animal Science (n=28). Seven students identified as visual learners, 19 as kinesthetic, and four were mixed visual or auditory learners. Before peer teaching, the majority of students “sometimes” understood the topics. After peer teaching, the majority of students “often understood” the topics. Students expressed several common themes about improvements for peer teaching including more teaching time, handouts, access to slides, a better outline of teaching expectations, and different topics to teach. Five (16%) students believed no changes were needed and one student thought the instructor should teach. Finally, quiz scores from 2011- 2017 were compared on similar topics (Table 1). The overall course grade was not examined because it included several different topics beyond those in the peer teaching sessions.

Year	# of Students	High Quiz Score	Low Quiz Score	Quiz Average
2011	26	93.33	13.33	50.06
2012	27	103.33	10.00	60.58
2013*	28	116.67	38.33	83.45
2014	28	106.67	20.00	57.92
2015	31	101.67	20.00	59.66
2016*	34	123.33	58.33	85.71
2017	33	111.67	26.67	68.97

*Table 1: Students quiz scores in the Meat Science course from 2011-2017. \* Denotes years when group quizzes were given.*

### Conclusions, Recommendations, and Implications

Sixty-one percent of the students identified as kinesthetic learners (Fleming, 2012). Therefore, it is important for teaching strategies to include hands-on learning, touching, and manipulation activities for engagement. Based on the post-pre questionnaire, seven of the 31 students improved knowledge in all topic areas after peer teaching and 27 students improved knowledge in greater than 50% of the topic areas. Next, all students reported they did enjoy some aspect of peer teaching whether it was researching information, listening to peers, teaching others, or simply a change in teaching format from the daily lecture. These results show that students were more involved and responsible for their learning supporting Anderson’s (2016) findings. Almost all students (n= 30) stated that they learned from listening to and leading peer teaching. Overall, peer teaching seems to have benefitted students in this class as the average quiz score in 2017 was higher than any of the previous years, except for those with group quizzes. Different ways of incorporating peer teaching deserves more research. Apart from simply lecturing, peer teachers could provide flipped teaching, research projects, and other ideas to incorporate various learning styles. Further research should include other colleges and classes, and a longitudinal study of this course to note differences or similarities as students and teaching strategies change.

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# [STATE] Agricultural Teachers' Perceptions of Urban and Non-Traditional Agriculture Curriculum & SAEs: An Application of the Theory of Planned Behavior

## Introduction/Need for Research

While studies have been conducted to learn about urban students' attitudes and motivations (Anderson, 2013) and the establishment of urban agricultural education programs (Brown & Kelsey, 2013), little attention has been devoted to understanding how prepared agricultural education teachers are in implementing curriculum, Supervised Agricultural Experiences (SAEs), and career information about the global, national, and regional issues facing agriculture (e.g. climate change, urban agriculture, bioengineering, water quality, food security, bioenergy). Agricultural education teachers have indicated a need for professional development in these areas of new and emerging careers and technology (Perkins, Sorensen, Hall, Dallin, & Francis, 2017). This study fits Priority Three of the National American Association for Agriculture Education (AAAAE) Research Agenda, specifically addressing the need for preparing people to work in a global agriculture and natural resources workforce (Roberts, Harder, & Brashears, 2016). The purpose of this study was to describe agriculture education teachers' perceptions of urban and non-traditional agriculture curriculum and SAEs.

## Theoretical Framework

The theoretical framework for the study was based on Ajzen's theory of planned behavior (TPB) (1991). Attitude, subjective norms, and perceived behavioral control interact with one another to form intent, eventually leading to the behavioral outcome in question (Ajzen, 1991). Attitude represents an individual's summary evaluation of psychological concepts or objects (Ajzen, 1991). Subjective norms are perceived social pressures that influence individuals to act on a behavior one way or another (Ajzen, 1991). Perceived behavioral control (PBC) refers to an individual's perceived ease or difficulty in completing a specific behavior (Ajzen, 1991). Behavioral intention is an individual's perception of the ease of performing the behavior in question.

## Methodology

The target population for this study consisted of [STATE] agriculture education teachers who participated in an Urban Agriculture-Farm and Feed Workshop and tours. Data were collected using a researcher-developed instrument consisting of 28 Likert-scale items to measure the four constructs of TPB and demographic characteristics. A panel of experts familiar with workshop evaluation and the theory of planned behavior affirmed the instrument's content validity. Cronbach's  $\alpha$  for internal consistency ranged from 0.83 to 0.92 for the TPB constructs. Forty-two participants completed the evaluation.

## Results

Roughly 75% of respondents ( $n = 29$ ) completed a traditional teacher certification program. The communities where respondents' schools are located were in metro urban ( $n = 3$ , 7.7%), urban ( $n = 13$ , 33.3%), urban clusters ( $n = 19$ , 48.7%), and rural ( $n = 4$ , 10.3%) areas. Roughly 53% ( $n = 21$ ) identified themselves as female, and 47.5% ( $n = 19$ ) identified themselves as male. The mean age was 36.5 years, with a range from 21 years to 58 years. The distribution of highest level of education obtained was as follows: master's degree ( $n = 15$ , 40.5%), bachelor's degree ( $n = 14$ , 37.8%), some graduate work ( $n = 7$ , 18.9%), and doctorate ( $n = 1$ , 2.7%). The respondents agreed or slightly agreed with the statements measuring their attitudes, subjective norms, perceived behavioral control, and intentions toward integrating urban/non-traditional agriculture concepts

into their curriculum (Table 1).

Table 1  
*Attitudes, Subjective Norms, Perceived Behavioral Control, & Intention to Integrate Urban and Non-Traditional Agriculture Curriculum*

<i>Construct</i>	<i>M</i>	<i>SD</i>
Attitude toward the integration of urban/non-traditional agriculture concepts into participants' curriculum	5.13	0.58
Subjective norms influencing the integration of urban/non-traditional agriculture concepts into participants' curriculum	4.41	0.93
Participants' perceived behavioral control to integrate urban/non-traditional agriculture concepts into their curriculum	4.72	0.77
Participants' intention to integrate urban/non-traditional agriculture concepts into their curriculum	5.01	0.76

*Note:* Scale: 1 = strongly disagree, 2 =disagree, 3 = slightly disagree, 4 =slightly agree, 5 = agree, and 6 = strongly agree.

Table 2 showed respondents had a positive attitude toward and agreed they intended to integrate urban/non-traditional agriculture SAEs with their students.

Table 2  
*Attitudes, Subjective Norms, Perceived Behavioral Control, & Intention to Integrate Urban and Non-Traditional Agriculture SAEs*

<i>Construct</i>	<i>M</i>	<i>SD</i>
Attitude toward the integration of urban/non-traditional agriculture SAEs	5.08	0.57
Subjective norms influencing the integration of urban/non-traditional agriculture SAEs	4.40	0.96
Participants' perceived behavioral control to integrate urban/non-traditional agriculture SAEs	4.73	0.75
Participants' intention to integrate urban/non-traditional agriculture SAEs	5.04	0.72

*Note:* Scale: 1 = strongly disagree, 2 =disagree, 3 = slightly disagree, 4 =slightly agree, 5 = agree, and 6 = strongly agree.

Furthermore, respondents slightly agreed to promote agriculture, food, and natural resource (AFNR) careers to their students ( $M = 4.95$ ,  $SD = 3.49$ ) and school professionals ( $M = 4.28$ ,  $SD = 1.05$ ).

### **Conclusions/Recommendations/Implications**

The findings suggest that the participants held a positive attitude toward integrating urban/non-traditional agriculture curriculum and SAEs, as well as slightly agreed that their subjective norms would want them to integrate it. Additionally, they slightly agreed about having the perceived behavioral control and ability to overcome obstacles affecting their integration of urban/non-traditional agriculture curriculum and SAEs. The researchers suggest implementing the workshop in other states and collecting more data using the instrument. Recommendations for future research include a quasi-experimental design to implement the curriculum in classrooms, measuring students' change in urban/non-traditional agriculture knowledge, participation in urban/non-traditional SAEs, and interest in AFNR careers.

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## [STATE] Agriculture Teachers' Perceptions of Teaching Urban and Non-Traditional Agriculture Content

### Introduction and Need for Research

While agriculture teachers may focus on guiding students into agricultural and natural resource career pathways, many have expressed the need to prepare existing and upcoming agricultural educators with a more extensive set of skills and knowledge to better prepare students for a broader scope of career opportunities in agriculture. Agricultural education programs are expanding across the country, including more programs in urban areas, but agricultural education teachers often have little exposure or experiences related to less traditional agricultural careers that might be found in urban areas. Furthermore, agriculture teachers are often prepared to teach agricultural content through coursework that is very prescriptive and focuses on skill and concept development for set of traditional careers in agriculture (e.g., livestock production). Few teachers are equipped to prepare students for success in agricultural careers in urban and suburban areas or with alternative production and marketing methods that small-scale farmers use. As a result, many students are not adequately prepared for these viable agricultural career options within their local or regional settings. Agriculture teachers simply lack the experience, skills, and knowledge to address these critical issues, and they have indicated a need for professional development in areas of new and emerging careers and technology (Perkins, Sorensen, Hall, Dallin, & Francis, 2017). This study fits Priority Three of the National American Association for Agriculture Education (AAAE) Research Agenda, specifically addressing the need for preparing people to work in a global agriculture and natural resources workforce (Roberts, Harder, & Brashears, 2016). The purpose of this study was to evaluate agriculture education teachers' knowledge, confidence, and level of importance of integrating urban and non-traditional agriculture concepts into their curriculum and Supervised Agricultural Experiences (SAEs).

### Theoretical Framework

The theory of change began as a program planning and evaluation tool, which explains the interventions (activities, workshops, etc.) that can lead to short-term, intermediate, and long-term outcomes and the connections between activities and these outcomes (Taplin, Clark, Collins, & Colby, 2013). Outcomes can represent changes in knowledge and behavior. The purpose and results (outcomes) that the theory of change delivers helps improve interventions and workshop evaluation designs.

### Methodology

The target participants for this study included agriculture education teachers in [STATE]. Participants attended an Urban Agriculture-Farm and Feed Workshop and tours in a centralized location in the state. A retrospective pretest-posttest evaluation was administered at the end of the workshop (Pratt, McGuigan, & Katzev, 2000). Participants rated on a scale of 1 (*very low*) to 5 (*very high*) the level of knowledge about urban/non-traditional agriculture and SAE options, level of confidence/ability to integrate urban/non-traditional agriculture concepts into their teaching, and level of importance of urban/non-traditional agriculture and urban/non-traditional SAE options for their students. Forty-two participants completed the evaluation. Researchers ran paired -

samples t-tests in IBM SPSS version 23. Effect size was computed using Cohen’s d (Thalheimer & Cook, 2002).

**Results**

Of the 42 respondents, 52.5% were female ( $n = 21$ ) and 47.5% were male ( $n = 19$ ). Age ranged from 21 years to 58 years, with a mean of 36.5 years. Roughly 75% of respondents ( $n = 29$ ) completed a traditional teacher certification program. The distribution of highest level of education obtained was as follows: master’s degree ( $n = 15$ , 40.5%), bachelor’s degree ( $n = 14$ , 37.8%), some graduate work ( $n = 7$ , 18.9%), and doctorate ( $n = 1$ , 2.7%). The type of community where the participants’ schools are located ranged from metro urban area ( $n = 3$ , 7.7%), urban ( $n = 13$ , 33.3%), urban cluster ( $n = 19$ , 48.7%), and rural ( $n = 4$ , 10.3%). A paired-samples t-test indicated that the posttest score ( $M = 20.50$ ,  $SD = 2.48$ ) was significantly higher for the respondents’ level of confidence than on the pretest ( $M = 14.31$ ,  $SD = 3.95$ ), a statistically significant increase of 6.19, 95% CI [4.87, 7.51],  $t(41) = 9.49$ ,  $p = .00$ ,  $d = 1.46$ .

Table 1

*Change in Knowledge, Confidence, and Importance of Integrating Urban-Non-traditional Concepts into Curriculum and SAEs*

<i>Construct</i>	<i>Pretest</i>		<i>Posttest</i>		<i>t</i>	<i>df</i>	<i>p</i>	<i>Cohen’s d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Knowledge	14.31	3.95	20.50	2.48	9.49	41	.000	1.46
Confidence	5.55	1.89	7.86	1.57	9.18	41	.000	1.41
Importance	6.86	1.92	8.90	1.21	8.59	41	.000	1.32

**Conclusions**

The knowledge-focused evaluation items suggest that participants learned more about urban and non-traditional agriculture in the state, urban SAE options, and non-traditional agriculture SAE options. The participants also gained confidence in integrating urban/non-traditional agriculture concepts in their teaching and in developing SAEs.

**Implications/Recommendations/Impact on Profession**

The workshop’s curriculum and suggested SAE options would help agricultural education teachers implement urban agriculture and non-traditional agriculture concepts into their curriculum, especially since the majority of participants lived in an urban (greater than 50,000-199,999 in population) or urban cluster (more than 2,500-49,999 in population) area. By teaching these urban agriculture and non-traditional agriculture concepts, these agricultural education teachers could prepare their students for a broader scope of careers in agriculture. One recommendation for future research is to conduct a follow-up survey with participants to evaluate their integration of urban and non-traditional agriculture concepts into their curriculum and the development of urban and non-traditional agriculture SAE projects with their students. Further study should survey their agriculture education students’ knowledge of and interest in urban and non-traditional agriculture careers to measure the effectiveness of the curriculum.

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## [STATE] Farmers' Involvement in Farm to School Programming: An Application of the Theory of Planned Behavior

### Introduction/Need for Research

The U.S. Department of Agriculture Farm to School Census (2015) reported that 35% of school districts in [state] participated in farm to school (FTS) programming, accounting for 349 schools and 220,881 students. Despite the number of schools participating, few studies have sought to examine the perspectives of primary stakeholders, such as farmers, in FTS programming (Izumi, Wright, & Hamm, 2010; Joshi, Azuma, & Feenstra, 2008). Lack of literature on the role of farmers in FTS programming presents a problem for stakeholders interested in program creation and success; this problem aligns with Research Priority Area Two of the National Research Agenda (Roberts, Harder, & Brashears, 2016). Without understanding the roles of all stakeholders involved in FTS programming, the relationships between groups such as farmers and food service directors may not occur and involvement in FTS programs may not increase (Izumi, Alaimo, & Hamm, 2010). Survey results provided information to the [state] State Board of Education's Farm to Fork task force on how to increase the amount of locally sourced products in school systems, expand educational activities in the classroom, and establish more school gardens. The purpose of this study was to describe respondents' role in FTS programming and their interest in institutional marketing of local foods. The research objective addressed in this manuscript was to describe the relationship between respondents' attitude, subjective norms, and perceived behavioral control in predicting intentions to participate in farm to school programming.

### Theoretical Framework

The theory of planned behavior was the theoretical framework for this study. Three factors (attitude, subjective norms, and perceived behavioral control) interact with one another to form intent, eventually leading to the behavioral outcome in question (Ajzen, 1991). Attitude represents an individual's summary evaluation of psychological concepts or objects described in such paradigms as good-bad or harmful-beneficial, forming a positive or negative attitude toward the behavior (Ajzen, 1991). Subjective norms are described as the perceived social pressures influencing individuals to act on a behavior one way or another (Ajzen, 1991). Perceived behavioral control (PBC) is described as an individual's perceived ease or difficulty in taking part in a specific behavior (Ajzen, 1991). PBC is associated with experiences and the expected complications of performing a new behavior (Ajzen, 1991). Although described as an attribute contributing to the formation of intention, PBC also plays a key role in affecting behavior directly (Ajzen, 1991). Behavioral intention is an individual's perception of the ease of performing the behavior in question (Fielding et al., 2008). A general assumption regarding the theory is that the more favorable the attitudes and subjective norms are in relation to a behavior, and the higher PBC, the chances that the individual engages in the behavior becomes greater.

### Methodology

This study utilized descriptive explanatory research. Online survey research methods were implemented to gather information to describe respondents' attitudes toward FTS, subjective norms that influence respondents' participation in FTS programming, participation in FTS activities, perceived behavioral control toward FTS participation, and intention to participate in FTS programming. The population examined in this study was farmers who belonged to the [State] Farm Bureau ( $N = 5,470$ ). The questionnaire was developed by the researchers with some

questions being modeled after FTS programming studies by Conner et al. (2012), Erpelding, Pinard, and Yarooh (2011), and Izumi et al. (2010). Survey data collection methods followed Dillman's (2011) *Tailored Designed Method*. A panel of experts with knowledge in survey methodology or FTS programming established content and face validity. Non-response error was addressed by comparing early respondents to late respondents on key demographic variables, identifying no statistically significant differences between the two groups. One-hundred and forty-three respondents participated in the study.

### Results

Multiple linear regression examined the ability of attitude, subjective norms, and perceived behavioral control to predict farmers' intention to participate in FTS programming. The regression model was significant and indicated good fit, with  $F = 29.60$ ,  $p < .001$ . The three variables accounted for 67.2% of the variance in influence on the intention of respondents to participate in FTS programming (Adjusted  $R^2 = 46.0\%$ ). Table 1 showed that the subjective norm variable significantly predicted the intention of respondents to participate in FTS programming,  $t(112) = 6.12$ ,  $p < .001$ . The perceived behavioral control variable also significantly predicted the intention of respondents to participate in FTS programming,  $t(112) = 4.61$ ,  $p < .001$ . The positive beta values of 0.518 and 0.400 revealed that as the influence of subjective norms and perceived behavioral control increased, so did intention to participate in FTS programming.

Table 1. *Multiple Regression Analysis for TPB Variables Predicting Intention to Participate in FTS Programming*

Variable	<i>B</i>	<i>SE B</i>	95% <i>CI</i>	<i>B</i>	<i>t</i>	<i>p</i>
Constant	- 0.071	0.379	[-0.82, 0.68]		-0.186	.852
Attitude	0.071	0.053	[-0.03, -0.18]	.09	1.347	.181
Subjective Norms	0.518	0.085	[0.35, 0.69]	.46	6.117	.000
Perceived Behavioral Control	0.400	0.087	[0.23, 0.57]	.35	4.613	.000

Note.  $R^2 = .45$  ( $n = 113$ ,  $p < .001$ ). CI = confidence interval for *B*.

### Conclusions/Recommendations/Implications

Attitude, subjective norms, and perceived behavioral control accounted for 67.2% of the variance in intention to participate in FTS programming. These findings suggest other factors contribute to intention to participate in FTS programming. Researchers could investigate other groups of farmers to determine if these components of the theory of planned behavior successfully influence their intention to participate in FTS programming. Researchers should further explore the attitudinal component of the theory of planned behavior to determine if it successfully influences intention to participate in other groups of farmers. Additional factors, such as demographics, knowledge, past involvement, benefits, and barriers should be independent variables analyzed with multiple regression to better predict farmers' intention to participate in FTS programming. Agricultural communicators and Extension professionals have a better understanding of who to work with and how to communicate with farmers interested in FTS programming. With these TPB factors known, it could be easier for Extension professionals to communicate more easily about FTS programming and provide training and resources needed to assist farmers in selling locally grown products and participate in farm to school activities.

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**A Case Study of the Texas Alliance for Water Conservation's Communication Efforts**

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## **A Case Study of the Texas Alliance for Water Conservation's Communication Efforts**

### **Introduction/Need for Research**

An estimated \$20 billion worth of the world's food and fiber is produced in the eight states that span from Texas to South Dakota, also known as the High Plains region in the United States (Little, 2009). Below these states lies 174,000 square miles of groundwater known as the Ogallala aquifer. The necessary and intense use of this water supply combined with the slow recharge rate (Marsh, Peterson, & Williams, 2003) has created the need to place an emphasis on conserving the water available in the Ogallala aquifer.

One effort to address the need to research and communicate water conservation practices is the Texas Alliance for Water Conservation, established in 2006. The purpose of this non-profit organization is to educate West Texas farmers and ranchers about effective and efficient water management techniques to more efficiently conserve water from the Ogallala aquifer. TAWC producers and analysts keep records of crop yields, water usage, and other aspects of crop production. This information is analyzed to determine what the most efficient (both environmentally and economically) farming practices are. Then these TAWC producers communicate with fellow farmers about this information, with the goal to establish a behavioral change in how West Texas farmers and ranchers conserve their water (TAWC, 2016). The purpose of this study was to explore how agricultural producers use TAWC's communication efforts for water management decisions.

### **Conceptual and Theoretical Framework**

The conceptual framework for this study was based on social marketing, which refers to the "efforts focused on influencing behaviors that will improve health, prevent injuries, protect the environment, contribute to communities, and, more recently, enhance financial well-being," (Lee & Kotler, 2016, p. 8). When the goal of an organization is to foster a sustainable behavior, it is vital to emphasize personal contact because it is through personal contact that a person's attitudes and behaviors are influenced (McKenzie-Mohr, 2011).

The theoretical framework for this study was Rogers' (2003) diffusion of innovation theory. The process of diffusion refers to "an innovation communicated through certain channels over time among the members of a social system," (p. 5). For individuals to adopt something new, they must go through the Innovation-Decision Process (Rogers, 2003). The diffusion of innovations theory was an appropriate framework for this study because the implementation of water conservation practices into agricultural operations requires individuals to move through the innovation-adoption process.

### **Methodology**

This study used a case study research design. The lead researcher conducted semi-structured interviews, group observations, and analyzed TAWC documents (project summaries, final reports, and annual research reports) to answer the research questions. Using criterion, stratified purposeful, and snowball sampling, the lead researcher selected individuals who represented three distinct groups to interview to gain different perspectives regarding TAWC's communication efforts. The participants of this study are divided into the categories of TAWC

Staff ( $n = 5$ ), TAWC Producers ( $n = 3$ ), and West Texas Farmers and Ranchers ( $n = 3$ ).

Using a questioning guide, the lead researcher conducted 30-minute semi-structured interviews with these participants. Participants were asked about their awareness and opinion of TAWC and its communication efforts. At the conclusion of the transcription process, the data from the interviews were organized, read and noted, and classified into codes and themes (Creswell, 2013). To address the study's trustworthiness, the researchers followed Guba and Lincoln's (1985) recommendations to establish credibility, transferability, confirmability, and dependability.

### Results/Findings

Interview participants indicated having a personal contact within TAWC is key to awareness. One participant credited a large majority of his awareness and interest in the TAWC project to his relationship with key TAWC informants. These statements suggest there is an opinion leader influence from TAWC staff members. Some of the emergent themes from the interview process was that all participants want to conserve their water, know the importance of water conservation, and have already implemented water conservation techniques to some degree. Participants agreed that any program focused on conserving water while keeping farming profitable is a good thing and they would be open to whatever water conservation techniques the conservation organizations recommend.

Participants stated that they use various communication methods for different purposes; therefore, it is important for TAWC to use a variety of communication methods to deliver its information and reach stakeholders. The various methods of communications used included online media, interpersonal communications, and traditional media. Online media use was key to being aware of the TAWC and recent research, but interpersonal communication was necessary to learn about the TAWC project. To stay informed, one participant, Mr. E, credited the necessity of using a variety of these communication methods to the constant progression of technology and communication channels. Another participant, Mr. A said he believed that the different audience characteristics within TAWC's targeted group is the reason a variety of communication methods must be used.

### Conclusions

For agricultural producers to become aware of TAWC and interested in the organization's activities it was helpful to know someone else in the project. McKenzie-Mohr (2011) noted it is important to emphasis personal contacts when encouraging sustainable behaviors, and Rogers (2003) acknowledged the role of change agents in the diffusion of innovations. Communications use by the TAWC are varied in methods in order to serve a diverse audience and meet the different preferences of its stakeholders.

### Implications/Recommendations

TAWC should continue using a variety of communication channels to reach agricultural producers, but rely on interpersonal communications as its primary communication method. The TAWC could also host workshops or webinars for producer members of the project to help them become more effective communicators. Future research could determine how the TAWC project changes in terms of its communication efforts to meet its stated goals, as well as

determining the communication preferences and habits of its audience members.

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## **A Comparison of the Safety Education Exposure Levels of Students Participating in the 2003 and the 2013 [STATE] Agricultural Mechanics Project Show: Are students more safe 10 years later?**

### **Introduction/ Conceptual Framework**

In the U.S., agricultural education has historically been focused using a three-circle model with the three various components working together. These three components consist of classroom/ laboratory instruction, the FFA, and Supervised Agricultural Experience projects (SAE). School-based agricultural education programs offer many unique hands-on opportunities for students, not only in the agricultural industry, but also in academia and life (Hubert, Ullrich, Lindner, & Murphy, 2003).

Agricultural mechanics classes continue to be one of the most popular curriculum choices for agriculture students today (Hubert & Leising, 2000; Perry, Williams, & Anderson, 2012). When school administrators and teachers commence a laboratory learning experience with their students, they assume the responsibility of providing an accident free environment for the learner (Gliem & Miller, 1993). Of all the tasks and duties of an agricultural science teacher, student safety while working in an agricultural education laboratory is the most important task (Dyer & Andreasen, 1999). Mahon (1975) found that the primary responsibility for providing student safety instruction and a safe learning environment rests with the teacher. Numerous studies concerning safety in agricultural education laboratories have found that these environments can have potential safety hazards relating to noise (Miller & Schimpp, 1993), ventilation (Madou-Bangurah, 1978), and student and teacher attitudes regarding safety (Laird & Kahler, 1995; Lawver & Frazee, 1995). Additionally, students may be exposed to many different tools and materials, some of which are potentially hazardous to their health or could cause serious injury — including death (Johnson & Fletcher, 1990). These laboratories can become dangerous if students are not required to adhere to certain safety guidelines and procedures. With adequate safety education in place, laboratories are an essential venue for learning industry-related skills and gain work experience (Daclan, 2013).

In a recent study by Shultz, Anderson, Shultz, and Paulsen (2014), researchers found that Iowa agriculture teachers perceived safety in the agricultural mechanics classroom/laboratory as being of utmost importance; hence, out of 54 agricultural mechanics competencies that teachers identified as important, seven of those were safety related. In 2012, Perry, Williams, and Anderson, found that 15.4% of Texas agricultural science teachers reported that they do not require students to wear safety glasses or proper personal protection equipment (PPE) while working in the laboratory during hazardous conditions. Another safety study conducted in 1999 by Gerlovich, Whitsett, Lee, and Parsa found that 59% of teachers in Wisconsin had never received any type of safety training and only 14% of the teachers surveyed knew the purpose of Material Safety Data Sheets. As educators, our role in safe laboratory instruction is paramount as the popularity of agricultural mechanics courses increase in public schools.

Furthermore, in teacher preparation programs across the U.S., the instruction of the curriculum area of agricultural mechanics is a critical component in the preparation of new

teachers for classroom/laboratory instruction. (Burris & Robinson, 2005). Based upon a review of literature, a conceptual framework based upon the need for safety education in agricultural education laboratories was found and still present to this day.

### **Methodology**

The purpose of this non-experimental, quantitative census was to understand the extent of safety education provided to the 2013 [STATE] Mechanics Project Show participants ( $N = 632$ ), by their respective agriculture teachers and compare those results to data collected in 2003 by Ullrich, Pavelock, Muller, and Harrell (2005). Additionally, injury intensity and demographic characteristics of the participants were also explored. The instrument was judged to be valid (face and content) by a panel of experts ( $N = 5$ ). Data was collected via a booklet style survey that contained two sections (demographic information and questions concerning safety education). Within the safety education section of the instrument, age specific questions were offered to the respondents. Because the instrument was merely collecting demographic information about the participants, reliability of the instrument was of minimal concern to the researchers. Surveys were individually delivered to each student at each project during the 2013 [STATE] show. A response rate of 100% was achieved from all participants. Data was analyzed using IBM SPSS Statistics ® 22.0 and frequency and percentages were reported.

### **Results**

Analysis revealed that students had more positive levels of safety education exposure in [STATE] agriculture classrooms in 2013 than in 2003. The top three increases in student exposure to safety education were in the following categories: *hearing protection was required when working in the agricultural mechanics laboratory* ( $\Delta n = 325$ ; 46.64%), *teacher conducted tool safety demonstrations* ( $\Delta n = 321$ ; 39.64%), and *eye protection was required when working in the agricultural mechanics laboratory* ( $\Delta n = 313$ ; 36.90%). The top three decreases in student exposure to safety education were in the following categories: *CPR instruction* ( $\Delta n = -191$ ; -51.04%), *green house safety* ( $\Delta n = -154$ , -44.30%), and *student safety exams are kept on file at school* ( $\Delta n = 13$ ; -21.64%). Overall, students received more safety education exposure in 11 of 18 competencies as measured by the instrument.

### **Conclusions/Implications/Recommendations**

Based upon the 18 measureable competencies in the survey instrument, the majority of participants in the 2013 study received more safety education exposure than students in 2003. However, the majority of students surveyed did not receive CPR instruction by their agriculture teacher. Additionally, the majority of students did not witness nor receive injuries in the agricultural education laboratory that required on or off campus medical treatment. Implicative questions arose from the results of this study that include: (1) Are agricultural science teachers certified in CPR? (2) If yes, then why do they not instruct CPR to their students? (3) Should teacher education programs require that all new teachers be CPR certified? (4) Based upon the large number of students who were injured in agricultural education programs, should these laboratories be inspected for safety? These questions and others are grounds for future research in the area of agricultural laboratory safety. Based on the results of this study, the researchers recommend that all agricultural education laboratories be investigated to ensure that a safe learning environment is established for all students — especially CPR training for teachers.

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**A World without Citrus: How will we make our Margaritas?**

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## **A World without Citrus: How will we make our Margaritas?**

### **Introduction**

Citrus greening, a citrus disease spread by an invasive insect, has reached all major citrus producing states in the United States (US) and has been identified in every commercial grove in Florida (Kelley, 2017; Teague, 2017; UF/IFAS Citrus Extension, 2016). Because this disease decreases the production and viability of citrus trees, orange juice prices are expected to increase (Perez, 2017). However, citrus consumption is predicted to increase (United States Department of Agriculture-Foreign Agricultural Services [USDA-FAS], 2016), which makes citrus greening an issue for consumers and producers alike. If the disease continues to spread, consumers will no longer have affordable or domestic options for citrus to be used for snacks, juices, home goods, or mixed drinks (Florida Department of Citrus, 2017). Currently, there is no cure for citrus greening (Singerman & Useche, 2016), but research points toward biotechnology as a potential and likely long-term solution (Voosen, 2014). Yet the industry remains concerned that if the public is not willing to accept this new biotechnology in citrus, the industry will collapse (Voosen, 2014). To help agricultural communicators and Extension professionals develop communication and education programs related to citrus greening, there is a need to understand how the public will react to information related to potential solutions for the disease. In accordance with priority area 2 of the national research agenda (Lindner, Rodriguez, Strong, Jones, & Layfield, 2016), the purpose of this study was to understand consumers' ability and motivation to process information related to solutions for citrus greening.

### **Conceptual Framework**

The elaboration likelihood model (ELM) of persuasion was used to guide this study. This theory proposes that people will use one of two processing routes to inform their attitude when presented with information (Petty, Brinol, & Priester, 2009). The central processing route will be used when people have the motivation (e.g. personal relevancy) and ability (e.g. knowledge) to process the information (Petty & Cacioppo, 1986). In these cases, people elaborate upon their past experiences, and if the message elicits more or less favorable thoughts, a long-lasting change in attitude occurs. When people do not possess motivation and/or ability to process the information, they move through the peripheral processing route (Petty & Cacioppo, 1986). These individuals rely on peripheral cues, like message source or imagery, to inform their attitude. If an attitude change occurs, the new attitude is not strong or predictive of behavior (Petty & Cacioppo, 1986). Past research has concluded that consumers typically use the peripheral processing route when presented with information about agricultural and life science topics because they do not possess the motivation to elaborate upon the messages (Krause, Meyers, Irlbeck, & Chambers, 2015; Ruth & Rumble, 2017).

### **Methods**

Qualitative data were collected through focus group research to fulfill the purpose of the study. Eight, 90-minute focus groups ( $n = 73$ ) were conducted in four regions of the US in January 2018: two citrus producing states (Florida and California) and two major media markets (Illinois and New Jersey; Nielsen, 2016). The purpose of these focus groups was to understand consumers' perceptions of biotechnology solutions used to combat citrus greening. Participants were told what citrus greening was before reading information about different technologies, like genetically engineered trees, a genetically engineered virus, and a topical spray, that could be used to combat the disease. Participants were asked how they felt about these solutions and their

likeliness to purchase citrus produced with the technology. A priori coding of the transcripts was used to understand the participants' ability and motivation to process the information delivered in the session (Kuzel, 1999). Peer debriefing served as an external check for analysis and an audit trail for coding was recorded (Lincoln & Guba, 1985).

### Findings

When assessing participants' *ability to process* the communication about citrus greening, it became apparent they did not have the knowledge necessary to evaluate the information. "I have never heard of citrus greening," said a New Jersey participant. The description of the potential solutions to citrus greening were met with questions rather than thoughts about the solutions. These questions included, "Is citrus greening even in the US yet?" (IL); "Is this technology real?" (CA); and "What will this technology do to the tree? How will it affect the tree and the environment?" (NJ). Participants agreed, "we need more information" (CA). The lack of citrus greening knowledge also appeared to influence *motivation to process* communication about the technology. An Illinois participant said, "It is hard to care about a solution that you have not heard about." Motivation to process information also appeared related to understanding the severity of the disease. For example, a participant in Florida said, "people need to be aware the citrus industry is dying before they can react to communication." Participants also asked "What is the scope of this issue?" (IL), and "Why are we discussing it now?" (NJ). The personal relevancy of citrus appeared to influence motivation as well. While some participants stated "citrus greening doesn't affect me, so I don't care," (IL), others described how they "couldn't imagine [their] grandchildren not being able to eat an orange in the future," (FL). When an Illinois participant said he decided he could live without citrus, another one replied, "Well I need them for my mimosas!" Similarly in Florida, when participants were discussing a future without citrus, one replied, "What will we make our margaritas with [if there is no citrus]?"

### Conclusions & Recommendations

These focus groups revealed that participants' ability and motivation to process information related to citrus greening was low (Petty et al., 2009). Their lack of knowledge regarding citrus greening appeared to inhibit their ability to process the information about potential solutions and only led participants to asking questions. The focus groups also revealed a general lack of understanding for the severity of the citrus disease, which decreased the participants' motivation to care about the information. Despite the fact that some people believed the disease would not affect them personally, many indicated they wanted citrus for their families or to use in drinks. Due to a lack of ability and motivation to process the information, participants appeared to not use either ELM route and retained their initial attitudes (Petty, et al., 2009). Rather than elaborating on the information or assessing peripheral cues (Petty & Cacioppo, 1986), the majority of participants only expressed questions or said they did not know enough to think one way or another. Practitioners need to be cognizant of this finding as they develop communication related to citrus greening. Consumers first need to know a problem exists to have the ability to process communication about viable solutions. Focusing communication on the severity of citrus greening could help to increase consumer motivation to process future communication about solutions. Personal relevancy of the information could be increased by framing messages around a hypothetical world without citrus in children's lunches or a world without mimosas, margaritas, sangria, etc. These message strategies should be tested in a survey of a random sample of the population to help generalize the findings. This research should also be considered when developing communication for other problems facing the agriculture industry.

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**Agricultural Education and Mathematics Performance among Secondary Students**

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# **Agricultural Education and Mathematics Performance among Secondary Students**

## **Introduction**

Mathematics and science achievement of United States (U.S.) students continue to lag behind other technologically developed nations as revealed by The Third International Mathematics and Science Study, TIMSS (Mullis, Martin, Foy, & Arora, 2012). Several reasons for this lag include: unimaginative instructional methods, inexperienced teachers and lack of connection between school mathematics and the day-to-day life experiences of students. Mathematical literacy and knowledge is required for one to pursue most college degree programs and also to compete in the technology driven workforce. Most students will learn mathematics best when they see the connection between the concepts learned in school and their real life applications (Theriot, Kortlik, & Jabor, 2009). According to Ladson-Billings (1997), agricultural education provides a context in which students can explore key biological and mathematics concepts and skills. However, limited studies have been conducted looking at mathematics performance of high school agriculture, specifically as mathematics performance is related to FFA and Supervised Agricultural Experience (SAE). Anderson and Driskill (2012) indicated that agricultural education is a content area that is rich in mathematics concepts.

The purpose of this study was to determine if agricultural education, FFA involvement and SAE participation of high school students have any effect on students' performance in mathematics. The main research questions for this study were: 1) how does the mathematics performance of agricultural education students compare to non-agricultural education students? 2) What is the relationship between FFA and SAE participation and mathematics performance of agricultural education students?

## **Theoretical Framework**

This study is grounded in Dewey's (1938) experiential learning theory, Doolittle's and Camp's (1999) constructivism theory, and Lave's and Wenger's (1991) situated learning theory. These theories support contextualized learning of mathematics. Experiential learning is learning in real-life contexts, and it involves learning by doing, solving problems or conducting projects. Constructivism posits that: learning should occur in genuine real life settings; learning should assimilate in social interactions; subject matter should be relevant to students; content should be connected with previous skills; students should become self-regulated learners in the process; teachers should act as facilitators; and teachers should encourage learners to represent content and learning in different ways. The essence of situated learning theory is that knowledge should be presented to learners in real context with settings and applications that would normally involve that knowledge.

## **Methodology**

The research employed a posttest-only causal-comparative control group research design also known as *ex post facto* (Leedy & Ormond, 2005). The target population for this research was students from a large comprehensive urban high school. Data related to research questions were collected from two populations. The first population was students enrolled in Agricultural Education programs at the school while the second population was students who were not enrolled in Agricultural Education courses. A convenience sample of 139 participants was used in the study. The researcher-developed instrument contained questions addressing students'

demographics and a rating scale for SAE and FFA involvement. The instrument also included 25 mathematical questions that indicated competency on Mathematics Standards of the Common Core State Standards Initiative. The researcher-developed instrument was reviewed for content validity (Leedy & Ormond, 2005) by a panel of experts. The Cronbach's alpha for the 25 items was 0.7. IRB approval for the study was granted. Data were analyzed using SPSS software. Frequencies and percentage distributions were obtained for all data. Means and standard deviations were used to analyze and interpret data. The researcher then carried out t-tests for the second part of the survey to determine impacts of agriculture coursework, FFA, and SAE.

### **Findings**

Overall mathematics scores ranged from a low of three to a maximum of 23 out of 25. The mean mathematics score for all participants was  $M=11.53$ ,  $SD=4.27$ . There was a low, positive, and significant relationship between number of agriculture courses and math scores,  $r(78) = .26$ ,  $p < .05$ . The average score for agricultural students was  $M=12.15$ ,  $SD=4.61$  while that of non-agricultural students was  $M=10.67$ ,  $SD=3.63$ . An independent samples t-test showed that the difference between the two groups was statistically significant [ $t(137) = 2.03$ ,  $p=0.04$ ] at an alpha level of 0.05. There was a moderate, positive, and significant relationship between level of FFA involvement and math achievement,  $r(78) = .35$ ,  $p < .05$ . FFA members had a mean of  $M=15.77$ ,  $SD=4.07$  while non-FFA agricultural students scored  $M=11.45$ ,  $SD=4.41$ . There was a significant difference between the two means [ $t(78) = 3.275$ ,  $p=0.002$ ]. Results showed a low, positive, and significant relationship between SAE and math scores,  $r(78) = .23$ ,  $p < .05$ .

### **Conclusions**

This study supports Theriot, Kortlik, and Jabor (2009) as it determined that FFA, SAE, and number of agricultural education courses passed were related to mathematics performance of high school students. Agricultural education program embraces experiential learning concept which engages students with hands-on learning environments that are rich with real life applications of mathematics (Shinn et al., 2003). If improving mathematics is a goal, agricultural education courses should be viewed as a viable option, not a wasted course. Agricultural educators and other decision makers should encourage FFA and SAE participation as well.

### **Recommendations**

This study has a great significance to agricultural education and the general school community, as it will help agricultural educators and others understand the potential for academic achievement in mathematics if students will enroll and then be fully engaged in a total program of agricultural education. This study will also help justify the importance of an Agricultural Education program, including FFA and SAE in the secondary school system.

The results of this study are limited to a comprehensive urban school in one state. Additional studies, with randomization, are recommended across that state and also across the nation. Since this was the first time the instrument was used, modification of the instrument is also recommended.

Additional research of a larger scope is suggested to examine the impact of specific agricultural education courses (i.e. agricultural mechanics, agriscience for science credit, etc.) on mathematics performance as well as academic achievement in other areas. Future research should also analyze student success on specific standards.

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# **Agricultural Students' Perceptions of being taught with Curriculum for Agricultural Science and Education (CASE)**

## **Introduction**

Many agricultural education programs have incorporated hands-on or experiential learning activities, not only as a way to teach their students, but to allow students to develop different skills to be successful within the agricultural industry (Johnson, Wardlow, & Franklin 1997). When inquiry-based learning and hands-on learning is used within a classroom, the students are deeply engaged in the learning process (Wells, et al., 2015). Dyer and Osborne (1995), stated "students react differently to different teaching methods, and that the selection of the proper method is critical to the learning style of those being served by the instruction" (p. 260).

Curriculum for Agricultural Science and Education (CASE) was created in 2007 by the National Council for Agriculture Education and allows students to obtain hands-on experiences (CASE lesson development, 2012). The goal of creating CASE was to implement a national curriculum for secondary agriculture education and incorporate inquiry-based learning (CASE, 2012). CASE uses the activity, project, and problem-based model for instructional strategies giving students the chance for hands-on activities (CASE, 2012 p. 1). The CASE curriculum can be used as a way to allow students start to guide their own learning through critical thinking (Lambert, Velez, & Elliott, 2015). Many studies have been conducted to understand the teacher's perceptions of using CASE in agricultural classrooms, however, students' perceptions of being taught by the CASE curriculum have not been explored.

## **Theoretical Framework**

The theoretical framework used for this study was Leagans Major Elements in a Teaching-Learning Situation (n.d.). This model includes five factors that influence the teacher-learning situation (Prawl, Medlin, & Gross, 1984 p.108). The factors are the teacher, learner, subject matter, physical facilities/environment, and instructional materials/methods. All of the factors are interconnected and directly affect the quality of the learning experience (Seevers & Graham, 2012). The teacher and learner bring different backgrounds and experiences to the learning situation. If the different backgrounds and experiences differ too much between the teacher and learner, the learning situation will be compromised (Seevers & Graham, 2012). Subject matter can be formatted to fit the predetermined learners and can be adjusted based on the learners needs (Seevers & Graham, 2012). The instructional materials/methods must be applicable to the learner's backgrounds and previous experience and must be related to the subject matter (Seevers & Graham, 2012). There must also be an available physical facilities/environment to allow for learning to occur (Seevers & Graham, 2012).

## **Methods**

The purpose of this qualitative study was to determine the students' perceptions of CASE curriculum. For this study, researchers posted flyers in a collegiate agricultural orientation course to obtain participants who were freshmen and transfer students who took CASE Curriculum courses in high school. All six participants selected for the study indicated they had taken more than two CASE curriculum courses. The instrument developed for this case study was a focus group interview protocol asking each participant 11 open-ended questions over their experience regarding the CASE curriculum. Demographic information from the participants was collected and questions focused on the subject matter, instructional materials, and physical facilities available of CASE.

The focus group's interview was recorded with a basic audio-recording device. Data field notes were taken and stored in a secure location. Research logs, peer review of data, and member checks were used to ensure trustworthiness, credibility, and reliability of data (Lincoln & Guba, 1985). Very detailed procedures were utilized to ensure a high level of dependability. This includes the use of peer review, transcribing data following the interview and utilizing participants for the accuracy of the transcripts. Braun and Clark (2006) theoretical analysis was used to analyze the data. Researchers identified, analyzed, and reported the themes that emerged from the focus group (Braun & Clark, 2006).

### **Results**

Of the students who participated in the study, five were females and one was male. Three of the students did not have any agricultural background, but indicated they grew up in a rural setting. The first theme which emerged by students was CASE courses were very student-centered and focused on hands-on learning. Three of the students indicated their agriculture teacher bounced around in the CASE curriculum, but also connected it back to what was happening in the industry. One student said, "I liked the way our teacher bounced around because she taught it in an order she thought was best fitted for the type of classes we were in or the backgrounds of the students who were in the class."

A second theme focused on challenges students had with the CASE curriculum where students indicated the problems they experienced were with equipment and instructions that were lengthy and wordy. One student explained, "The soil probes got irritating because sometimes they would work and sometimes they wouldn't and you kind of lost focus of what exactly you were supposed to be getting out of the lesson." The third theme identified by students was the objectives guided the learning. Students who were not from an agricultural background found the objectives especially helpful. In addition, the students agreed it was very structured. One student explained, "If you build a house on concrete all the stuff that comes after it will stand. If you build it on sand it's going to fall down."

The fourth theme identified, was the CASE curriculum kept agricultural teachers more on schedule which kept the class consistent. One student said,

"There was actual consistency in CASE courses. My other agriculture teacher who taught farm business management did not use CASE and by the end of the class it was more of a do whatever you want for the rest of the class."

Students were asked about the amount of science that was incorporated into the CASE curriculum. One theme identified by students was that the curriculum had a good balance of science and was easily relatable to agriculture. The layouts of the classrooms were similar among all students.

### **Conclusion/Recommendations/Implications**

Overall, students involved in this focus group were very supportive of the hands-on experiences the CASE curriculum incorporated into classrooms. The hands-on experiences allowed students the ability to connect ideas from class to make sense in different hands-on opportunities. Hands-on experiences allow students to learn the content in a more enjoyable way (Johnson et al., 1997). The findings of this study are limited to the perceptions of the study's participants. Future research should be conducted with a larger audience in multiple high school CASE certified programs across the country. Additional research should focus on how teachers are implementing the CASE curriculum in their classroom.

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**Aligning Industry Certification and Industry-Specific Skills: A Delphi Study Determining the Skills Needed for Entry-level Positions in Animal Science**

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## Introduction

A foundational relationship exists between workforce readiness, commercial industry, and public education (McNamara, 2009). Deficiencies in the number of graduating students who have the knowledge and skills required by industry are leading to a skills gap across the country (Whittaker & Williams, 2016). In efforts to improve students' college and career readiness, governing agencies in education have created higher academic thresholds. The use of standardized testing is one such example. Dalal and Gunderman (2011) suggested that while student preparation for standardized testing reinforces a foundation of academic knowledge, other student learning outcomes, such as skill capacity, are often ignored. Proponents of Career and Technical Education (CTE) suggested that educational programs designed for students to acquire industry-specific skills for the twenty-first century offer a solution to this problem (Rojewski & Hill, 2017). Many states, including Florida, have created specific secondary school education course pathways and industry certification exams to establish a more concrete link between industry needs and the content that is taught in CTE programs. Students completing a CTE pathway and passing the pathway's exam earn an industry certificate. The goal of industry certification is to produce highly qualified graduates who are career ready for specific entry-level positions. However, research that examines the technical skill-based competencies needed for specific entry-level positions is limited (Fletcher & Tyson, 2017).

## Purpose and Framework

The conceptual framework that guided this study is Roberts and Ball's (2009) *content-based model for teaching agriculture*. This model illustrated that competent educators who possess technical knowledge and teach industry-validated curriculum influence the skill acquisition of high school CTE students (Roberts & Ball, 2009; Slusher, Robinson, & Edwards, 2011). There is a clear need to examine the effectiveness of industry certifications to determine if students who have obtained an industry certification, are in fact, proficient in the skills required of entry-level positions within that industry. This research focused on industry needs, and specifically narrowed the scope of the study to animal science industry certification. The objective of the study was to identify the skill-based competencies needed for an entry-level animal science career.

## Methods

A modified Delphi technique was employed as the research instrument for this study. A modified Delphi technique can be used to provide a synthesis of insight and knowledge from experienced personnel when distant communication is convenient (Stewart, 2011). The following steps were followed, as recommended by Geist (2010): (1) establish a panel of experts on the topic who are willing to participate, (2) deliver round one of the Delphi where panelists complete an initial question, (3) analyze the responses and build a succeeding questionnaire, (4) deliver round two of the Delphi where panelists complete the succeeding questionnaire, and (5) repeat the third and fourth step until a consensus is reached. Three faculty members in the Department of Animal Science at the University of Florida were asked to provide a list of industry experts that was used as the sampling frame for this study. Sixteen animal science industry experts were identified and asked to complete the research instrument, with nine industry experts agreeing to

participate. It was determined that nine panel members were a sufficient number of participants in the Delphi, as subjects were highly qualified experts and had homogeneous backgrounds (Delbecq, Van de Ven, & Gustafson, 1975). Furthermore, it is recommended that researchers should use the minimally sufficient number of experts that can appropriately represent the pooling of judgments (Delbecq, Van de Ven, & Gustafson, 1975; Ludwig, 1994). E-mail invitations were sent to each panel member for all three rounds throughout the study. A follow-up email was sent to panel members who did not respond in a timely manner in attempt to withstand any substantial dropout rates (Okoli & Pawlowski, 2004). To create the first stage of the Delphi, open-response, email communications were sent to all participants that asked “What are the skills and competencies that an entry-level employee/entrepreneur needs to be able to perform in the animal science industry?” Seventy-three skill competencies were identified and utilized for the corresponding Delphi round. During the second and third round, panel members used a survey created on Qualtrics to assess and rate each skill competency through a five-point, Likert-type scale (*1=unimportant, 2=somewhat unimportant, 3=neither important nor unimportant, 4=somewhat important, 5=important*). Skill competencies that achieved a mean rating of 4.00 or higher were considered to have reached consensus as a necessary entry-level skill for an animal science position (Slusher, Robinson, & Edwards, 2011).

## Results

After completion of the modified-Delphi, it was determined that 55 skill statements achieved a consensus of being a necessary entry-level skill. The skill competencies determined the most important were accurately reading a feed label and understanding animal herd movement, fecal patterns, and eating behavior. The ability to effectively administer oral applications, topical application, pour-on insecticide, wormer/worming agents, vaccinations, and antibiotics were also identified as important. Lastly, non-technical skills, such as basic math, reading, and communication skills, were considered to be highly important. Skills that did not achieve consensus as being essential, but were initially identified, include animal age identification, internal parasite knowledge, and administering intravenous, intradermal, and intraperitoneal injections.

## Conclusions & Implications

Industry-specific pathways in CTE can strengthen the relationship between workforce readiness, public education, and industry. This relationship is a vital component to the sustainability of CTE programs. Results of this study identified skill competencies deemed essential in entry-level animal science careers. CTE programs that offer animal science career pathways should give special attention to these skills, modifying curriculum taught in animal science pathway courses if necessary. Furthermore, non-technical skills, such as basic math, reading, and communication skills, were identified as being highly important. Integrating math, reading, and communication into contextual applications in animal science courses may strengthen these general workplace skills. Lastly, as the capstone of many CTE pathway programs, industry certification aims to distinguish students who will be proficient in the workplace. The criteria to achieve industry certification should align with industry needs in order for industry certification to be effective. Phase two of this larger study will seek to determine if students who have completed industry certification in animal science can perform skills identified in this Delphi, and therefore bridging the gap between knowledge and practice.

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**American Indians: The Under-Underrepresented Population  
in Agriculture**

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## American Indians: The Under-Underrepresented Population in Agriculture

### Introduction

In Priority Area 3 of the *American Association for Agricultural Education National Research Agenda: 2016-2020* (Stripling & Ricketts, 2016) a call was made to increase diversity within the agricultural workforce. While 61% of the annual job openings in the agriculture industry will be filled with recent agriculture graduates (Goecker, Smith, Fernandez, Ali, & Theller, 2015), this sector of the economy has struggled to attract underrepresented students (Talbert & Larke, 1995). Recently, however, colleges and departments of agriculture have witnessed an increase in minority undergraduates (United States Department of Agriculture, 2014). African, Asian, and Hispanic or Latino American students are most often identified as those groups making up the underrepresented population for which increased enrollment is observed or desired. However, conspicuously missing from these lists are American Indian students.

Attempting to improve the participation of American Indians in the agricultural workforce by increasing enrollment in post-secondary agriculture programs will be challenging, at best. Among Whites, African, Asian, and Hispanic or Latino Americans, the post-secondary student demographics resemble the most recent United States population demographics (Kena et al., 2016; United States Census Bureau, 2017) however, this is not the case for American Indians. American Indians and Alaska Natives constitute approximately 1.7% of the United States population (United States Census Bureau) yet, less than 0.6% of the 17.3 million undergraduates enrolled in post-secondary education were American Indians or Alaska Natives (Kena et al.). Regarding agriculture specifically, of the 27,609 students, in the United States, who graduated with a bachelor's degree in agriculture in 2013, 0.8% were American Indian or Alaska Natives (National Science Board, 2016). However, these statistics may be misleading or even inflated, as the American Indian demographic is consolidated with Alaskan Natives, thus complicating the ability to truly discern accurate enrollment statistics. The incongruity of the proportion of American Indian students studying agriculture, relative to the general student population justify the need to further investigate this demographic. Therefore, the purpose of this study was to explore the factors which contribute to the intentions of American Indian students to pursue agriculture as a college major.

### Theoretical Framework

The theory of planned behavior served as the foundation for this study as it “provides a useful conceptual framework for dealing with the complexities of human social behavior” (Ajzen, 1991, p. 206). Furthermore, this theory provides a “means of understanding students’ decisions to act and can allow the development of programs to meet targeted students’ needs” (Murphey, Lane, Harlin, & Cherry, 2016, p. 14). Ajzen and Fishbein (2005) suggested that an individual’s behavior is a result of the combination of beliefs, attitudes, and intentions. Ajzen (1991) posited intentions precede behavior and presented a model that depicts the influences on intention. Ajzen (2006) explained that individuals act on behavioral decisions based upon *behavioral beliefs* (what one thinks the outcomes of the behavior will be), *normative beliefs* (what other people think about the behavior), and *control beliefs* (what one understands about the factors that facilitate or discourage the behavior).

**Methodology**

This was a quantitative case-study. The study participants were all secondary agriculture students (N = 75) at a public high school located on a federally recognized Indian reservation in [STATE]. The researcher developed survey was based upon the work of Frazee, Wingenbach, Rutherford, and Wolfskill (2011). The survey included 5-point Likert-type statements, with answer choices ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*), and related to agriculture as an academic subject, college major, and career, with additional questions focused on academic and social support for pursuing higher education in agriculture. Upon approval to participate, all students completed the online survey over a two-day window during their scheduled agricultural education class. All study participants (100%, n = 75) identified themselves as American Indian and included Freshmen (14.7%, n = 11), Sophomores (17.3%, n = 13), Juniors (21.3%, n = 16), and Seniors (46.7%, n = 35) with an average age of 16.9 years.

**Findings**

Multiple regression analysis was used to determine if a model existed explaining a significant portion in the variability in the students’ intentions to major in agriculture as measured by their attitudes toward agriculture as a subject and career along with their academic and social support. The analysis resulted in a statistically significant model (p= <.001) that explained 92% of the variance in one’s intentions to major in agriculture. As indicated in Table 1, all variables were included in the model explaining a portion of the variability.

Table 1  
*Factors Explaining American Indian Students’ Intentions to Pursue Agriculture as a College Major*

Variable	$\beta$	Std. Error	t	p
Agriculture as a Career	.51	.06	7.73	<.001
Academic Support	.34	.04	8.44	<.001
Agriculture as a Subject	.26	.07	3.49	.001
Social Support	-.07	.03	-.08	.03

Note: R<sup>2</sup> = .92

**Conclusions**

The findings suggest, at least with this specific study population, beliefs toward agriculture as an academic subject and career as well as the academic and social support American Indian students receive can influence their intentions to pursue agriculture as a college major. However, as this was a case-study, it must be noted, conclusions drawn from the findings cannot be generalized to groups outside of the study population. However, the findings from this study can be used as a foundation from which to guide future research.

**Implications/Recommendations/Impact on the Profession**

As the profession seeks to increase the diversity of the students pursuing post-secondary education in agriculture and, ultimately the agriculture industry, attention must be paid to this demographic. Incorporating academic and social support programs along with youth organizations like the FFA and 4-H into the lives of American Indian students may aid in the recognition of the positive benefits of pursuing agriculture as an academic and career option. It is recommended that agricultural education scholars continue to pursue diversity and multicultural research to build the knowledge base surrounding underrepresented populations in an effort recruit and retain these groups into this sector of the economy and society.

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## **An Examination of the Agricultural Mechanics Professional Development Needs of the 2016 National FFA Agricultural Technology and Mechanical Systems Career Development Event Qualifying FFA Advisors**

### **Introduction**

Parr, Edwards, and Leising (2008) noted that across the U.S., agricultural mechanics curriculum instructed at the secondary level has exposed students to the application of knowledge and skills in real world situations often found in business and industry. Furthermore, a review of literature found that agricultural mechanics gives students hands on, educational learning opportunities that use a variety of technologies (Wells, Perry, Anderson, Shultz, & Paulsen, 2013). Across the U.S., there is a shortage of agricultural science teachers, especially in high school agricultural education programs that offer agricultural mechanics courses (Wolf, 2011). Due to the dwindling number of qualified agricultural science teachers nationwide, the education of secondary agricultural students could be negatively affected by a shortage of qualified teachers who can instruct this unique curriculum area (Saucier, McKim, & Tummons, 2012). With such a high demand for employees with agricultural mechanics skill sets in industry, agricultural mechanics curriculum can play a definitive roll in bridging the gap for entry level employees with pre-existing skill sets, therefore, also increasing the need for agricultural mechanics teachers (Wells et al.).

### **Conceptual Framework**

To guide this study, the Borich Needs Assessment Model (Borich, 1980) was used. This model enables “researchers/evaluators to purposefully prioritize teaching and/or research competencies so participants can receive training in the most needed area first, and in each successively less urgent area (competency), if time and funding permit the extension of a training and professional development session” (McKim, 2013, p. 1). Borich (1980) identified three dimensions within the needs assessment model that would allow a better understanding of the needs of teachers that included: *Knowledge Competence*, *Performance Competence*, and *Consequence Competence*. Furthermore, a comparison of scaled measures: importance, knowledge, ability to perform, and ability to teach others to perform, can be compared to create a Mean Weighted Discrepancy Score (MWDS), which allows insight into these dimensions. The MWDS also allows researchers the ability to prioritize training for teachers based upon these dimension areas.

### **Purpose and Research Questions**

The purpose of this mixed method census was to determine the agricultural mechanics professional development needs of FFA advisors who had a qualifying team at the 2016 National FFA Agricultural Technology and Mechanical Systems (ATMS) Career Development Event.

1. What are the personal, professional, and program demographic characteristics of 2016 National FFA Agricultural Technology and Mechanical Systems (ATMS) Career Development Event (CDE) Qualifying FFA Advisors?
2. What are the agricultural mechanics professional development needs of 2016 National FFA Agricultural Technology and Mechanical Systems (ATMS) Career Development Event (CDE) Qualifying FFA Advisors?

## Methods

The population for this mixed method census were all ( $N = 44$ ) FFA advisors who had a qualifying team at the 2016 National FFA Agricultural Technology and Mechanical Systems (ATMS) Career Development Event (CDE). A census was conducted with usable responses received from 40 teachers (93.02%). The data collection instrument was developed based upon a review of literature. The instrument was then reviewed for face and content validity by a panel of experts ( $N = 5$ ) with experience in secondary agricultural education and changes to the instrument were made based upon their recommendations. A pilot test ( $N = 19$ ) was conducted with Texas agricultural science teachers who attended an agricultural mechanics professional development workshop during the fall 2016 semester. A reliability analysis (Cronbach's alpha coefficient) of the scales of measurement was conducted (Importance = .926, Knowledge = .930, Ability to Perform = .929, Ability to Teach Others to Perform = .936) and were deemed reliable (Ary, Jacobs, & Sorensen, 2010). Scaled data was analyzed using the Borich (1980) Needs Assessment Model, Microsoft Excel, and IBM SPSS Statistics 22.

## Findings

For research question one, researchers found that teachers were on average 43 years of age ( $M = 42.74$ ;  $SD = 10.91$ ), mostly of a white ethnicity ( $f = 38$ ; 92.7%), were mostly male ( $f = 37$ ; 90.2%), and had on average 18 years of teaching experience ( $M = 18.28$ ;  $SD = 11.27$ ). Furthermore, more than half of these teachers ( $f = 22$ ; 53.7%) had earned a master's degree and did not have a separate budget at their program for only agricultural mechanics courses ( $f = 24$ ; 58.5%). In their programs, teachers noted that they had on average a Personal Protection Equipment (PPE) budget of \$500.87 ( $SD = \$494.89$ ), a hand tool budget of \$333.82 ( $SD = 306.22$ ), a power tool budget of \$1,342.92 ( $SD = 1712.08$ ), and a budget for consumables of \$3,426.26 ( $SD = \$3,466.33$ ). Additional demographics will be reported on the poster.

Within the *Knowledge Competence*, the top three agricultural mechanics skill areas that teachers indicated they needed professional development in were: *Electricity* (MWDS = 2.24), *Gas Metal Arc Welding* (GMAW; MWDS = 1.80), and *Metal Fabrication* (MWDS = 1.68). The top three needed professional development needs within the *Performance Competence* were: *Gas Metal Arc Welding* (GMAW; MWDS = 4.61), *Electricity* (MWDS = 2.12), and *Safety/Laboratory Management* (MWDS = 1.69). When evaluating the *Consequence Competence*, the top three competencies that had the greatest need for professional development were: *Electricity* (MWDS = 2.35), *Planning and Estimation* (MWDS = 2.12), and *Metal Fabrication* (MWDS = 2.01).

## Conclusions, Implications, & Recommendations

Across all three-competence areas, teachers indicated a need for professional development. The most frequent skill areas included: electricity, GMAW, and metal fabrication. Implications from this research could be useful when assessing the overall ATMS CDE team score and using the teachers professional development needs as a predictor of success. Furthermore, this study could also provide insight into the professional development needs of expert U.S. agricultural mechanics teachers and provide some upper echelon base line data. By understanding the knowledge, performance, and consequence competence of these teachers, adequate and timely professional development opportunities could be structured and offered to keep these mid-career teachers in the classroom and an industry that is struggling to retain qualified teachers.

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**An Examination of the Questioning Habits of Pre-Service Teachers when Planning for Student Learning**

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### **Introduction/need for research**

Questions used by teachers in the classroom to facilitate learning can influence the way students engage with the content and how well they learn the material (Chin, 2004). Cotton found teachers spend between 35-50% of their time in the classroom questioning their students (2001). With such a significant amount of time being devoted to questioning, it's important teachers utilize questioning strategies effectively. While controversy exists over the exact definition of a question as a teaching method, Sanders defines a question as any task requiring cognitive action that necessitates the student produces an answer and is not necessarily worded in the form of a statement followed by a question mark (Sanders, 1966). Most researchers agree higher-order, divergent questioning strategies yields higher student achievement (Croom & Stair, 2005; Ornstein & Lasley, 2004; Lustick, 2010). Higher-order questioning can be defined as requiring students to transform data in order to craft a response and be able to justify it (Redfield & Rousseau, 1981).

### **Conceptual Framework**

High-order, divergent questioning strategies are the most successful questioning techniques for increasing student learning (Croom & Stair, 2005; Ornstein & Lasley, 2004; Lustick, 2010). Pre-service teachers have been shown to be more efficient and accurate at categorizing and utilizing questions at a higher level after instruction on Bloom's *Taxonomy of Educational Objectives* (Newton, 1969). Additionally, studies revealed pre-service teachers exposed to microteaching and peer teaching methods during training utilized higher order questions more frequently than their peers who were exposed to observation and peer-lecture-discussion groups throughout their student teaching experience (Sounders et al., 1976). The conceptual framework of this study utilizes the question structure founded in Gallagher & Ascher (1963). The structure separates questions into four main categories: cognitive memory, convergent thinking, divergent thinking, and evaluative thinking. They refer to questions causing students to process given information in some way and range from very close-ended questions to very-open-ended questions.

### **Methodology**

This study analyzed the lesson plans of 18 pre-service teachers in an ex-post-facto pre-post design. Of the 18 students enrolled in Methods and Materials in Teaching Agriculture, 78% were female and 67% were seniors with 33% as juniors. All participants were exposed to the same conditions over the course of the semester long class. Each micro-teaching lesson plan focused on one of the seven teaching methods; demonstration, lecture, questioning, discussion, cooperative learning, inquiry, and individual application (Roberts, Stripling, & Estep, 2010). The plans were then placed into three categories based on the specific instruction received by the pre-service teachers at the time of teaching: pre-instruction, during instruction, and post-instruction. 'Pre-instruction' included lessons one and two which occurred before any specific instruction on questioning. Lesson three was categorized as 'during' because the lesson was aimed at focusing on questioning as a teaching method. Lessons four through seven were categorized as 'post-instruction' because students had received instruction on questioning prior

to the development of these lesson plans. Any question posed by the participant in their lesson plan was highlighted and coded using a literature based flow chart into at least one of the 5 questioning categories (cognitive memory, convergent thinking, divergent thinking, evaluative thinking, procedural, yes/no questions, or rhetorical).

### Findings

The first objective was to describe the types of questions posed by the preservice teachers in their lesson plans. Pre-instruction the average number of questions was 6.3 (L1=4.5, L2=8.1), during instruction the average number of questions was 13.4, while post instruction the average decreased to 6.1 (L4=7.6, L5=5.2, L6=6.0, L7=5.7).

To help describe the specific types of questions asked the totals of each type of questions were analyzed. Rhetorical and procedural questions were omitted because they are not focused on student learning. Cognitive–memory questions showed little change over the course of the semester in terms of the percentage of questions asked. Beginning with 26.7% during pre-instruction, cognitive-memory questions increased to 28.9% during instruction, and decreased to 24.2% post-instruction. Convergent thinking began at 15.1% pre-instruction, increased to 21.9% during instruction, and decreased to 14.8% post-instruction. Divergent thinking questions showed a significant increase throughout the study. Pre-instruction, pre-service teachers utilized divergent thinking questions 22.6% of the time, compared to 29.3% during instruction, and 33.8% following instruction. Evaluative thinking was utilized the least out of all the questioning categories. Pre-instructions lessons were evaluative 2.7% of the time, during instruction, 3.7% of total questions and 9.0% during post-instruction lessons. Yes/No type questions decreased in use throughout the study, beginning with 16.4% pre-instruction. During instruction, yes/no questions decreased to 9.9% and 9.3% post-instruction.

There was a significant change in the number and type of questions between all three matched pairs of lessons. Overall the number of questions planned by pre-service teachers post instruction changed from before the instruction;  $t(89)=2.84$ ,  $p=.029$ . While it also changed between Pre and during ( $t(89)=3.82$ ,  $p=.007$ ) and between during and post-instruction ( $t(89)=3.46$ ,  $p=0.011$ ). See Table 2 for detailed differences between groups.

### Conclusions and Implications

The most significant findings from this study are in the area of divergent questioning habits and total questions compared to quality of questions asked by pre-service teachers. Divergent questioning increased significantly with instruction and experience over time. Overall, there is an increase in utilization of higher-order questions (divergent) compared to lower-order questions (cognitive-memory and convergent thinking). It is also notable that questioning ability continued to increase after initial instruction, suggesting experience benefits pre-service teachers in the development of efficient questioning habits. Pre-service teachers increased their use of questions when told to focus on questioning as a teaching method. This trend when compared to the improvement in quality of questions indicates students improve the effectiveness of their questioning habits over time with instruction and experience.

The largest limitation to this study is that questioning classification is subjective, especially when questions are analyzed out of context. This limitation was minimized by reading the entire lesson plan and using a flowchart to determine questioning classification. Classification can also be complicated by a large degree of variance in the student population.

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**Assessing the Availability and Academic Offerings of Extension Education in the United States**

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### **Introduction / Need for Research**

Workforce readiness is a critical concern for the agricultural industry. According to Stripling and Ricketts (2016), “the educational system to provide skilled individuals to fill the needed occupations has scrambled to keep pace” (p. 30). New hires in Cooperative Extension often have expertise in a technical discipline but lack much or any training in nonformal education, program development, or evaluation, creating a considerable challenge for Extension staff development units charged with preparing them to be successful in their careers. An informal survey of staff development units in the southern U.S., conducted by this study’s authors, found onboarding training typically lasts 4-6 days with some online modules also required; neither is comparable to the depth of learning available through an academic extension education program. The lack of available applicants with academic backgrounds in extension education leads to the following questions: are there enough extension education programs to produce the number of graduates required to meet the hiring needs of the Extension system, and are extension education programs teaching the competencies needed for careers in Extension?

### **Conceptual Framework**

Mulder, Gulikers, Biemans, and Wesselink (2009) argued for the appropriate application of a competence-based approach to higher education, noting the usefulness of course-competence matrices to map the courses in which particular competencies are taught. Mulder et al. (2009) defined competence as “a series of integrated capabilities consisting of clusters of knowledge, skills and attitudes necessarily conditional for task performance and problem solving and for being able to function effectively in a certain profession, organisation [*sic*], job, role and situation” (p. 757). Harder, Mashburn, and Benge (2009) investigated extension education curriculum of land-grant universities (LGUs) and found the most frequently offered courses were in the competency areas of extension knowledge, leadership, and management; theories of human development and learning; and program planning, implementation, and evaluation. Only 19 LGUs offered some type of academic program in extension education.

### **Methodology**

The purpose of this descriptive study was to explore the present status of extension education within the land-grant university (LGU) system of the U.S. The objectives were to identify: (a) which types of LGUs offered formal extension education programs and where those LGUs were geographically located, (b) which types and how many extension education programs were offered, and (c) what types of courses were offered in the undergraduate and graduate curriculum, using the categories outlined by Scheer, Cochran, Harder, and Place (2011).

This descriptive study used content analysis (Gall, Gall, & Borg, 2007) to gather data from the websites of LGUs. A census of the 1862, 1890, and 1994 LGUs was conducted in the 2016/2017 academic school year. The population was comprised of 57 1862 LGUs, 18 1890 LGUs, and 35 1994 LGUs (i.e. tribal colleges). Only LGUs which *clearly* designated an extension education major, minor, concentration, program, emphasis, or specialization were considered formal extension education providers. The possibility for websites to be inaccurate is recognized as a limitation of this study. Frequencies were calculated during data analysis.

### **Results / Findings**

As of July 2017, there were eighteen 1862 LGUs and one 1890 (a total of 19 LGUs) offering an academic program in extension education. Most LGUs (9) with extension education

programs were in the Southern region. Seven of these universities offered a major, and five offered a minor in extension education. Additionally, 12 LGUs offered a Master's degree in extension education and five offered a doctoral program with a specialization in extension education. Of these universities, six provided the opportunity for extension education via distance learning.

Looking at the curriculum, there were 82 undergraduate courses found that directly related to extension education. At this level, competency areas of focus were adult education ( $n = 29$ ); agricultural leadership and management ( $n = 22$ ); agricultural communication, technology and media ( $n = 13$ ); extension knowledge, philosophies and theories ( $n = 12$ ); and program planning and evaluation ( $n = 6$ ). At the graduate level, 154 courses were offered. These courses mostly emphasized competencies related to teaching and learning theories ( $n = 43$ ); agricultural communication and leadership ( $n = 33$ ); research methods and statistics ( $n = 32$ ); extension principles, knowledge, philosophies and theories, including the Cooperative Extension Service and international extension ( $n = 26$ ); and program planning and evaluation ( $n = 20$ ). Other courses related to international development, youth development, technology in agriculture, and volunteer management.

### **Conclusions**

Access to academic extension education programs remained steady (Harder et al., 2009), with the same universities still offering academic programs. The supply of graduates with experience in an academic extension education program is almost exclusively a function of 1862 LGUs. Further, convenient geographic access to these LGUs is primarily limited to residents within one region of the country. Master's level programs are most prevalent, while few programs with doctoral specializations in extension education exist. A variety of courses are taught within the extension education curriculum nationwide, but little variation in the types of courses offered over the last eight years was observed. Teaching and learning courses – especially adult education – are the most common offerings. Program planning and evaluation courses are less frequently available, particularly at the undergraduate level.

### **Implications / Recommendations / Impact on the Profession**

The lack of growth in the number of academic extension education programs, coupled with their predominant tendency to be located in the southern U.S. at 1862 LGUs, presents challenges to preparing Extension's workforce. Innovation may be stifled both academically and within Extension broadly because of the small number of universities supporting extension education, as seen in the lack of variation in the types of courses being offered over the past 9 years. Extension faculty are encouraged to carefully review their curriculum to determine if it is developing the competencies needed by today's Extension professionals, as suggested by Mulder et al. (2009). The diversity of hiring pools is also likely to be negatively impacted given the lack of access to extension education programs at the 1890 and 1994 LGUs, a significant concern given the increasingly diverse workforce within the U.S. (Stripling & Ricketts, 2016). The Extension branch of the LGU system and the Extension Council on Policy must advocate for an increase in the number and geographic diversity of extension education programs available.

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**Communicating about the Agriculture Best Management Program through Extension:  
Ensuring the Sustainable Use of Water Resources**

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## Introduction

The agriculture industry often contributes inadvertently to water pollution through pesticide, nutrient, and sediment runoff (Ongley, 1996). The Florida Department of Agriculture and Consumer Services (FDACS) and University of Florida Institute of Food and Agricultural Sciences (Blinded) developed guides for agricultural producers that depict best management practices (BMPs) specific to their operation specialization to ensure the agriculture industry is protecting water resources (This Farm Cares, n.d.). The guides were developed using research, field-testing, and expert reviews to ensure the suggested practices were effective (FDACS). A BMP program was developed to increase producers' awareness of runoff issues and to decrease the amount of pesticides, nutrients, and sediment that is being released back into the water supply (FDACS, 2014). Florida's BMP program was a voluntary effort that was incentivized by the Florida Farm Bureau Federation through the County Alliance for Responsible Environmental Stewardship (CARES) program since 2001 (Florida Farm Bureau Federation, 2014). With the passage of the 2016 Florida Water Bill all agricultural operations in Florida were mandated to enroll in the BMP program (Lusk, 2016). Since the implementation of this bill, farmers and ranchers across the state have experienced successes and have also encounter barriers through their time in the program (Putnum, n.d.). Florida Extension has delivered a number of educational programs around agriculture BMPs since 2013 (UF/IFAS, 2017). This study was conducted to examine the impact of BMP programs on Florida residents' perceptions of agricultural BMPs and farmers who employ BMPs. This study can be supported under Research Priority 6 of National AAAE research agenda which aims to understand how Extension programs are affecting local communities (Graham, Arnold, & Jayaratne, 2016).

## Theoretical Framework

The framework used to guide this study is Rogers' (2003) diffusion of innovations theory. The diffusion of innovations theory states that in order for members of a community to recognize and adopt an innovation, the innovation must be communicated to the people composing this community (Rogers, 2003). In reference to this study, the innovation is agriculture BMPs that should decrease the amount of water pollution from pesticide, nutrient, and sediment runoff. Some communities in [State] have been exposed to education about agriculture BMPs and some communities have not.

## Methodology

The population of interest was Florida residents who lived in counties where BMP educational programs have been implemented. An online questionnaire was used as the instrument in this study to collect the same data in years 2014 and 2017. Face validity was established by an expert panel of faculty and staff with collective proficiencies in agricultural management practices and instrument development. *Post hoc* reliability estimates were calculated using Cronbach's alpha, for which all scales demonstrated exemplary internal reliability consistency of  $\alpha = .95$  or higher. The questionnaire was distributed to Florida residents via a third-party public opinion survey research company, Qualtrics. Non-probability opt-in sampling techniques are commonly used in public opinion survey research (Baker et al., 2013) and were employed for this study. In 2014, 699 responses were obtained from [State] residents in selected counties. In 2017, 524 responses were obtained from [State] residents in these same counties. Quotas were set *a priori* to ensure the

residence of respondents represented the targeted [State] counties. Descriptive statistics were used (e.g. means, standard deviations, frequencies, percentages). Chi-square analysis and independent *t*-tests were employed to determine if there were statistical differences between groups. A statistical significance level of .01 was set.

### **Findings**

Respondents were asked a series of questions pertaining to their (a) perceived importance of farmers' engagement in BMPs, (b) beliefs about the characteristics of farmers who use BMPs, (c) beliefs about whether Florida farmers are engaged in BMPs, and (d) trust in farmers who use BMPs. No statistically significant differences existed regarding respondents' perceived importance of farmers' engagement in BMPs. Respondents in both 2014 ( $M = 4.09$ ;  $SD = .75$ ) and 2017 ( $M = 4.04$ ;  $SD = .80$ ) perceived farmers' engagement in BMPs as very important. Regarding respondents' beliefs about the characteristics of farmers who use BMPs, Chi-square analysis revealed statistically significant differences between 2014 and 2017 respondents in three areas. More respondents in 2017 (84%) agreed or strongly agreed farmers practicing BMPs care about the environment than respondents in 2014 (75%). Further, more respondents in 2017 (76%) than 2014 (68%) agreed or strongly agreed they would rather purchase products from farmer who uses BMPs. Lastly, more respondents in 2017 (72%) than 2014 (64%) agreed or strongly agreed that they trust farmers practicing BMPs more than those who do not. Regarding farmers' engagement in BMPs, a statistically significant difference was observed between 2014 and 2017 respondents. Respondents in 2017 ( $M = 3.75$ ;  $SD = .70$ ) held a higher agreement that Florida farmers are engaged in BMPs than did respondents in 2014 ( $M = 3.61$ ;  $SD = .74$ ). Lastly, significant differences were observed between 2014 and 2017 respondents regarding their trust in farmers who use BMPs. Respondents in 2017 ( $M = 3.98$ ;  $SD = .70$ ) reported higher trust in farmers who use BMPs than did respondents in 2014 ( $M = 4.09$ ;  $SD = .70$ )

### **Conclusions and Recommendations**

Respondents in both 2014 and 2017 perceived BMPs as very important. This finding indicated public perceptions about BMPs is positive and county residents who have received education may be more likely to recognize the need for BMP innovations. Overall, respondents in 2017 had more positive perceptions of BMPs and farmers who use BMPs than did respondents in 2014. This may indicate that the BMP Extension programming may have influenced county residents positively over the past three years. As such, it could be beneficial for Florida Extension to expand BMP educational programs to other counties in the state. However, further research is needed to better identify how and to what extent BMP programs have influenced public opinion. Future research is also needed to explore other factors that may have influenced public perception of BMPs. Compared to respondents in 2014, respondents in 2017 were more likely to trust farmers who use BMPs, as well as were more likely to purchase products from a farmer who uses BMPs. Extension faculty should share this information with farmers in Florida to offer additional incentive to engage in BMPs and facilitate farmer adoption of BMP innovations.

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**Communicating to the Ages: Influence of Age on Florida Homeowners' Informational Processing Behaviors**

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## **Communicating to the Ages: Influence of Age on Florida Homeowners' Informational Processing Behaviors**

### **Introduction**

As Florida is surrounded by water on three sides and has many waterways within the state, water pollution resulting from Florida homeowners' fertilizer application is cause for concern (Shaddox & Unruh, 2017). As such, enhanced Extension programs are needed to better educate Florida residents about fertilizer application and water quality concerns (Lamm, Warner, Martin, White, & Fisher, 2017). Lamm et al. (2017) recommended videos as a possible tool to aid Extension in educating various audiences about water conservation and fertilizer use. In order to better design educational videos for Florida residents, it is necessary to better understand their informational processing behaviors. Since video media has been used widely and more frequently by younger generations than older generations (Zickuhr, 2010), processing behaviors during an education video may differ based on age.

### **Theoretical Framework**

The Elaboration Likelihood Model (ELM; Petty & Cacioppo, 1986) served as the theoretical framework for this study. Per the ELM, information can be processed through two cognitive routes, including the central processing route and peripheral processing route. When an individual processes information through the central route, attitudes can be changed and more critical thinking occurs (Petty, Cacioppo, & Schumann, 1983). Exposure to persuasive communication can determine which route a person uses to process information. Elaboration requires both motivation and ability, which can be influenced by a variety of factors (Petty & Cacioppo, 1986). This study was conducted to describe Florida residents' information processing behaviors and examine differences in their elaboration likelihood based on age. This study addresses national research priority area two: New technologies, practices, and products adoption decisions (Lindner, Rodriguez, Strong, Jones, & Layfield, 2016).

### **Methodology**

The population of interest was Florida residents who were responsible for their home lawn care. The instrument used in this study was an online questionnaire. Face and content validity was established by a panel of expert faculty and staff, and *post hoc* reliability estimates were calculated using Cronbach's alpha. In addition to demographic questions, one section of the instrument was used for analysis. Respondents were asked to reflect on their experience watching an educational video on proper fertilizer application and indicate their level of agreement with 12 items pertaining to their information processing behaviors during the video. Responses were collected using a seven-point Likert scale with 1 = *Entirely Disagree*, 2 = *Mostly Disagree*, 3 = *Somewhat Disagree*, 4 = *Neither Disagree nor Agree*, 5 = *Somewhat Agree*, 6 = *Mostly Agree*, 7 = *Entirely Agree*. The internal consistency reliability was  $\alpha = .81$ . The link to the online questionnaire was distributed by a public opinion survey research company. Non-probability opt in sampling techniques are commonly used in public opinion research (Baker et al., 2013) and were used for data collection in this study. Responses were obtained from 2,000 of the 4,300 invited residents for a 47% participation rate. Respondents were divided into two age groups for data analysis: (1) ages 30 or younger; (2) older than 30. Levene's test was utilized to ensure the assumption of equality of error variances was not violated, and robust tests of equality of means included Welch's *F*. Data analyses included descriptive statistics and one-way ANOVA. A statistical significance level of .05 was established *a priori*.

### Findings

Respondents' level of agreement with their informational processing behaviors during the video are displayed in Table 1. Negatively worded statements were reverse coded, and construct means were calculated for each age group. Statistically significant differences in overall construct means were observed between groups, for which the ANOVA yielded  $F(1, 240) = 5.84$ ;  $p = .02$ ;  $\eta^2 = .004$ .

Table 1. Respondents' agreement with their informational processing behaviors

Items	30 or younger		Older than 30	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Attempting to analyze the issues in the message	5.56	1.40	5.32	1.53
Doing your best to think about what was said	5.47	1.62	5.61	1.44
Deep in thought about the message	5.33	1.45	4.96	1.45
Reflecting on the implications of the argument	5.32	1.48	5.22	1.49
Searching your mind in response to the ideas	5.32	1.49	4.87	1.56
Extending a good deal of cognitive effort	5.22	1.44	4.84	1.59
Taking it easy	4.62	1.83	3.56	1.67
Resting your mind	3.89	1.89	3.03	1.67
Not really exerting your mind	2.95	1.74	2.63	1.63
Not very attentive to the ideas	2.93	.89	2.46	1.77
Distracted by other thoughts not related to the message	2.63	1.85	2.15	1.46
Unconcerned with the ideas	2.61	1.73	2.13	1.47
Construct Mean Score	5.07	.89	5.24	.91

### Conclusions and Recommendations

Overall, the information processing behavior of respondents over the age of 30 was slightly more positive than respondents 30 years old or younger, indicating a higher elaboration likelihood. However, examination of individual items yielded varying results. While watching the informational video on proper fertilizer application and use, respondents 30 years old or younger reported higher agreement that during the video they were analyzing the issues in the message, deep in thought about the message, searching their mind in response to ideas, and extending a good deal of cognitive effort. However, this same group was also more likely to be resting their mind, not really exerting their mind, distracted by other thoughts not related to the message, and unconcerned with ideas. These findings indicated respondents over 30 were more likely to process information through the central cognitive route, while respondents 30 or younger processed information through the peripheral route. Per the ELM, an individual's processing route is determined by his or her motivation, processing ability, and processing nature; both motivation and ability must occur (Petty & Caciopo, 1986). While respondents 30 or younger demonstrated the ability to process the information, lack of motivation may have contributed to their tendency to be less attentive. Extension programming should thus seek to increase interest in proper fertilizer application and water quality among younger homeowners. According to Petty and Cacioppo (1986), personal relevance is the most influential factor in an individual's motivation to process informational messages. Therefore, Extension messages should begin by establishing how the information is relevant to the younger audience. Lastly, as the influence of personal relevance can be mediated by other variables (Petty & Cacioppo, 1986), future research is needed to examine the influence of factors that influence Florida residents' information processing behaviors and abilities.

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**Does It Take a Village? – An Examination of the Experiential Roles Played by Educators in Supporting Agriscience Fair Participants in Oklahoma**

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## Introduction

Agricultural education and academic content are naturally connected. “Agriculture provides meaningful context for hands-on, object-based, and other experiential learning that connects traditional academic subjects” (Stubbs & Myers, 2016). Integration of academic content into the agricultural education classroom, though challenging, is called for today. One of the most common solutions to overcoming the barriers of integration is collaboration (Roberts & Ball, 2009; Warnick & Thompson, 2007; Parr, Edwards, & Leising, 2009). Using project-based learning strategies, teachers may answer the call of heightened integration of core concepts into agricultural education as project-based learning may serve as “an application of concepts in agriculture education courses, and as the vehicle through which people learn” (Smith & Rayfield, 2016). One manifestation of project-based learning that has long been adopted for the science classroom is the science fair. Agricultural education has its own version of the time-tested science fair model called the National FFA Agriscience Fair. Keys to success include the investigation of a relevant issue, teacher supervision, and collaboration between “student researchers, teachers, and specialists in the field of study” (National FFA, 2016).

## Conceptual and Theoretical Framework

The theoretical framework of this study is Experiential Learning Theory (Kolb, 2015), described as the creation of knowledge as being a result of experiences that have been grasped and transformed. According to Kolb (2015), this process occurs through four modes: concrete experience, reflective observation, abstract conceptualization, and active experimentation. The framework guiding how educators should direct and engage with students through experiential learning is the Educator Role Profile (ERP) which provides a dynamic, relational, and holistic approach to being an exceptional educator (Kolb, Kolb, Passarelli, & Sharma, 2014).

## Purpose and Objectives

The purpose of this study is to describe what collaboration exists as agricultural education students prepare an agriscience fair project in Oklahoma, and to determine what experiential educator roles are filled by various collaborators during the experience. Four research questions guided this study including: *How many collaborators support each student participating in the Oklahoma FFA Agriscience Fair? What was the extent of collaboration by each individual educator or stakeholder? What experiential educator roles do collaborators and educators play in the student’s agriscience fair project experience? What was the extent of student engagement with individuals serving in each of the educator roles during the development of the student project for the Oklahoma FFA Agriscience Fair?*

## Methodology

This descriptive, survey design, study utilized a population of 201 secondary based agricultural education students participating in the Oklahoma FFA Agriscience Fair in April 2017. A census approach was used due to the small population size as recommended by Krejcie and Morgan (1970). Of the population, 186 students responded consistently for a response rate of 93% of the population. The instrument was researcher developed and was embedded in an evaluative questionnaire to be utilized for Oklahoma FFA program purposes.

### Results/Findings

Addressing the first research question, the average number of collaborators assisting each agriscience fair student, including the agricultural educator, was 3.65 ( $SD = 3.35$ ). In response to research question two, students reported that a total of ten unique collaborator types assisted them overall reporting a range of zero to ten collaborators. Of those collaborators, the agricultural educator ( $M^* = 47.68$ ), parent and/or guardian ( $M^* = 17.65$ ), and core science teacher ( $M^* = 12.42$ ) played the largest roles in guiding their agriscience fair experience where the mean represents the average percentage of assistance each collaborator provided.

Surprisingly, collaborators such as professor at local university ( $M^* = 3.45$ ) and grandparent ( $M^* = .38$ ) were also identified as sources of assistance for some students.

Students identified the agricultural educator as the primary collaborator serving in all four roles: facilitator (78.2%), expert (51.1%), evaluator (63.9%), and coach (70.3%). A large percentage of students also noted an industry professional as the collaborator serving in the primary expert role (17.0%). Parent and/or guardian (10.3%) and core teacher (8.0%) were also found to be critical collaborators meeting the evaluator role. These findings support research question three.

Research question four relates to the frequencies of students' self-reported engagement with each individual educator role throughout the agriscience fair experience. Students reported somewhat engaging with a collaborator who served in the facilitator role responding with neutral (33.5%) and agree (42.1%). Students reported active engagement with a collaborator serving in the expert role responding agree (33.5%) and strongly agree (30.5%). The evaluator role was strongly utilized with students responding agree (34.5%) and strongly agree (45.4%). Finally, students actively engaged with collaborators in the role of coach responding agree (34.2%) and strongly agree (43.4%).

### Conclusions and Discussion

First, the agricultural educator was found to be the primary collaborator. Many students sought out specific, non-traditional collaborators, like agriculture industry professionals and core teachers, to fill certain educator roles. Students engaged with each of the educator roles during the project, but collaborators were more likely to emphasize the subject and action foci via support through the evaluator and coach roles. The learner and meaning foci are less evident as facilitator and expert roles were underutilized, demonstrating an imbalance similar to that found in Baker and Twenter (2016). Overall, the benefits of collaboration impact both student and teacher, and students are recognizing the importance of these partnerships.

### Recommendations

Recommendations for research are centered on further studies around the concept of collaborative village building for the good of the student, extending into the community and home life of the student. Secondly, is this village-building concept limited to students who are engaged in FFA career development events? As parents played such a large role in collaboration, what does this mean for students with a non-traditional home life? Research on how teachers and students facilitate these partnerships is warranted for the continued success of such projects. Recommendations for practice begin with the empowerment of teachers to collaborate more extensively and effectively. Teachers must be ready to guide students using the facilitator and expert roles, in addition to the coach and evaluator roles. Resources for all collaborators, especially non-traditional collaborators, could prove beneficial.

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**Effects of Activity Type and Gender on Cognitive Achievement in Hydraulics**

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## Introduction

Agricultural mechanics is an important component of a majority of high school agricultural education programs (McCubbins, Anderson, Paulsen, & Wells, 2016). National professional standards (American Association for Agricultural Education, 2017) call for teachers to be “aware of cutting edge technology” and to “teach students how to use technology appropriate to the agricultural industry” (p. 2). Yet, researchers (McCubbins et al., 2017) have found that many school-based agricultural education programs lack the necessary tools, equipment, and financial resources to teach the current curriculum, much less a more modernized curriculum. Thus, teachers are caught in a dilemma; urged to modernize, but lacking the necessary resources to do so (Johnson & Wardlow, 2017).

Educational simulations are “an artificial representation of a real world process to achieve educational goals through experiential learning” (Al-Elq, 2010, p. 35). Constructivist learning theory, which posits that students construct knowledge when they “attach meaning to an experience or activity” (Rutherford-Hemming, 2012, p. 133), supports the efficacy of educational simulations. This study sought to determine if there was a significant ( $p < .05$ ) difference in cognitive achievement between students taught basic hydraulics using an inexpensive educational simulation activity as compared to a trainer-based activity (\$10,000 per trainer; Iron Horse, 2016). A secondary purpose was to determine if there was a significant ( $p < .05$ ) difference by gender or a Gender X Treatment interaction. This research replicates and extends research by Agnew and Shinn (1990) and supports development of a sufficient scientific and professional workforce (Stripling & Ricketts, 2017) for the agricultural industry.

## Methodology

The accessible sample for this study consisted of students ( $n = 47$ ) enrolled in two laboratory sections of a freshman-level university agricultural systems course taught in fall 2017. Prior to lab, we randomly assigned all enrolled students to the control or experimental groups; due to absences, 20 and 24 students participated in the control and experimental groups, respectively. The control group planned and constructed two hydraulic circuits using the hydraulic trainers by connecting components with hydraulic hoses; the experimental group planned and constructed the same two circuits by connecting printed hydraulic symbols using wires with clip-connectors. The control group manipulated the trainers and observed the operation of the system. The experimental group “operated” each circuit by manipulating the specially designed directional control valve symbol and tracing the path of oil flow through each circuit. Three or four students worked cooperatively with each trainer or set of symbol cards. As part of each lab activity, students in the control and experimental groups answered the same set of questions about the operation of each circuit. Immediately following the lab activity, each student completed a five-item multiple-choice quiz (*coefficient alpha* = .62) based on the content of the lab. The quiz was consistent in format and length with the lab quizzes normally administered after lab activities.

## Results

The results of a 2 X 2 factorial ANOVA indicated no significant ( $p < .05$ ) differences in quiz scores by the main effect of activity type (trainer or simulation) or the interaction of activity type and gender. The results did indicate a significant ( $p = .03$ ) difference in quiz scores by the main effect of gender, with males scoring higher than females (Table 1). The  $\eta^2$  of 0.12 indicated

gender explained 12% of the variance in quiz scores, while the Cohen's  $f$  of 0.36 indicated a medium effect (Cohen, 1988) for gender on quiz scores.

Table 1. Means, Standard Deviations, and 2 X 2 Factorial ANOVA Results for Effects of Activity, Gender and Activity X Gender on Cognitive Achievement in Hydraulics

Treatment	<i>n</i>	<i>M</i>	<i>SD</i>	ANOVA	
				<i>F</i> (1, 40)	<i>p</i>
Lab Activity				0.21	.65
Control (Trainers)	20	3.75	1.37		
Experimental (Simulation)	24	4.00	1.22		
Gender				5.43	.03
Female	22	3.45	1.22		
Male	22	4.32	1.21		
Treatment X Gender				0.27	.61
Control-Female	11	3.27	1.27		
Control-Male	9	4.33	1.32		
Experimental-Female	11	3.64	1.21		
Experimental-Male	13	4.31	1.18		

### Conclusions

The results of this study indicated use of hydraulic trainers and simulations using hydraulic symbol cards were equally effective in teaching basic hydraulics when cognitive achievement was the instructional objective. These results agree with those of Agnew and Shinn (1990) and support the efficacy of an inexpensive simulation method of incorporating hydraulics into the curriculum. Further, the simulation method was equally effective with all students regardless of gender. The finding that males significantly out-performed females on the hydraulics quiz contradicts results reported by Johnson, Wardlow, and Franklin (1998) who reported females outperformed males in tests of applied mechanics and electricity.

### Implications/Recommendations/Impact on the Profession

To the extent students enrolled in this freshman-level university agricultural systems course were similar to students in advanced high school agricultural mechanics courses; these results have important implications for high school agricultural education programs. The results indicated teachers can effectively use simulations with inexpensive hydraulic symbol cards to teach basic hydraulic system components, functions, principles, and circuits and be confident students will learn as well with these simulations as they would using expensive hydraulic trainers. This is an important finding because high school teachers have reported the lack of equipment as a major factor preventing them from incorporating hydraulics into the curriculum (Johnson & Wardlow, 2017).

The finding that females scored lower than males on the posttest raises some concern, given that 67% of all agricultural teacher education candidates in 2016 were female (Smith, Lawver, & Foster, 2016). However, because gender explained only 12% of the variance in quiz scores, additional research is needed before concluding this is a significant problem for the profession.

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Effects of Induction Programs on Teacher Self-Efficacy

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## **Effects of New Teacher Induction Programs on Teacher Self-Efficacy**

### **Introduction**

Effective teacher induction programs have the ability to decrease teacher turnover and increase the longevity of careers in the classroom (Darling-Hammond & Lieberman, 2011). Additional research needs to be conducted under the imperative of increasing the understanding of how induction programs are effective in their pursuit. In 2015 an Induction Task Group of the California Commission on Teacher Credentialing (CCTC) recommended that “new teachers receive appropriate support and mentoring in their first few years of teaching” (CCTC, 2015). To date, there have not been any reports made that measure the objectives of this CCTC recommendation as they relate to agriculture teachers. In order to increase job satisfaction and place focus on teacher attrition within agricultural education (Clark, Kelsey, & Brown, 2014) the current state of the field needs to be surveyed.

In previous state-centered forms of induction, the distinct subpopulation of agriculture teachers has been underserved (Davis & Jayaratne, 2015). Agriculture teachers do not exist in similar concentrations as other subject teachers, and it can be difficult to pair agriculture teachers with a mentor actively engaged in a similar content area. This may lead to a decline in self-efficacy during the first years of teaching for an induction-level teacher when a mismatched mentor relationship is the only option which increases the potential for novice teachers to leave the profession. This research examines the efficacy among induction-level agriculture teachers in the state of California, and considers how induction needs may vary for this specific subpopulation of teachers in order to keep effective agriculture instructors in the classroom.

### **Framework**

Guided by Bandura’s work on social cognitive theory, we examined the interactions of induction-level teachers with particular focus on self-efficacy and its manifestation on satisfaction with a mentor relationship. Self-efficacy of teachers is linked to how impactful they feel their work is, how much experience they have, and how capable they feel about attaining designated goals (Soodak & Podell, 1996; Bandura, 1986). These levels of efficacy leading to confidence are different for all teachers, but unique for agriculture teachers. There is a familial nature to the development of agriculture teachers which increases the connection of novices to their preparation and mentorship programs; providing a unique environment of constant contact. According to Rice & Kitchel (2015) adequate preparation and support of a novice teacher through an induction program will double the likelihood that they stay in the profession. Thus, the increased connection within agricultural education should positively align with the development of self-efficacy and satisfaction with support providers.

### **Methodology**

Self-efficacy can be examined in a number of ways, but in order to understand the impact on induction level teachers and imply need for potential future exploration, a quantitative survey approach is appropriate. An instrument was developed to examine efficacy and dyad satisfaction using the Teacher’s Sense of Efficacy Scale (TSES; Tschannen-Moran & Woolfolk Hoy, 2001), which has been previously used in similar populations (Knobloch, 2006). The instrument consisted of limited and free-choice response questions to identify current levels of self-efficacy and mentor satisfaction with respect to induction-level agriculture teachers in a large western state.

For the purposes of this study, an induction-level teacher was defined as a teacher currently engaged in the first three years of teaching and enrolled in an induction program in the state of California. The population sample was derived from the California Agricultural Teachers' Induction Program (CATIP) and various other local education agency (LEA) endorsed induction programs. The survey instrument was developed and disseminated in accordance with Dillman's (2007) tailored design method. A total of 88 responses were recorded with 59 of those being currently enrolled in one of two different types of induction programs (i.e. locally coordinated or coordinated via a state consortium specifically for agricultural educators). Data was analyzed through independent sample t-tests using Statistical Protocol for Social Sciences (SPSS, v25).

### Results

All data were analyzed under non-normal data assumptions (i.e. small sample size and non-normality) utilizing a Mann-Whitney U *t*-test of independent samples. The *TSES* (Tschannen-Moran & Woolfolk Hoy, 2001) show that mean scores for self-efficacy are high. For example, both cohorts of induction-level teachers express high levels of efficacy ( $M = 7.37$ ) in classroom management, and ability to address the needs of disruptive students ( $M = 7.02$ ). While there is a noticeable dip in efficacy to motivate students and connect with student families ( $M = 6.71$  and  $M = 6.80$ , respectively) responses still reflect a trend of higher efficacy. Between the two cohorts of induction-level teachers there are no significant differences in the CATIP participant mean efficacy scores relative to their peers in other locally managed induction programs. For the purpose of evaluating mentor satisfaction, a Mann-Whitney U *t*-test of independent samples was conducted. Candidates in both programs are similarly satisfied that their mentor is providing quality service ( $M = 2.53$ ) on a scale of -3 (negative level of satisfaction) to +3 (positive level of satisfaction), and CATIP participants express higher satisfaction that their mentor has more content area knowledge. Results are significantly different ( $t = 2.603$ ,  $p = 0.002$ ) between the two cohorts suggesting that the CATIP participants are more satisfied ( $M = 2.53$ ) with their mentor's content area connection than their peers ( $M = 2.60$ ). The point biserial correlation effect size  $r_{pb} = .41$  expresses a substantial relationship (Vaske, 2008) between induction cohort and mentor content area knowledge satisfaction.

### Conclusions

The data reveals induction-level agricultural teachers who are enrolled in the CATIP are just as likely to have similarly positive self-efficacy measures at the end of their first term teaching as their peers in other programs. This finding indicates a trend of future growth due for the recently formed CATIP program. Further examination reveals positive measures of mentor satisfaction that rival those of induction level teachers in other programs, and a positive outlook for future measures.

### Implications for the Profession

The problem of teacher retention has been studied previously, and Clark et al. (2014) specified that agriculture teachers are twice as likely as teachers in other content areas to leave the profession within the first six years. This study addresses the teacher retention issue by building on previous recommendations to examine potential structures that may be affecting agriculture teacher attrition in the State of California. Within the first year of a new induction program, participants are showing on-par results with their peers who have continued in other programs. The recommendation made by this research is to continue to develop and expand the CATIP mentorship program.

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**Employer Perspectives of Agricultural Students' Communication Skills:  
Curriculum Considerations Based on Real-World Input**

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## **Employer Perspectives of Agricultural Students' Communication Skills: Curriculum Considerations Based on Real-World Input**

### **Introduction and Theoretical Framework**

Scientific communication skills are often overlooked in food, agriculture, natural resources, and human sciences' classrooms because of an intense focus on technical knowledge. However, the need for improved scientific communication skills has been documented in the literature (Crawford, Lang, Fink, Dalton, & Fielitz, 2011) as graduates are expected to disseminate and transfer scientific information to broad audiences. Writing-intensive courses have been used to reduce students' writing apprehension and encourage writing confidence (Fisher & Meyers, 2017), but universities continue to look for ways to improve students' communication skills. Crawford et al.'s (2011) study identified listening effectively, communicating accurately and concisely, communicating orally, communicating pleasantly and professionally, communicating in writing, asking effective questions, and communicating appropriately and professionally using social media as seven key characteristics of communication skills.

The National Research Council (2009) expressed concern that "little communication" (p. 3) occurs between academics and industry. Therefore, there is a need to understand employers' perspectives of the communication characteristics identified in the Crawford et al. (2011) study to improve curriculum so it meets industry needs. Within the profession, the American Association for Agricultural Education National Research Agenda (2016) calls for studies to address needed workforce competencies across agriculture and natural resources areas (Roberts, Harder, & Brashears, 2016). This study addressed the identified need by seeking guidance from agricultural industry leaders in regard to curriculum needs and assessing industry needs for communication.

Human capital theory guided this study. Capabilities, training, knowledge, experience, and abilities each contribute to human capital, and entities seek to capitalize on these attributes to benefit the company (Vargas, Lloria, & Roig-Dobon, 2016). Entities are often willing to provide on-the-job training for employees to acquire beneficial skills but would prefer for employees to join the company equipped with the needed skills (Raffiee & Russel, 2016). Thus, communication skills are critical within the context of human capital.

### **Purpose and Methods**

The purpose of this study was to investigate employers' perspectives about the communication skills of college students they hired in the past, as well as understand their potential needs in future hires. To investigate employers' perspectives, we used qualitative interviews that focused on Crawford et al.'s (2011) seven characteristics of communication skills. We used interviews to gain rich and meaningful input from participants. Data collection continued until we reached data saturation. In all, we interviewed 37 employers who attended a career fair in spring 2017 (17 participants), fall 2017 (11 participants), or spring 2018 (nine participants). Employers represented companies related to animal industries, pest control, construction, retail, fertilizer, feed/seed, produce, food/beverage, equipment manufacturing, landscaping, financial services, and other professional services. All interviewees had hired Texas A&M University students in the past and were on campus with the goal of recruiting new hires. The employers were appropriate because they possessed knowledge of graduates who had been hired by their

company and could share meaningful information given their experience (Merriam & Tisdell, 2016). We asked employers to share their insight regarding communication skills needed by new hires, and the interviews lasted between eight and 15 minutes. We also asked the employers to rank Crawford et al.'s (2011) seven characteristics of communication skills. We assigned each employer a code in the order they were interviewed to allow an audit trail within and across the data (Erlandson, Harris, Skipper, & Allen, 1993). The letter *b* was added to the employers interviewed in the fall and the letter *c* was added to those interviewed in spring 2018 to separate them from those interviewed in spring 2017. We also maintained a journal to increase trustworthiness and credibility and used the constant-comparative method to identify categories within the data (Glaser & Strauss, 1999). The institutional review board approved the study.

### **Findings**

All employers indicated communication skills were important. In fact, one employer (C02) specifically indicated communication skills were of paramount importance, possibly more important than content-specific scientific knowledge. Employers emphasized that two specific aspects of communication were very important: interpersonal skills (C01, C06, C11, C15, C20b, C26b, C28b, C29c) and active listening (C07, C09, C16). In regard to oral communication, employers indicated public speaking (C05, C17, C18b, C22b, C31c, C33c), speaking clearly (C07), eye contact (C12), expression (C17) and phone etiquette (C07, C25b, C36c) were essential. Regarding written communication, employers expressed professional written communication (C16) via both email (C06, C21b, C32c, C34c) and business letters (C07) were important. Employers also stated they wanted to hire individuals who could communicate effectively using technology (C03), translate scientific information into common terms (C06), and summarize complex scientific material (C08, C11). Employers also noted communication across teams (C27b, C33c), enthusiasm (C13), commitment (C14), and multicultural awareness (C35c) were important. In addition to communication-specific skills, employers noted understanding sales (C02, C04, C19b, C21b, C24b, C37c) and communicating with confidence (C04, C05, C09, C10, C30c, C23b, C37c) were critical. Thirteen employers indicated oral communication was the most important communication characteristic. This contradicts findings by Crawford, et al. (2011), which revealed listening effectively as the most important. Similar to Crawford, et al. (2011), all employers ranked social media as the least important of the seven.

### **Conclusions, Implications and Recommendations**

Employers value effective communication skills that can be readily applied in the workplace and, thus, contribute to the human capital within their company. They desire for universities to incorporate more activities into curriculum to enhance communication skills. Because they expressed a stronger need for oral communication over written communication, universities should look for ways to strengthen oral communication skills. Writing-intensive courses often involve written papers rather than research briefs, letters, emails, or speaking points. Thus, there is a need to incorporate real-world communication activities from industry into the university food, agriculture, natural, and human sciences classroom. The findings of this study are timely for agricultural education and provide a baseline for improvement in the current communication coursework. Research is needed to determine the most effective means of incorporating activities to enhance communication skills, and researchers should conduct experimental studies to determine skill and knowledge attainment and knowledge transfer as a result of the activities.

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Examining Agricultural Literacy and the Perceptions of Being Literate in Agriculture

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## Examining Agricultural Literacy and the Perceptions of Being Literate in Agriculture

The purpose of this Delphi research study was to identify the characteristics of being agriculturally literate and the understanding of literacy by agricultural professionals in the United States. Shanahan and Shanahan (2012) note a difference between content and disciplinary literacy. Content literacy, also referred to as general literacy, focuses on broad subject areas such as science, technology, engineer, mathematics, and agriculture (Wolsey & Lapp, 2017), while disciplinary literacy focuses on specialized content within subject areas (e.g. animal reproduction, genetically modified field crops, agricultural communications, and agriculture education). Meischen and Trexler (2003), defined agricultural literacy as entailing "... knowledge and understanding of agriculturally related scientific and technologically based concepts and processes required for personal decision making, participating in civic and cultural affairs, and economic productivity..." (p. 44). The concept of literacy implies content knowledge in a field of study and application of knowledge to make reasonable judgments related to concepts, content, and practices. It is also important to distinguish between the terms "literate" and "literacy" in order to better understand and communicate about agriculture. Harris and Hodges (1995) define being literate as an individual's skill to read and write. The term literate can also be described as basic literacy skills. Mercier (2015) notes a lack of research on agricultural literacy prevents educational programs from expanding and recommends additional research to better understand this problem. This research study addresses Research Priority 1, "What methods, models, and programs are effective for informing public opinions about agricultural and natural resources issues?" (Enns, Martin, & Spielmaker, 2016).

### Conceptual Framework

The conceptual framework for this study is bound by disciplinary literacy, content literacy, agricultural literacy, and the Pillars of Agricultural Literacy (Frick, Kahler, & Miller, 1991; Meischen & Trexler, 2003; Shanahan & Shanahan, 2012; American Farm Bureau, 2013). In addition to defining agricultural literacy, Frick, Kahler, and Miller (1991) identified eleven concepts which encompass agricultural literacy: environment, processing, policy, natural resources, animal production, societal significance, plant production, economic impact, marketing, distribution, and globalization. Frick et al. (1991) further noted "an individual possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture." (p.52). Frick et al. (1991) concepts of agricultural literacy are operationally defined as disciplinary literacy. Based on this assumption of disciplinary literacy, a person would need to be literate and possess content literacy in order to learn through reading and writing in the discipline (Shanahan & Shanahan, 2008).

### Methods

The Delphi process consisted of four rounds. The instrument was developed using statements constructed from existing research in the field of agriscience education, disciplinary literature, and literacy research outside of agriscience education. The first-round instrument consisted of two statements: "*How do you define the term "Agricultural Literacy,"*" and "*What does it mean to be agriculturally literate?"*" Using a series of selection processes, 15 purposively

chosen panelists participated in the study and used established Delphi techniques as reported by Rayfield and Croom (2010) and supported by Conner and Roberts (2013). Qualifications for inclusion in the study required participants to be employed in the agriculture industry, serve in a capacity in which their employment provided opportunity for interacting with the public, and employed in the same or similar position equal to or greater than five years. The composition of the expert panel included participants from seven states. Participants possessed at minimum a bachelor's degree in an agriculture area of study and predominately resided in rural locations. Participants represented a wide range of agricultural careers including political and policy, education, for profit advocacy centers, agribusiness/industry, agriculture communications, and FFA/Professional Organizations. Fifteen agricultural professionals indicated their desire to participate in the study.

## **Results**

The first-round instrument was comprised of 24 unique responses and were developed into 11 statements to measure the level of agreement of the participants in round two. Agreement levels of eighty percent (Dalkey, 1969) were used to determine consensus for each question in each of the four rounds. Round two statements were presented using a five-point scale: 1) Strongly Agree, 2) Agree, 3) Neither Agree or Disagree, 4) Disagree, 5) Strongly Disagree. The third-round instrument consisted of 19 new statements and asked participants to indicate their level of agreement using a two-point scale: 1) Agree or 2) Disagree. The fourth-round instrument asked participants what it means to be agriculturally literate and what agricultural literacy is. Participants indicated their perceptions of being agriculturally literate and defining agricultural literacy with the intended purpose of determining if a knowledge and application gap existed between being literate and understanding literacy. The interpretation of the participant responses reinforced the gap between content knowledge and literacy while extending the definition of agricultural literacy.

## **Conclusions and Implications**

This study describes the need for a closer analysis of the differences between being literate and understanding literacy to address the issues of agriculture to the greater society. Participants demonstrated deep understanding for agriculture when explaining advocacy for producers, teachers, other professional fields, displaying appreciation for the cultivation of livestock and crops, and sharing information regarding production and scientific agriculture as related to defining agricultural literacy. The findings indicated that the participants did not recognize the depth of literacy as related to reading, writing, and speaking efficiently. The conclusions indicated a traditional approach to answering the question, "What does it mean to be agriculturally literate?" The final definition provided to the participants did not include attributes of being literate: reading, writing, and communicating about the discipline. Those who would learn in the discipline of agriculture today need specialized reading and writing skills, the skills employed by expert agriculturalists in learning from agricultural texts. The implication of this observation is that there is a gap in understanding agricultural literacy and its implications for current educational practices and ultimately, the education of future generations.

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**Exploring Motivations of Volunteers to Teach Agriculture in West Africa**

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### Introduction / Need for Research

AgriCorps is a non-governmental organization which seeks to aid in the alleviation of hunger and poverty in West African countries. The mission of AgriCorps is operationalized through a model that immerses American agriculture graduates in high-need communities for one year (AgriCorps, 2018). During their year of service, fellows are tasked with teaching agriculture in the local primary or secondary school, developing the local 4-H program, and assisting farmers with their operations. Often, fellows are recent college graduates, have limited professional experience, and little-to-no teaching experience. Why then, would they volunteer to teach agriculture alone in a rural African community for one year?

While motivations to volunteer abroad and motivations to teach agriculture have been studied, little is known about connections between the two. Research investigating motivational factors to engage in volunteer activities has largely pointed to multi-motivational goals (Clary & Snyder, 1999). Motivations to volunteer specifically for international experiences include altruism and egoism (Mustonen, 2007; Rehberg, 2005), travel and adventure (Stoddart & Rogerson 2004), cultural immersion and exchange (Wearing, 2001) and personal growth and learning (Otoo, 2013). Literature exploring why teachers are motivated to choose education as a career suggests intrinsic, altruistic, and extrinsic factors at play, and often a combination of reasons for choosing to teach (Thomson, Turner, & Nietfeld, 2012).

### Conceptual Framework

We utilized a functional approach to understand what motivated AgriCorps fellows to volunteer to teach agriculture in West Africa. A functional approach is “the attempt to understand the reasons people hold the attitudes they do” (Katz, 1960, p.170). Reasons which, according to Katz (1960), are motivations existing at the psychological level. People seek out volunteer activities and make decisions about engaging and continuing volunteer activities to serve varied individual functions (Clary & Snyder, 1999). The guiding functionalist principle is “that these decisions and behaviors depend on the match of an individual’s motivations to the opportunities afforded by the volunteering environment” (Clary & Snyder, 1999, p.157-158).

### Methodology

The purpose of this study was to investigate the motivations of AgriCorps fellows to teach agriculture in West Africa. To explore this, we conducted one-on-one, face-to-face, semi-structured interviews with the 2017-2018 AgriCorps fellows ( $N = 8$ ) during the summer of 2017 while fellows were engaged in their preservice training. The interviews were between 10 and 15 minutes long during which participants were asked to discuss their motivations for joining AgriCorps, their motivations for wanting to teach agriculture in West Africa, the experiences that prepared them, their expectations, and what they were most nervous and excited for in regards to teaching agriculture in West Africa. Interviews were transcribed verbatim to capture the rich and detailed responses of the participants (Maxwell, 2005). We used a retroductive method (Bulmer, 1979; Katz, 1988) of data analysis, which included close readings of the data, open coding, focused coding, and integrative memoing through an iterative process (Emerson, Fretz, & Shaw, 2011). As salient themes emerged, we searched for discrepant evidence and negative cases to

ensure valid conclusions (Maxwell, 2005). We received institutional review board approval to conduct this study.

### **Results/Findings**

While our initial research question was to explore motivations of AgriCorps fellows to teach agriculture in West Africa, it became evident as the interviews unfolded that participants largely were not motivated to teach agriculture at all. Rather, teaching was largely seen as a distant role they had not given much consideration. In light of this, three themes emerged from the interview data including, (a) teaching as a shortcoming, (b) teaching as complementary yet circumstantial, (c) teaching as pivotal. Two participants viewed teaching as a shortcoming of the AgriCorps experience. Justin for example said, “At first I was like thinking of teaching as a downside.” Similarly, Samuel was doubtful about the prospect of teaching saying, “teaching is actually nowhere near on my playlist of things to do”. Four participants viewed teaching as complementary yet circumstantial to the AgriCorps experience, indicating that the teaching component sounded intriguing. For these participants, teaching was discussed as something they would do during their time abroad, but not as a long-term career option. Two individuals, the only participants who held degrees in agricultural education, viewed the teaching role of AgriCorps as a pivotal component of their experience and a driving force in their decision to pursue AgriCorps. For example, Beth, when asked about her motivations to teach agriculture in West Africa, stated matter-of-factly, “I’ve always wanted to teach”. Julia, on the other hand, spoke about her motivations to teach agriculture as stemming from a “little fuzzy feeling” that blossomed into long-term career goals to teach agriculture.

### **Conclusions/Implications/Recommendations**

It became evident that participants in this study were largely unmotivated to teach agriculture in West Africa. Rather, the teaching component of their position as an AgriCorps fellow was seen as a shortcoming or a complementary yet circumstantial component of the experience. Katz’s (1960) functional theory posits that motivations to engage in a particular volunteer experience align with an individual’s motivations. Our data revealed teaching agriculture largely did not serve as a function of their motivation to engage in AgriCorps. Future research should include more broad inquiry about why fellows apply for AgriCorps. This may illuminate other functions of motivation to become an AgriCorps fellow or an international agriculture volunteer. More research is needed concerning the specific functions of various motivational factors on the decision to volunteer to teach internationally. For instance, does the teaching component begin to serve a more important function over time, or is the “strength” of other motivational factors enough to overcome the perceived circumstantial function of the teaching component? Answering these questions will provide practical implications related to recruitment of AgriCorps fellows and other international volunteers.

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**Fishing for Answers: Barriers to Secondary Agricultural English Course Adoption**

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## **Fishing for Answers: Barriers to Secondary Agricultural English Course Adoption**

### **Introduction**

Wamba (2012) said, "...literacy education plays an important role in moving people out of poverty toward greater self-sufficiency post-graduation" (p. 109). Nearly 47% of first-time California community college students are enrolled in remedial English coursework (Student Success, 2015). Further, California high school dropout rates are at 11% due to "school-related reasons...implying a lack of engagement and lack of perceived relevance" in curriculum (Gottfried & Plasman, 2017, p. 30). Literacy in our high school classrooms must be addressed.

Career and Technical Education (CTE) coursework has been linked to lower dropout rates; particularly in grades 11 and 12 (Gottfried & Plasman, 2017). University of California Curriculum Integration (UCCI) was developed to help teachers facilitate creating courses which were both CTE and academically aligned for college preparation (UCCI, 2014). The Business of Sustainable Agriculture course was developed as a UCCI curriculum project to help high school seniors gain skills in writing and entrepreneurship in agriculture while meeting University of California area "b" (English) entrance requirement for 12th graders. According to the UCCI portal, only one California school is currently offering the course.

The adoption of innovative, curriculum ensures high school students are prepared for life post-graduation. This research aligns with Priority 4 of the AAEE National Research Agenda - Meaningful, Engaged Learning in All Environments (Roberts, Harder, & Brashears, 2016), by examining how agricultural education programs evolve to meet student needs. Investigating barriers preventing adoption of beneficial curriculum capable of increasing literacy, preventing dropout, and producing a viable workforce will strengthen CTE programs in agriculture.

### **Theoretical Framework**

Rogers' (1995) innovation-decision process framed the theoretical background of this study. Knowledge, persuasion, decision making, implementation, and confirmation comprise the process in which "information-seeking and information-processing...reduce uncertainty about the advantages and disadvantages of an innovation" (Rogers, 1995, p. 172). Ultimately, the innovation-decision model outlines a process that occurs over time in which different barriers may stall the process. The literature revealed barriers to curriculum adoption are centered on cost-benefits and increased teacher workload (Lionberger, 1960; Conroy, 1999). Further, lack of understanding and awareness of curriculum have also been identified as potential barriers to the adoption of innovative curriculum (Conroy, 1999).

### **Methodology**

The Delphi technique is "a widely used and accepted method of gathering data from respondents within their domain of expertise" (Hsu & Sandford, 2007). We used this technique to form a consensus from leaders in California agricultural education. All 30 participants were regional officers for the California Agricultural Teachers' Association (CATA). Reliability was considered high with at least 11 participants in each round (Dalkey, 1969).

In round one we asked: To your knowledge, what barriers do you perceive as preventing California teachers of school-based agricultural education (SBAE) from implementing the UCCI

Business of Sustainable Agriculture course for UC English area “b” credit? A 60% (n=18) response rate generated 12 answers from which the second round was created. In round 2, we asked participants to rate the 12 items on a scale of 1 (minimal barrier) to 10 (extreme barrier) in preventing California teachers of SBAE from implementing the course. This round had a 66% (n=20) response rate, where respondents rated all 12 barriers an average score of 5 (moderate barrier) or more. Round 3 asked participants to rank the 12 items from least to greatest barrier providing a final list of 5 barriers to course adoption with a 60% (n=18) response rate. In round 4 we asked for additional insight on the final 5 items and had a 53% (n=16) response rate.

### **Results and Findings**

The following were the top five perceived barriers, in ranked order, as to why California teachers of SBAE have not implemented the UCCI Business of Sustainable Agriculture course:

Barrier 1: Lack of acceptance by English Department.

Barrier 2: Competition between Agriculture and English departments to teach the course.

Barrier 3: Agriculture teachers are not qualified to teach English.

Barrier 4: Challenges with district course adoption policies.

Barrier 5: Agriculture teacher fear of teaching the content.

### **Conclusions**

Respondents agreed with the top five barriers and offered comments. Most came to the conclusion English departments would not embrace an agriculture class where students would receive English credit; especially in smaller agriculture programs. “At a small high school, this option to offer yet another singleton class will be a huge challenge,” one participant said. Another advocated the course be taught by an English teacher in order to gather more approval of the course content from the English department. While cost-benefit and teacher time were not explicitly indicated, it was evident time and money allocated toward improving agriculture teachers’ abilities to teach the class would also be an obstacle. These barriers provided insight into the innovation-decision process in connection to curriculum adoption in California, asserting paucity of knowledge was a predominant factor influencing initial adoption stages.

### **Implications/Recommendations**

Further research is recommended in order to understand how innovative curriculum is adopted at the high school level, particularly curriculum overlapping two content areas. It is recommended a follow up study be conducted at the current program who has implemented the UCCI Business of Sustainable Agriculture course to understand their curriculum adoption process and the relationship with their English department. Leadership within the state of California should look at providing professional development opportunities which promote acquisition of skills to teach literacy and writing in order to alleviate fear of the content and build collegial rapport with teachers of English. Innovative curriculum, like the UCCI Business of Sustainable Agriculture class, gives rigor and relevance to CTE programs. Implementing cross-disciplinary curriculum between English and agriculture could prove to be valuable for agriculture students, making them literate members of society who can write their own futures.

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**Grit and Optimism in Leadership Development Event (LDE) Participants: A Descriptive Examination**

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### **Grit and Optimism in Leadership Development Event (LDE) Participants: A Descriptive Examination**

#### **Introduction/Need for Research**

Researchers have suggested that academic achievement stems from a combination of cognitive and personal traits (Bazelais & Lemay, 2016). There is a growing interest in the importance of non-cognitive traits as drivers of academic outcomes (Charity & Cureton, 2016). Student success in school has been largely attributed to activities which take place outside of the regular classroom (Bazelais & Lemay, 2016). Two non-cognitive factors that may play a role in student achievement are grit and optimism. Grit is a non-cognitive factor defined as “perseverance and passion for a long term goal” (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1087). According to Carver and Scheier (2002), optimism is a positive expectation for the future. As a personal disposition, optimism refers to tendency to believe that one will generally experience good outcomes in life (Scheier & Carver, 1985). Grit and optimism may be closely tied. Usher and Pajares (2008) noted that optimistic individuals are “equipped with the self-enhancing bias needed to sustain resilient belief in the face of difficulty” (p.785).

Understanding the role of an agricultural education program in student grit and optimism could allow future research into components of the program which are helping increase these traits in students. Although optimism has been widely studied in leadership (Lamm & Lamm, 2014), few studies have been conducted to examine the levels of grit and/or optimism in secondary agricultural education students. We designed this portion of a larger study on grit and optimism to gather the grit and optimism scores specifically for agricultural education students who were competing in FFA LDEs on the district level. Gathering this information was conducted to provide initial data for a more detailed examination of grit and optimism in secondary agricultural education students as a whole.

#### **Conceptual Framework**

This study was developed based on the concept of growth mindset (Rattan, Savani, Chugh, & Dweck, 2015). Dweck proposed that individuals are more successful when they are able to look toward and overcome obstacles in order to reach desired results, and stressed the importance of personal change as a factor in improvement. Grit and optimism are both factors related to having a growth mindset (Duckworth, et al, 2007; Usher & Pajeres, 2008). The purpose of this study was to describe the grit and optimism scores for students competing at in a district FFA LDE event.

#### **Methods**

This descriptive study was a portion of a larger examination of grit and optimism in secondary agricultural education students. The study population was a census of students ( $N = 98$ ) students attending the [District] Leadership Development Events on the [University] campus in November 2017. As this study involved a selected population, caution should be taken in generalizing results to populations outside of the respondents.

The survey instrument included three sections. Section one were demographic questions including: age, gender, numbers of years competing in CDE/LDE events and chapter. Section two was the short form of Duckworth's (2007) grit scale which included 10 likert-type items, with rating options from 1-5, where 5 was the highest level of agreement. Previous estimates of reliability for this instrument were  $\alpha = 0.82$ . We used the 10-item life orientation test (Scheier, Carver, & Bridges, 1994) in section three to measure student levels of optimism. This section also included 10 likert-type items, with a scale from 1-5, where 5 was the highest level of agreement. Previously reported reliability estimates for the life orientation test were  $\alpha = 0.88$ . A post hoc analysis of reliability for this population yielded  $\alpha = 0.72$  for the grit section and  $\alpha = 0.87$  for the optimism section.

We began this study by developing the required consent documents and obtaining IRB approval. A consent/assent form was emailed to all the participants, and was required to be submitted upon event check-in. A paper copy of the survey instrument was distributed to participants during event orientation, and collected prior to students disbursing for their individual competitive activities. All registered students completed the instrument, for a 100% response rate. Data were entered into an Excel spreadsheet and analyzed using SPSS v. 24.

### **Results/Findings**

Student scores for grit and optimism are shown in Table 1. Self-reported grit scores for LDE participants at the [District] LDEs were  $M = 3.66(0.51)$  Normative grit scores for adolescents are 3.4 on the five point scale (Duckworth et al, 2007). Optimism scores for participants were  $M = 3.86(0.41)$ . By comparison, average scores on the life orientation test range from 3.5 to 3.9 for previously examined populations (Pan, et al, 2017). Male participants had grit scores of  $M = 3.48(0.53)$ , while the female participants grit scores were  $M = 3.77(0.48)$ . In regard to optimism, male respondents had scores of  $M = 3.58(0.45)$ , while females had scores of  $M = 3.73(0.45)$ .

### **Conclusion, Implication, Recommendations**

From the findings we can conclude that students attending [District] LDE events reported scores that were above the normative scores for both grit and optimism. Students with higher grit are more likely to persist toward goals, even in the face of challenges (Duckworth, et al, 2007). Individuals with higher optimism scores have a more positive life outlook (Carver & Scheier, 2002). The question remains, are students who have high levels of grit and optimism drawn to agricultural education and LDE events, or is there an embedded component within the program and LDE preparation which increases these traits in students? The information gathered through this study yields many opportunities for future research. We recommend an examination of factors within agricultural education programs, including LDE preparation. We also recommend further research to investigate the relationship between demographic characteristics, agricultural education program involvement, and grit and optimism scores. Understanding the role of grit and optimism may play an important role in investigating social skill factors for agricultural education students in the future.

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# **Help! Determining the FFA and SAE Professional Development Needs of [State] Agriculture Teachers by Years of Teaching Experience**

## **Introduction**

While education is always changing for every type of educator, for an agriculture teacher the change can be much more drastic. With rapidly changing standards and expectations, professional development workshops for educators are imperative. Departments of agricultural education have had the purpose of identifying and delivering important in-service workshops to agriculture teachers (Barrick, Ludewig, & Hedges, 1983). However, workshop designers often have had difficulties in identifying the most relevant topics (Birkenholz & Harbstreet, 1987; Washburn, et al., 2001). Specifically, FFA and SAE professional development needs vary from teacher to teacher based on years of teaching experience. Research has indicated that early career teachers often desire professional development over implementing SAE programs and advising FFA members (Layfield & Dobbins, 2002). However, experienced teachers have reported desire for professional development in (a) preparing FFA degree applications, (b) Career Development Event (CDE) training, (c) preparing proficiency award applications, (d) utilizing computers/multimedia, and (e) teaching record keeping skills (Layfield & Dobbins, 2002).

## **Theoretical and Conceptual Framework**

The Theory of Andragogy served as the theoretical framework underpinning this study. The core premise of andragogy is that adult learners have different needs, wants, and desires for learning experiences than do young students (Knowles, 1980; Knowles, Holton III, & Swanson, 2015). Per the model, teachers' professional development needs may differ depending on career stage. The literature review revealed that scholars in agricultural education have assessed the professional development needs of agriculture teachers for many years. Research commonalities have been noted, but professional development needs can vary by state, years of experience, and career stage (Birkenholz & Harbstreet, 1987; Fessler & Christensen, 1992; Layfield & Dobbins, 2002; Roberts & Dyer, 2004; Washburn et al. 2006). Additionally, a comprehensive study of the FFA and SAE related professional development needs of [State] agriculture teachers has not occurred in the past 20 years. The principle research that arose from the review of literature was: how do the FFA and SAE professional development needs of [State] agriculture teachers vary by years of teaching experience?

## **Methods**

The target population of this study was all [State] agricultural educators actively working during the 2017–2018 academic year (N = 261). Data were collected, with a paper instrument delivered by the researcher at each of the three [State] FFA Leadership Camp sessions in July 2017. In all, 190 advisors registered for camp and 164 finished the survey, which yielded 86.0% response rate, representing 62.8% of the total agriculture teacher population in [State]. No attempt to collect data from those who did not attend a camp session was attempted because an accurate frame (i.e., directory) of agriculture teachers was not available at the time of data collection. The instrument consisted of six sections, (a) instruction/curriculum, (b) technical agriculture, (c) Career/Leadership Development Events, (d) SAE, (e) program management, and (f) teacher characteristics. For the purpose of this study, only Career/Leadership Development Events, SAE, and Program Management are reported. Data were analyzed utilizing SPSS version 24.

## Results

Table 1 highlights the perceived FFA and SAE needs of [State] agriculture teachers. Agriculture teachers with 1 – 5 years of experience reported *Career Development Events* ( $M = 2.44$ ), and *Leadership Development Events* ( $M = 2.41$ ) were in need of some professional development. Teachers with 6 – 25 years of experience reported some professional development needs in *Leadership Development Events*, and *Program Management*. Finally, teachers with 26+ years of experience responded with some need in *Career Development Events* ( $M = 1.96$ ), and *Program Management* ( $M = 1.98$ ).

Table 1  
*Perceived FFA and SAE Needs of [State] Agriculture Teachers*

Item	Years of Experience											
	1–5		6–10		11–15		16–20		21–25		26 or more	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Career Development Events	2.44	0.92	2.40	0.89	2.03	0.88	1.77	0.94	2.16	0.90	1.96	0.71
Leadership Development Events	2.41	0.97	2.42	0.90	2.16	1.01	1.85	0.86	2.21	1.11	1.90	0.86
Program Management	2.37	0.90	2.70	0.96	2.24	1.14	1.87	0.87	2.19	1.02	1.98	0.84
Supervised Agriculture Experience	2.03	0.84	2.33	0.70	2.02	0.84	1.45	0.92	2.08	0.79	1.49	0.83

*Note. Note.* Real limits: No Need = 0 – 0.49; Little Need = 0.50 – 1.49; Some Need = 1.50 – 2.49; Much Need = 2.50 – 3.49; Highest Need = 3.50 – 4.00

## Conclusions/Implications/Recommendations

The purpose of this study was to identify FFA and SAE professional development needs of [State] agriculture teachers by years of experience. Table 3 sought to identify FFA and SAE related professional development needs of [State] agriculture teachers by years of experience. All items were reported in need of some or much professional development by all categories of teachers. Previous research concluded that experienced teachers needed professional development in performing FFA related activities, such as degree applications and award applications (Garton & Chung, 1996; Layfield & Dobbins, 2002; Joerger, 2002; Peiter, Terry & Cartmell, 2003; Duncan et al., 2006). However, previous research has indicated that novice teachers need the greatest professional development needs in SAE related activities (Layfield & Dobbs, 2002). Based on this research the authors recommend that this information be shared with state agricultural education staff, [State] Agriculture Teachers' Association, and anyone else who offers professional development for agriculture teachers. It is also recommended that professional development workshops be tailored to specific years of teaching experience. One size fits all professional development workshops may not be the most effective way to deliver quality professional development to all career stages.

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**How Extension Can Use Videos to Encourage Homeowner Adoption of Fertilizer Best Management Practices**

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## How Extension Can Use Videos to Encourage Homeowner Adoption of Fertilizer Best Management Practices

### Introduction

According to Nielson and Smith (2005), landscape maintenance is influenced by homeowner associations and neighborhood aesthetics. As a result, homeowners are inclined to over-irrigate and over-fertilize their lawns to uphold landscape appearances. Such practices affect water quantity and quality (Nielson & Smith, 2005), however water quality is most impacted by fertilizer runoff (Toor et al., 2017). According to a report by the Florida Department of Agriculture and Consumer Services, “excess nitrogen and phosphorus are the most common causes of water quality impairments in Florida” (FDACS, 2014, p. 4). The report additionally stated that proper management of nutrient sources, and pollutant discharge was crucial for safeguarding clean water resources (FDACS, 2014). Hence, supporting water programs and engagement in fertilizer best management practices (BMPs) can have positive impacts on water quality. The purpose of this research was to determine if video messages about fertilizer BMPs influenced high water users’ perceptions of fertilizer use.

### Theoretical Framework

The diffusion of innovations (DOI) theory (Rogers, 2003) explains how an idea or product considered new by a population is accepted and adopted over time. According to Rogers (2003), there are five attributes that influence the diffusion of an innovation – relative advantage, compatibility, complexity, observability, and trialability. Relative advantage is described as the degree to which fertilizer BMPs are perceived as better than current fertilizer practices; compatibility is described as the degree to which fertilizer BMPs are perceived as consistent with existing needs of high water users; complexity is the degree to which fertilizer BMPs are perceived as difficult to understand and use; observability speaks to whether the results of using fertilizer BMPs are visible to others; and trialability is the degree to which fertilizer BMPs can be experimented with before committing to adoption. With favorable perceptions of the attributes, adoption of fertilizer BMPs is likely, which helps inform educational water quality programs. For example, a study by Lamm et al. (2017) applied the DOI theory to determine adoption of water conservation technologies.

### Methods

The target population for this research were homeowners in Florida who owned a lawn or landscape and engaged in fertilizer practices. An online researcher-developed questionnaire was administered to 2,000 residents by an online survey company. Respondents were screened to ensure they resided in Florida, were 18 years of age or older, and had a lawn or landscape they fertilized. An expert panel qualified in the fields of urban water engineering and water conservation reviewed the questionnaire. A pilot study confirmed there were no issues with question construction. Video messages were developed around social and personal engagement in fertilizer BMPs. There were two non-goal orientation treatment groups: those who received a social video non-goal orientation message (SVNGO,  $n = 400$ ), those who received a personal video non-goal orientation message (PVNGO,  $n = 401$ ), and a control group that received no video message ( $n = 398$ ). Both non-goal orientation videos showed the importance of fertilizer BMPs in protecting water quality. However, respondents were not primed with messages about good fertilizer practices prior to viewing these videos. Constructs created for the compatibility ( $\alpha = 0.88$ ) and complexity ( $\alpha = 0.89$ ) diffusion attributes averaged all items under each construct, and each construct had acceptable internal consistency (Field, 2006). Chi-square tests determined

the association between the treatment and control groups for relative advantage, observability, and trialability. ANOVA analysis tested differences in video treatment and control groups for compatibility and complexity. Then, Tukey's post-hoc test determined where significant differences occurred between group means. Also, partial eta squared was used to determine the strength of the association between variables.

### Results

The ANOVA indicated there were statistically significant differences between the treatment and control groups in residents' perceptions of compatibility ( $p < .01$ ) and complexity ( $p < .01$ ). However, the Tukey post-hoc test indicated that the statistically significant difference was only between the control group and the PVNGO ( $p < .01$ ) and SVNGO ( $p < .01$ ) groups for the compatibility and complexity attributes. Chi-square tests determined if the expected versus observed response between the groups and the categorical response to the relative advantage, observability, and trialability attributes were statistically different. Respondents were asked to indicate their level of agreement or disagreement with the following statement: Good fertilizer practices are better than the fertilizer practices I have used in the past. The Chi-square test indicated a statistically significant difference ( $X^2(8) = 45.48, p < .01, \eta^2 = .15$ ) between the relative advantage of the groups in which the respondents were assigned. There was also a statistically significant difference ( $X^2(2) = 15.75, p < .01, \eta^2 = .11$ ) between the response to the question "Have you had the opportunity to observe others using or demonstrating good fertilizer practices you are not currently using?" and the groups in which the respondents were placed. However, there was no statistically significant difference ( $X^2(8) = 7.50, p = .48, \eta^2 = .07$ ) between the answers to the question "How likely are you to adopt good fertilizer practices you observed someone else using?" and the groups in which the respondents were placed. The respondents were asked to indicate on a five-point Likert-type scale if good fertilizer practices can be tested before they commit to changing their lawn/landscape management routine to determine their perceived trialability of BMPs. There was a statistically significant difference ( $X^2(8) = 27.60, p < .01, \eta^2 = .13$ ) in perceptions of the trialability of fertilizer BMPs.

### Conclusion, Implications and Recommendations

It is evident that videos influenced homeowners' perceptions of fertilizer BMPs. However, the type of video (social or personal) did not matter. Rogers' (2003) notion is that a new idea, in this case best management practices, will be adopted and accepted over time by homeowners. Videos (both social and personal frames) can be used over time to help homeowners understand the relative advantage, compatibility, complexity, observability, and trialability of adopting fertilizer BMPs. Extension agents can develop videos messages and disseminate them to their local communities to encourage adoption of BMPs. When discussing the relative advantage of the fertilizer BMPs through video, cost saving, and positive environmental and health impacts can be topics of discussion. Extension agents can highlight the ways in which fertilizer BMPs can fit seamlessly within the systems the homeowners already have to express the compatibility of the BMPs. To address complexity, Extension agents can address lack of knowledge or homeowner misinformation about fertilizer BMPs. Extension agents can make fertilizer BMPs more observable to consumers by showcasing home landscapes that have already implemented BMPs, and interviewing homeowners about their experiences with BMPs. Lastly, Extension agents can provide opportunities for homeowners to learn about fertilizer BMPs through videos highlighting differences in a non-fertilizer BMP lawn, and a fertilizer BMP lawn. In addition, discussing ways that homeowners can still have aesthetically-pleasing lawns with the use of fertilizer BMPs can promote adoption of fertilizer BMPs.

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**Stakeholder Groups that Pennsylvania Farmers Consider as Influential to make Climate Change Adaptation Decisions**

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## Stakeholder Groups that Pennsylvania Farmers Consider as Influential to make Climate Change Adaptation Decisions

### Introduction/Conceptual Framework

Climate change is a global phenomenon affecting human livelihoods and fostering changes in the economy (World Health Organization, 2017). One such area, agriculture, is facing dramatic consequences such as increases in storms, changes in precipitation, and fluctuations in heat (Horton et al., 2014, US-EPA, 2016). In the United States, agricultural researchers have honed in on the role of understanding local communication and local influence. By way of regional and local information, researchers are able to best assist farmers that are impacted by climate change and prepare for future uncertainties (Prokopy et al., 2015).

In the U.S. Corn Belt, Tyndall et al. (2015) indicated that localized information regarding farmers' beliefs toward climate change and who their farm management decision advisers could play a key role in outreach organizations such as Extension. Utilizing key influencers in a community could be a key way in implementing a more impactful change. Prokopy et al., (2015) found that Corn Belt producers were influenced by farming organizations and advisors, all while their trust was more on Extension and family (p. 265). Below et al (2015) indicated that utilizing key influences in a community could be a key factor in implementing a more impactful climate change adaptations.

The conceptual framework for this study is based on the Adaptation Cycle proposed by Wheaton and MacIver (1999). Wheaton and MacIver used five questions to assess what change created the need for an adaptation. Of the five questions, two questions are pertinent to this study that include *what do farmers adapt to and why* and *who or what system (influencer) adapts*, as it pertains to farmers. These questions guided the researchers in first understanding reasons as to why farmers were making adaptations, and second in connecting key influencers to the adaptations that farmers were making to help determine which group of stakeholders or *system* adapts. Determining what farmers adapt to and who influences their decisions assists researchers in working with the most influential groups to increase farm adaptations. Within the American Association for Agricultural Education, there are seven research priority areas outlined for 2016-2020 (Roberts, Harder, & Brashears, 2016). Of these seven priority areas, four (priority areas six, and seven) can be directly connected to better understanding key influences of farmers regarding farm adaptations. With farmers, influencers, and outreach organizations working together to counter agricultural impacts felt from climate change, each research priority has the opportunity to be addressed.

### Purpose and Objective

This study stemmed from a larger study that more comprehensively examined Pennsylvania farmers' perspectives on climate change. Two objectives guided this study (1) determine who Pennsylvania farmers believe as influential in making farm adaptation decisions, and (2) determine relationships between influencer groups and reasons to adapt new farming practice.

### Methodology

The population for this study consisted of Pennsylvania farmers (N=59,309). The target population for the study consisted of 3,860 Pennsylvania farmers. Using Krejcie and Morgan (1970) sampling

procedures, a sample size to be 357 farmers was selected. Farmer sample was generated at random from a national agricultural journal, who provided a list of Pennsylvania farmers. A six section survey was developed based on focus group responses and an extensive literature review. Survey questions were then reviewed by a panel of experts, as well as field and pilot tested to ensure validity and reliability. Section one asked participants to identify the level of influence different groups have on their farming decisions. The items measured on a three-point scale that ranged from 'High Influence'(3) to 'No Influence' (1) and were grouped into four categories (a) 'community,' (b) 'business,' (c) 'government/other,' and (d) 'online weather resources. Farmers were also asked to indicate on a five-point scale (1=strongly disagree) to (5=strongly agree) the reasons they adopt a new practice. Following Dillman's five-point, tailored design method (Dillman, Smyth, & Christian, 2014), five mailings occurred over an eight-week period. In total, 260 surveys (52.1%) were returned with 252 (50.5%) surveys usable for analysis. Non-respondents were contacted through phone calls. Early, late and non-respondents were compared on key questions on the survey and no significant differences were found and thus the results are generalizable to the population (Miller & Smith, 1983). Data were analyzed using descriptive and inferential statistics.

### Results

**Objective 1:** Farmers were asked to indicate the level of influence certain groups have on their farm adaptation decisions. In *community*, the most influencer was "family" with a mean score of 1.62. For *business*, the influencer "crop/livestock consultant/advisors" with a mean score of 1.70, and in *government/other*, it was "conservation district staff" with a mean score of 1.49. For the final subgroup, *online weather resources*, the most influential factor was "1-7 day forecasts" with a mean score of 2.39 indicating a medium to high level of influence.

**Objective 2:** Farmers agreed that they would adopt a new practice if it increased production on farm ( $M=4.40$ ), improved the land they farm ( $M=4.39$ ), saved them time ( $M=4.21$ ), was an easy change to make ( $M=4.09$ ), and protected them from extreme weather variability ( $M=4.01$ ). Significant, positive relationships ( $r$  values ranged from .27 to .32) were found between influencer categories (community, business, government and on-line resources) and reasons to adopt a new practice. Farmers who rated groups as having high influence also rated high for reasons to adopt a new farming practice such as increased production, improvements on their land, etc.

### Conclusions/Implications

In-depth awareness of key influencer groups is critical for removing the negative perceptions that farmers have and for successfully implementing climate change adaptations. Determining who farmers in the Pennsylvania turn to for climate change information can assist researchers and outreach organizations in best communicating the reality and solutions to impacts felt from climate change. Understanding a farming community could greatly help when seeking to collaborate with partner organizations that farmers consider high influencers in their decision making process. For example, farmers identified family, conservation staff, online weather resources as most influencing groups. Involvement of these influencer groups could increase not only acceptance of new adaptation practices but also the implementation of said practices in ways that are economically and socially beneficial to farmers. Additionally, these findings encourage collaboration efforts between researchers, outreach, and the sources that farmers are influenced by to work together to meet the climate change needs of Pennsylvania farmers.

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## **Injuries and Other Accidents Sustained In An Agricultural Mechanics Laboratory by [STATE] Secondary Agricultural Education Students**

### **Introduction**

Agricultural mechanics courses have been popular in secondary agricultural education programs for many years and continue to be (Burriss, Robinson, & Terry, 2005). One of the reasons that agricultural mechanics draws so much interest is the substantive amount of time spent in an agricultural mechanics laboratory learning hands-on skills (Hubert, Ullrich, Lindner, & Murphy, 2003). The incorporation of laboratory-based experiences allows opportunities for students to engage in scientific inquiry and Science, Technology, Engineering, and Math (STEM) based projects (McKim & Saucier, 2013). By incorporating laboratory-based experiences for students, teachers must become more attentive to student safety concerns.

Agricultural mechanics laboratories are inherently a dangerous learning laboratory because of the age and experience level of the learners being introduced to the operation of power mechanics machinery (Dyer & Andreasen, 1999; Shultz, Perry, Byrd, & Anderson, 2012). The agricultural educators' most important role in agricultural mechanics instruction is to ensure that student safety is a top priority (Dyer & Andreasen). The purpose of this study was to identify the injuries and accidents sustained by secondary students within an agricultural mechanics laboratory during their teaching career.

### **Theoretical Framework**

The theoretical framework that guided this study was the disaster theory (Downer, 2010). Furthermore, Turner (1978) found that a series of man-made disasters presented warning signs, that if acted upon, could have been averted. Turner's findings suggest that social implications superseded engineering problems, thus indicating that disasters could have been avoided. Since students tend to live in a risk-taking world with disregard to rules, they are more apt not to know and understand the consequences of unsafe behaviors (Hubert et al., 2003); unfortunately injuries have occurred in agricultural mechanics laboratories that could have been avoided.

### **Methodology**

The research objectives for this study included: (1) Determine selected personal, professional, and program demographic characteristics of [STATE] secondary agricultural education teachers who instruct in and manage agricultural mechanics programs; (2) Determine the frequency of student injuries as reported by [STATE] Agricultural Education teachers over the course of their teaching careers, and (3) Determine the source of medical attention provided to the students who were injured over that timespan. The data collection instrument developed by Johnson, Schumacher, and Stewart (1990), modified by Saucier, Terry, & Schumacher (2009) and further modified by McKim and Saucier (2012) was used for data collection in this study. A three-section instrument was utilized in the overall study, the second and third section was used to address the research questions of this study. The first section of the instrument consisted of 33

statements with double-matrix response scales. The double-matrix required subjects to respond to each statement twice. The second section of the instrument was used to identify personal, professional, and program characteristics of the respondents and the agricultural education programs in which they taught. The third section of the instrument was used to collect the types of injuries, the frequency of injuries and the medical attention rendered. Dillman's (2007) electronic data collection protocol was followed for this study. After five points of contact, a response rate of 49% ( $n = 72$ ) was obtained. Non-response error was a relevant concern; therefore, procedures for handling non-respondents as outlined as *Method 1* in Lindner, Murphy, and Briers (2001) were followed by comparing early to late respondents.

### **Results/Findings**

Results indicated that the teachers spent on average 7.48 hours per week supervising students in the agricultural mechanics laboratory, the average class size was 13 students, the average size of the laboratory was 2,403 ft<sup>2</sup>, and the average age of these facilities was 36 years. Seventy-three percent of respondents have received first aid training. Additionally, respondents indicated that in their career, they encountered the following types of student injuries: 45.8% lacerations, 42.7% burns, 28.1% abrasions, 11.5% eye injuries, 14.6% slips/trips/falls, 1% muscle sprains/strains, 2.1% crushed appendages, 1% severed appendages, and no hearing injuries or broken bones. The most commonly occurring injury in the agricultural mechanics laboratory were lacerations ( $n = 40$ ), closely followed by burns ( $n = 38$ ).

### **Conclusions/ Implications/Recommendations/Impact on Profession**

The 72 agricultural education teachers reported on average less than two minor student injuries that did not require the students to leave the school for medical attention over the course of the 2013-2014 academic school year. Only three major injuries requiring medical attention were reported. The low number of major injuries reported per teacher indicated that the teachers are putting student safety as a top priority, which is supported by the findings of Shultz, Anderson, Shultz, and Paulsen, (2014) that safety is the most important topic taught in agricultural mechanics. Over an entire career, teachers noted that there were eleven eye injuries reported, this leads the researchers to question if those injuries could have been avoidable by wearing safety glasses. This could align to the suggestions of the disaster theory (Downer, 2010) that those injuries could have been avoidable. The researchers recommend that agricultural education teachers should continue to model and enforce safe work habits. The agricultural education teacher administered some level of medical attention for 110 of the 117 accidents, which further indicates the importance in assuring the teachers should be prepared to administer first aid. The researchers recommend that teachers receive up-to-date training administered annually at the state teachers' association meetings.

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Less Than, Greater Than, or Equal To: Mathematics in Agriculture, Food, and Natural Resources  
Education by Community Type

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# **Less Than, Greater Than, or Equal To: Mathematics in Agriculture, Food, and Natural Resources Education by Community Type**

## **Introduction and Conceptual Framework**

Mathematic skills are essential for success in school, work and everyday life; however, many students experience “math anxiety,” take fewer mathematics courses and have decreased ambition and ability to learn mathematical concepts (Maloney & Beilock, 2012). Additionally, a large majority of students achieve below proficient marks on national mathematics assessments (Kuenzi, 2008), a situation exacerbated by achievement gaps amongst various demographic groups (Gonzalez & Kuenzi, 2012) and school community types (i.e., rural, suburban, and urban) (Graham & Provost, 2012).

School-based agricultural education (SBAE) alone cannot solve mathematics underperformance; however, effective programs can serve to supplement the teaching of mathematical concepts by illuminating the implicit connections between math and agriculture (Roberts, Harder, & Brashears, 2016; Stripling & Roberts, 2013; Stubbs & Myers, 2015). Current research has produced one study which records intentions to teach mathematics across curricular offerings of SBAE (Wells & Anderson, 2015), though it is unknown if mathematics teaching intentions vary across community type. Employing the Ecological Systems Theory (Bronfenbrenner, 2005), which describes the influence of concentric systems on an individual, the purpose of this study was to explore the relationship between school community type (i.e., macrosystem) and SBAE mathematics teaching intentions (i.e., microsystems).

## **Methods**

A simple random sample of 950 teachers was requested and received from the frame of SBAE teachers housed by the National FFA Organization during the 2015-2016 school year. Due to frame error (e.g., incorrect email addresses), the number of potential respondents was reduced to 830. After a maximum of five email requests, a total of 212 completed surveys were submitted using the online survey tool Qualtrics (i.e., response rate = 25.60%). Data were downloaded into the Statistical Package for the Social Sciences (SPSS) for analysis where non-response bias was checked by comparing on-time respondents ( $n = 168$ ) to late responders ( $n = 44$ ) in the areas of community type and intentions to teach mathematics. No statistically significant differences evidenced a lack of non-response bias (Lindner, Murphy, & Briers, 2001; Miller & Smith, 1983). Data collected are part of a larger research project.

Within the survey, relevant data included community type and mathematics teaching intentions. Community type was collected categorically, with respondents self-identifying teaching within either a rural, suburban, or urban community. Mathematics teaching intentions were measured across eleven curricular offerings (i.e., eight career pathways, FFA, SAE, and General Agriculture) in which respondents indicated the percentage of curriculum that met the following definition, “purposeful inclusion of grade appropriate mathematics (e.g. algebra, functions, modeling, geometry, and statistics) concepts and/or practices.” Data analysis yielded average percentages of mathematics intended within the eleven curricular offerings among teachers who identified teaching in rural, suburban, and urban SBAE programs. Intentions to teach

mathematics were ranked within each community type grouping to support comparisons between rural, suburban, and urban teachers.

### Findings

Comparison of intentions to teach mathematics by community type revealed teachers of all community types intended to teach most mathematics within agribusiness systems and power, structure and technology systems pathways, and the least amount of mathematics within natural resource systems and FFA pathways (see Table 1). Comparisons also revealed suburban teachers intended to teach more mathematics in seven of the eleven pathways than their rural and urban teaching peers; whereas, urban teachers intended to teach the least mathematics in eight pathways.

Table 1

*Comparing Intentions to Teach Mathematics among Rural, Suburban, and Urban Teachers*

Pathway	Rural		Suburban		Urban	
	Rank	Mean	Rank	Mean	Rank	Mean
Agribusiness Systems	1	42.47	1	53.64	1	40.50
Power, Structure, and Technology	2	37.55	2	45.24	2	34.44
SAE	3	31.03	3	31.84	4	26.07
Biotechnology Systems	4	26.58	4	26.25	5	23.13
Food Products and Processing Systems	5	23.99	7	22.35	3	26.88
Plant Science Systems	6	22.14	6	24.35	8	20.36
Animal Systems	7	21.92	5	25.50	7	21.57
General Agriculture	8	21.08	8	22.12	9	19.29
Environmental Service Systems	9	21.06	9	19.38	6	21.88
Natural Resource Systems	10	20.54	10	17.92	10	18.50
FFA	11	14.43	11	17.24	11	13.93

*Note.* Means represent average intentions to teach mathematics within curriculum.

### Discussion, Implications, and Conclusions

The purpose of this study was to explore the relationship between school community type and mathematics teaching intentions within SBAE. Findings support the illumination of mathematics within SBAE, allowing students to practice the application of mathematical concepts and skills across agricultural pathways (Roberts et al., 2016; Stripling & Roberts, 2013; Stubbs & Myers, 2015). However, disparity of mathematics teaching intentions amongst community types, especially favoring suburban communities, has the potential to widen pre-existing achievement gaps (Graham & Provost, 2012); therefore, the SBAE community must increase intentions to teach mathematics within SBAE curriculum in rural and urban communities. Increased engagement of students from these historically-underachieving communities (Graham & Provost, 2012) in practical applications of mathematical concepts and skills will serve the agriculture industry and society by producing a diverse group of graduates interested in mathematics and prepared to succeed in the workforce.

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## Lessons Learned from the Previous Generation of Agricultural and Extension Educators

### Introduction

There are currently challenges such as budget shortages, government mandates regarding teacher accountability, and retention rates in the field of agricultural and extension education (Lemons, Brashears, Burris, Meyers, & Price, 2015; Marx, Smith, Smalley, & Miller, 2017). While there is no clear-cut solution to these problems, it is beneficial to current and future agricultural and extension educators to understand how the previous generation was affected by changes in the field, and how they overcame obstacles to ultimately achieve career satisfaction.

### Theoretical Framework

Herzberg's (1966) Motivation-Hygiene Theory provides a framework for understanding the motivating factors of retention and career satisfaction in the field of agricultural and extension education (Foor & Cano, 2011). Central to the theory are motivating factors such as how stimulating the vocation is, its level of accountability, personal fulfillment through awards and accomplishments, and personal development (Strong & Harder, 2009). Additionally, career satisfaction level can be determined through personal oral reflections (Lambert, Sorensen, & Elliott, 2014). This reflective action aligns with Kolb's Theory of Experiential Learning (1984), which posits that humans gain knowledge and meaning after reflecting upon the learning experiences of themselves and others.

### Methodology

The purpose of this study was to describe the career experiences of retired agricultural and extension education (AEE) professionals, to provide a historical view of the evolution of AEE. The research objectives of this study were to describe retired agricultural and extension educators' retrospective of their experiences in AEE, and to describe changes to the AEE profession based on agricultural and extension educators' retrospective. A narrative approach was utilized for data collection and aligns with the suggested approach for analyzing the oral history of people, which focuses on personal reflections and events in their lives (Gay, Mills, & Airasian, 2009). Four retired agricultural educators and two retired extension educators (males,  $n=4$ ; females,  $n=2$ ) with a range of nine to 38 years of service ( $M = 25.17$  years) were interviewed to fulfill assignment requirements for a Historical Foundations of Agricultural and Extension Education course offered in the summer 2017 semester at a university.

Student-selected interviewees were asked a series of predetermined questions, which enabled participants to tell their personal stories. The questions were designed to allow the interviewees to reach into their past experiences, explain how AEE has evolved over time, and finally provide advice for future professionals. This underscores Cronon's belief that oral stories in narrative form are essential to understanding the past through "the reality of human experience" (Cronon, 1992, p. 1369). Summaries of the interviews were analyzed for broad themes that addressed the research objectives. Each theme was then broken down into subcomponents that addressed specific, inherent topics.

### Findings/Conclusions

Four themes emerged from analysis of interviews: backgrounds and career paths, observed changes in agricultural and extension education, views toward the future, and personal legacies

left upon retirement. Personal background was an important commonality between the interviewees. Most received rural upbringings, and the majority were influenced by their childhood experiences as 4-H or FFA members. All demonstrated a passion for agriculture in general, with many entering their educator positions already skilled in fields such as horticulture, forestry, and livestock management. Specific career paths were shaped largely by various societal and political influences such as segregation, gender expectations, governmental mandates, educational opportunities, and emerging needs in the agriculture industry.

Over their careers interviewees observed many changes to the agriculture industry. Most noted the increasing role of technology in agriculture, which ranged from computers in the classroom, GMOs in the lab, and mechanical equipment in the field. They also discussed changes in the focus of agriculture education, noting a distinct evolution from the farm-centered curricula of yesterday to the extensive and broad-based opportunities of today. Other related topics were the role of women and minorities in agriculture, the development of new classes and workshops, and the retention of new audiences. Less positive changes to agriculture education included governmental mandates, loss of extended contracts, increased responsibilities, decreased budgets, employee turnover, and unpleasant or ineffective supervisors.

Interviewees also expressed several ideas in common regarding the future of agriculture education. The primary call was for a greater awareness of agriculture amongst the general population. Many noted that the public often sees their work as “just farming,” and that the modernized, progressive topics are ignored or misunderstood. They also expressed a need for better relations with both the government and the business sectors, two entities upon which American agriculture heavily relies. Interviewees envisioned a more technology-based future, although they noted the importance of appreciating the ways of the past.

Finally, the interviewees were asked to reflect upon their time in AEE and describe the legacy that they hoped to leave. Overall, they stressed the importance of building positive relationships with coworkers, students, and clients, and of maintaining a habit of continuous improvement across both personal and educational fronts. Their role as educators was meant not only to help others by sharing agricultural information, but to shape lives and communities by making progress towards the future.

### **Impact on Profession**

The findings of the study hold valuable implications for future agricultural and extension educators. First, childhood experiences in 4-H and FFA were decisive factors for entering both professions, supporting how the past shapes future career decisions. Second, the previous generation acknowledges change is inevitable due to technological advancements, but stresses the importance of future generations remembering the past and how it has molded the field of agricultural and extension education. Lastly, positive relationships with government and business sectors are crucial to the general population understanding the importance of agriculture both locally and worldwide. Consistent with the findings of previous studies, developing positive relationships is essential to professional development and progressive decisions to positively impact the community-at-large (Lamm, Sapp, & Lamm, 2017; Roberts & Ramsey, 2017).

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Research Poster

**Linking Subject Matter Topics Published in the *Journal of Agricultural Education* (1996-2016) to the National Research Agenda Priorities: Implications for the Profession**

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**Linking Subject Matter Topics Published in the *Journal of Agricultural Education* (1996-2016) to the National Research Agenda Priorities: Implications for the Profession**

**Introduction/Conceptual Framework**

The *Journal of Agricultural Education* (JAE) has been the impetus for ingenuity within the discipline for scholars in the profession and across the globe. The articles published in JAE range from reviews of current and historical literature to newfound theories and innovations. Subject matter topics published in JAE have been discussed quite a bit in the form of publications, presentations, and scholarly communications. Consensus drawn from these efforts show that scholars in the profession researching subject matter topics for the last 20 years have found that the topics published are changing. This is due to a broader definition of agricultural education as agreed upon by the profession--teacher education, extension education, leadership, agricultural communications, and international agriculture (JAE Philosophical Statement).

The conceptual framework for the study is based on the previous work of numerous scholars in the profession (Buriak & Shinn, 1993; Radhakrishna & Xu, 1997; Edgar, Briers, & Rutherford, 2008; Chaudhary and Radhakrishna, 2014; Naile, Robertson, & Cartmell, 2010; Miller, Stewart, & West, 2006). The first National Research Agenda (NRA) identified five broad disciplinary dimensions--agricultural communications, agricultural leadership, extension and outreach education, agricultural education in university and postsecondary settings, and school-based agricultural education (Osborne, n.d.). Edgar, Briers, and Rutherford (2008) analyzed research published in leading agricultural education journals from 1997 to 2006 and compared them to the 2007-2010 NRA and found no gaps in the NRA. However, Edgar et al. suggested that if advances in the scholarship of agricultural education were to continue, then adjustments in the research priority must occur. Further, the report, *A Science Roadmap of Food and Agriculture* (Osborne, 2012) resonated loudly within the discipline and became one of the leading documents in the development of the 2<sup>nd</sup> (2011-2015) NRA. The 2<sup>nd</sup> NRA consisted of six main priority areas: PR1) *Public and Policy Maker Understanding...*; PR2) *New Technologies, Practices and Products Adoption...*; PR3) *Sufficient Scientific and Professional Workforce that Addresses the Challenges...*; PR4) *Meaningful, Engaged Learning in all Environments*; PR5) *Efficient and Effective Agricultural Education Programs* and; PR6) *Vibrant, Resilient Communities*. One of the goals of the revised NRA was a commitment to making the research agenda an integral part of American Association for Agricultural Education (AAAE) research efforts (Doerfert, 2011). In committing to Doerfert's objective of making the research agenda evolve with the societal changes and needs, the NRA was revised once again for the most current 2016-2020 edition. Six of the research priority areas from the 2011-2015 NRA were retained, while a seventh priority area; *Addressing Complex Problems* was added (Roberts, Harder, & Brashears, 2016).

**Purpose and Objectives**

The purpose of this study was to review the articles published in *Journal of Agricultural Education* (1996-2016) to identify trends and gaps among the most frequently published subject matter topics in JAE as well as establish linkages to the 2016-2020 NRA developed by AAAE.

## Methods and Procedures

To examine the subject matter topics researched in agricultural education, the analysis included all articles published in the JAE from 1996 to 2016 (n=909). The articles were accessed through the JAE online database. A relational content analysis was performed among 909 articles published in JAE over a 20-year period (1996 to 2016). After reviewing the 909 articles, they were categorized into 21 distinct subject-matter research topics. The 21 categories were then compared with the seven NRA (2016-20) research priority areas: PR1 through PR7. The category descriptions of each priority area included in the NRA were used as the sole criteria for determining which of the seven priority areas they corresponded with the subject matter topics. The articles were first reviewed independently and validated again by another reviewer.

## Results

The top five subject matter topics researched were teaching and learning (n=208), program evaluation, (n=100), post-secondary education (n=71), secondary-level agricultural programs (n=61), and FFA (n=54). Emerging topics were leadership, international, and agricultural mechanics. In more recent years, the analysis indicated a decrease in research topics published in 4-H youth development, young farmers, and distance education. Further review revealed that a majority of topics were linked into three NRA priority areas. These were PR5 (n=245); PR7 (n=242); and PR3 (n=141). See Table 1.

Table 1.

Articles Categorized by 5-Year Group and Priority Areas (N=909)

5-Year Group	No. of Articles	PR1	PR2	PR3	PR4	PR5	PR6	PR7	Other
1996-2000	167	16	4	24	13	56	4	39	11
2001-2005	162	17	8	26	22	32	10	38	9
2006-2010	226	19	11	37	3	59	14	73	10
2011-2016	354	39	22	54	5	98	19	92	25
<b>Total</b>	<b>909</b>	<b>91</b>	<b>45</b>	<b>141</b>	<b>43</b>	<b>245</b>	<b>47</b>	<b>242</b>	<b>55</b>
<b>(%)</b>	<b>100</b>	<b>10.0</b>	<b>4.95</b>	<b>15.5</b>	<b>4.73</b>	<b>26.95</b>	<b>5.2</b>	<b>26.6</b>	<b>6.0</b>

## Conclusions/Implications

Findings from this study indicate that the research efforts of the agricultural education discipline are not being diversified to meet all the needs of the NRA research priorities. A substantial portion of AAEE scholarship is reflected in three research priority areas: PR5, PR7, and PR3. It is significant to note that priority area PR7 did not even exist in the previous two rounds of NRA, but has made a significant stride in research scholarship. Perhaps, scholars in the profession are looking into the NRA priority areas to focus their research and outreach efforts. While research in these areas may be trending and of relevance, we as a discipline/profession must not neglect the other societal issues that exist. Further research is needed to fill the literature gap in the NRA priorities: PR4, PR2, and PR6. This analysis of 20 years of scholarship published in JAE should serve as a springboard for researchers and scholars to identify potential topics or gaps in the knowledge base in these priority areas for future studies. New faculty and graduate students should use this study to chart a research scholarship agenda for themselves as well as AAEE.

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**Measuring the Impact of Intergenerational Service-Learning on Students' Stereotypes  
Toward Older People in an Agricultural Education Technology Course**

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## **Measuring the Impact of Intergenerational Service-Learning on Students' Stereotypes Toward Older People in an Agricultural Education Technology Course**

### **Introduction/Need for Research**

The Bureau of Labor Statistics estimates that 31.9% of the workforce will be in the 65-74 age range by 2022 (Toosi, 2013). The rise of the aging workforce presents a challenge for college graduates entering the workforce with limited prior exposure to seniors. Chumbler (1994) found that negative stereotypes toward older people, such as irritability, health behavior, personality, and activity, existed among college students. Chumbler suggested that such views may "reflect a lack of sensitivity and awareness of older individuals on college campuses" (p. 207). Augustin and Freshman (2016) opined "The exposure effects of service-learning provide an opportunity to change attitudes, perceptions, and behaviors while simultaneously gaining new knowledge and understanding of the aging population" (p. 125).

Service-learning reinforces two values commonly known to agricultural educators, community development and hands-on learning. Newman & Smith (1997) described intergenerational service-learning (ISL) as "Through mutual interaction, people across the life span from one another can contribute to each other's growth and development while enhancing their own lives" (p. 19).

The primary purpose of the study was to measure the impact of intergenerational service-learning on the attitudes toward older people by students enrolled in an agricultural applications of educational technologies course. This was conducted at a Land Grant in the Southeast.

### **Theoretical Framework**

Ageism is a theory based on negative bias or stereotypic attitude toward the aging and aged. Traxler (1980) postulated four primary factors that contribute toward the negative views of aging, more specifically, Ageism. The factors are: the fear of death in Western society; the emphasis of youth culture in American society; the emphasis in American culture on productivity, and the manner in which previous gerontological studies have been conducted.

The theoretical basis of this study is found in the Theory of Reasoned Action (Ajzen & Fishbein, 1980; Fishbein, 1967; Fishbein & Ajzen, 1975) which later expanded into the theory of planned behavior (Ajzen, 1988, 1991). This theory states an individual's attitudes, subjective norms in respect to a behavior, and perceived control over a behavior can predict behavioral intentions with a high degree of accuracy. In consideration of the theories of Ageism and Reasoned Action, one may purport that if stereotypes toward seniors exist, negative attitudes could result in less favorable intentions in the workplace and in general society.

### **Methodology**

To assess the impact of intergenerational service learning on students' perceptions toward older people, a descriptive research design was used. The population of the study consisted of 29 undergraduate students. Usable data were collected from 25 students.

The instrument, Chumbler's (1994) *Stereotypes Toward Older People Scale (STOPS)*, was chosen to assess students' attitudes toward older people. Pre-tests and post-tests were administered before the first meeting with seniors and during the final session of the course, respectively. The service-learning activities were conducted with a group of seniors at the local Osher Lifelong Learning Institute (OLLI). The students had ten weeks of class instruction before they were introduced to the seniors at OLLI. The students were assigned to work with a specific participant. During each of the three sessions, students assisted in scanning old photographs, film negatives and 35mm slides using different digital technologies. Means and Standard Deviations

were used to analyze the data collected by the STOPS instruments. Mean scores were calculated into composite mean scores based on groupings of the 14 questions, previously determined by Chumbler (1994).

### **Results/Findings**

Findings from the pre-test STOPS indicated that all four of the factor areas had high composite mean scores, ranging from 12.6 to 19.48. Following the service-learning activity, the composite scores of each factor changed to “more favorable” views, ranging from 12.04 to 17.44. Of the four factor areas, the factor labeled as “Personality” had the greatest change with a decrease of 2.04 in composite means, from the pre-test mean of 19.48 and post-treatment mean of 17.44. The statements with the most impact on this change were that old people are “set in their ways” and “are old-fashioned.”

### **Conclusions**

Results from the pre-test indicated students’ initial perceptions toward older people were in the negative categories of the instrument. The statements for personality with high mean scores included old people are “set in their ways,” “old-fashioned,” and “think about the good old days.” Most of these are commonly portrayed personality characteristics within the media. The data supporting the high mean scores of the personality factor could be linked to one concept in Traxler’s Ageism theory, where the emphasis placed on youth culture in the American society. The theory elaborates that this emphasis stems from a media bias against older people. These findings might lead one to question the origin of students’ initial stereotypes toward older people and how much socio-environmental elements, including media, affect the views of personalities of older persons. This finding supports Brown and Roodins’ (2001) recommendations that ISL can positively impact students’ stereotypes toward older people. The biggest change in students’ stereotypes was in the Personality factor, as students had ample opportunities to observe personalities of the participants. The change is less obvious with Activity, Irritability, and Health Behavior factors.

### **Implications/Recommendations/Impact on Profession**

The general implications of this study are that students enrolled in the course possessed somewhat negative stereotypes toward older people. However, with the opportunity to interact with older persons, the students’ negative views improved even from the minimal exposure to seniors. Considering the potential for future agricultural educators and agricultural business employees to interact closely with older people (as FFA volunteers and resource persons), the need for such exposure to reduce stereotypes is evident. Teacher educators and other faculty may seek to expose students to the growing population of aging baby boomers.

Based on supporting literature and the findings of this study, it is recommended that agricultural educators who teach courses with service-learning components consider the benefits of intergenerational activities. Such activities provide opportunities for Land Grant Universities to extend their outreach activities, as faculty can share their research through students. It is recommended that additional studies be conducted using Chumbler’s instrument with larger populations. Using this instrument with large introductory freshman classes would provide valuable baseline data as well as would help to determine, if trends differ among various colleges/majors. A final recommendation is that future studies using the instrument include specific questions related to students’ prior history of interaction with older people.

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**Social Cognitive Career Theory Applied to Factors Shaping Black Youth Perceptions of Agriculture and Science, Technological, Engineering, and Mathematical (STEM) Careers**

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## Social Cognitive Career Theory Applied to Factors Shaping Black Youth Perceptions of Agriculture and Science, Technological, Engineering, and Mathematical (STEM) Careers

### Introduction

As America strives to both supply a workforce for the projected 70% increase in agricultural production needed in 2050 (Holt-Giménez & Altieri, 2013) and to increase its competitiveness in science, technology, engineering, and mathematics (STEM) (U.S. Department of Education, 2016), American institutions aim to recruit and retain more students within agriculture and related sciences (Association of Public Land-Grant Universities, 2009). However, an understanding of the racial gaps in agriculture and STEM is needed (Zhang & Barnett, 2014) as Blacks are underrepresented the industry of agriculture (Brown & Segrist, 2016), resulting in the missing skillsets and knowledge they bring to the disciplines. This historical study describes personal inputs and background factors as influencers of Black youth perceptions towards pursuing agriculture-related careers, supporting the AAAE research agenda Priority 3: “Sufficient Scientific and Professional Workforce That Addresses the Challenges of the 21st Century” and answering the research priority question of, “What strategies are effective in recruiting diverse populations into agriculture and natural resource careers?” In order to increase Blacks’ representation in agricultural industries and studies, programs designed to engage Black youth in agricultural explorations and education must address the historical context influencing Black youth outcomes and their career interest, goals, and actions towards agriculture.

### Theoretical Framework

The theoretical framework for this study relies on the model of Social Cognitive Career Theory (SCCT) developed by Lent, Brown, and Hackett (1994), which is based on Bandura’s (1986) Social Cognitive Theory. SCCT theorizes that career exploration and academic interest (i.e., expected outcomes and goals) is influenced by a combination of uncontrollable components, personal inputs and background, which shape the learning experiences (Ali & Menke, 2014) and one’s level of self-efficacy. SCCT highlights the manner in which various contextual factors (e.g., gender, socio-economic status, and racial–ethnic background) may enhance or serve as a barrier to one’s career development (Bounds, 2017).

SCCT constructs have been used in previous studies to investigate minorities’ career explorations (Hackett & Byars, 1996; Haynes, Jacobson, & Wald, 2015) and empirical support for the SCCT model has been provided with meta-analyses (Brown et al., 2008). Literature applying SCCT to influences unique to racial and ethnic groups is increasing (Lent et al., 2015), but examination of how historical context of slavery and discriminatory practices may influence Black youth career explorations in agricultural and its sciences is lacking in the literature.

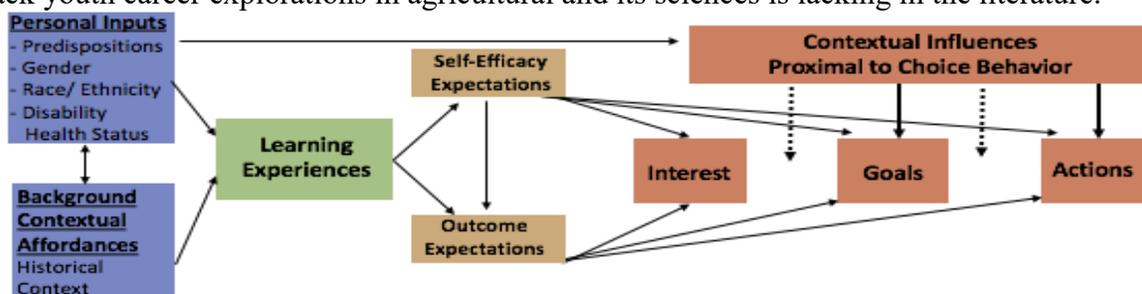


Figure 1. Integrative model of interest, satisfaction and choice stability. Modified from Lent, Brown, & Hackett (1994).

## **Methodology**

Historical context provides a perspective used to analyze past trends to uncover influences that are useful to our current situation and future endeavors. For this historical piece, the theoretical framework of SCCT is applied to findings from previous studies, historical data and government reports. Sources were identified by first reviewing previous studies on youth perceptions of agriculture and then uncovering identified factors influencing and forming Black youth perceptions of agriculture and its related sciences careers and studies such as, historical experiences and narratives of African Americans in agriculture.

## **Findings**

Black Americans in agriculture have been present since the onset of the displacement of Africans as chattel throughout the Atlantic Slave Trade. Slaves were forced to perform agricultural duties as a labor task and to garden, because it was the only food source (McWilliams, 2005). Soon after the abolishment of slavery, the era of scientific agriculture evolved and produced knowledgeable black farmers, technicians, engineers, machinists, and scientists. During the 1930's, the Tuskegee Institute formed an African American Male youth leadership organization, "New Farmers of America" (NFA). However, such strides don't undermine the negative perceptions Black youth have towards agriculture. Hurt (2011) explains that although this system of education benefited the Black farming community, it was hard to sustain due to the South's indebtedness and racist culture which hindered Black's success in the farming industries. This history creates the dominating associations of agriculture as sharecropping and slave work amongst Black youth today (Outley, 2008), despite the progressive experiences Blacks have had within agriculture and science. In addition, Black youth's elders aren't able to foster new generations of farmers (Gilbert & Felin, 2001). There is currently a lack of knowledge about the agriculture industry, contributing to the current negative perception of "farming" (Holz-Clause & Jost, 1995). The lack of mentorship and the sense of belonging for Black youth in agriculture and STEM is due to a lack of minority representation of faculty and staff (Townsend, 1994; Outley, 2008) within one's learning experiences. This outcome results in Black youth not feeling as if they have a place in the science related fields, leading to a lack of self-efficacy and outcome expectations to pursue careers in areas such as agriculture.

## **Conclusion**

Characteristics, such as race/ethnicity, and backgrounds, such as family and community influences and education systems, were identified, like in previous studies (Bounds, 2017). Background contextual affordances considered within a historical frame around slavery and discrimination in American agricultural and scientific industries help explain the challenges specific to the population of Black youth. According to SCCT (Lent et al., 1994), students need to develop self-efficacy and positive outcome expectations in order to develop an interest in the program of study. This cannot happen without learning experiences that take into account the personal characteristics and background contextual affordances described here.

## **Recommendations**

Agricultural education programs are possible tools to provide students with STEM general education and structure (Stubbs, 2015), history, and mentorship (Outley, 2008) to influence Black youth interest in STEM careers (Kransy & Tidball, 2009). Enhancing America's STEM workforce and agriculture production starts with the investigation of learning experiences' in agricultural education settings that are reaching Black youth. In the future, the effectiveness of agricultural programs that incorporate predominately Black's learning experiences should be examined.

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**Student Preparedness: College Ready or Career Ready?**

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### **Introduction**

College and career readiness has been the focus of several major educational initiatives. Within this focus, a question has emerged as to whether or not the skills required for college readiness are similar to those required for career readiness (Finn & Petrilli, 2010; Trilling & Fadel, 2009). The Common Core State Standards (CCSS) have included a college and career readiness component to help teachers align their instruction with college and workforce expectations. Many stakeholders believe students exiting high school are not being fully prepared for the demands of college or a career (Stone & Lewis, 2012). Are the skills needed to succeed in a college setting different from those needed for a career setting? Aligning with priority three of the National Research Agenda of the American Association for Agricultural Education (Stripling & Ricketts, 2016), this research sought to explore the college versus career ready question through teacher's open-ended responses by determining the variables that make college and career readiness similar or different from one another.

### **Theoretical/Conceptual Framework**

The guiding theory and framework for this research included Bandura's Social Cognitive Theory (SCT) (Bandura, 1986) and Bronfenbrenner's Bioecological Theory of Human Development (BBTHD) (Bronfenbrenner, 2005). Jointly SCT and BBTHD were connected to create the Conceptual Model for the Study of Student Readiness in the 21<sup>st</sup> Century providing a systems approach to prepare students to be both college and career ready (DiBenedetto & Myers, 2016). Within the model students develop learning, career and life skills that allow them to become life ready individuals prepared to be responsible citizens in their homes, schools and communities.

### **Methodology**

A non-experimental, descriptive survey research design was utilized for this study to collect data from 191 teachers in Florida. Data collection followed Dillman's tailored design method (Dillman, Smyth, & Christian, 2009). As part of a larger quantitative study, focused on teacher perceptions of college versus career readiness, the research question posed to teachers in Florida was, 'Do you think the knowledge, skills, and dispositions required of a student to be career ready differ from the skills required to be college ready?' If yes, 'Please explain why you think the knowledge, skills, and dispositions required of a student to be career ready differ from those skills required to be college ready.' Qualitative data analysis was conducted using the constant comparative method (Lincoln & Guba, 1985). In the first stage, each member of the research team separately analyzed ten of the total qualitative responses (n = 95). Codes were individually established, the research team met and minor adjustments were agreed upon to establish interrater reliability to compare and contrast the remaining open-ended responses.

### **Results/ Findings**

Findings revealed four overarching themes: skill sets, academics, environment, and expectations. The college ready skill sets theme revealed study skills with a testing and core academic performance focus existed. Academics, uncovered a broader, analytical, and abstract approach existed. A focus on preparing for the future appeared in college readiness skills, whereas career readiness focused on the here and now. Career ready skills focused less on academic skills and more on interpersonal and intrapersonal skills. Employability and technical

## Research

skills were revealed as key competencies needed for career readiness in a “learn as you go” environment. Within career readiness, a sense of professionalism was expected more so than in college readiness. Academic expectations differed between college and career readiness, as college readiness focused on higher academic levels, emphasizing core concepts, study skills, and being analytical. Career readiness academic expectations surfaced as technical skills, specific training, learning through hands-on/applied activities, and flexibility of thought.

The college environment was described to be more structured and forgiving. Students use college as a time to mature and figure things out, with more flexibility to explore various career options. Students are not completely independent from their parental support and are primarily focused on entering college and receiving high test scores, with little innovative thought. The career ready environment offers less formative assessment opportunities, has less room for error and expects the individual to initiate and complete projects with self-direction while being a contributing member of society. College ready requires a higher academic standard with little to no remediation, meeting teacher’s standards, whereas career ready expects professionalism, being interactive with others, and producing an accurate and quality end product.

## Conclusions

Teachers in Florida believe there are differences between the knowledge, skills, and dispositions required of students to be college versus career ready. College ready skill sets focus more on academic skills whereas, career ready skill sets focus more on professional and people skills. College ready academics are more focused on scholastic ability and study skills whereas career ready academics are focused on hands on job training. The college ready environment is more independent, structured, and forgiving, whereas the career ready environment is less structured and teamwork oriented. College ready expectations are more focused on academic preparedness and meeting teacher expectations whereas career readiness expectations encourage employees to be professional, responsible, and show initiative. The research question primarily focused on self-perception, therefore respondents’ perceived competencies and their past experiences in high school, college, and career may have had an effect on their responses. This research supports the notion that the environment surrounding students affects how they view themselves, their academic success, and how they interact with various experiences on a variety of levels. The student’s environment in a college or career setting influences requisite knowledge, skills, and dispositions that are impacted by their education and experience as depicted in the Conceptual Model for the Study of Student Readiness in the 21<sup>st</sup> Century (DiBenedetto & Myers, 2016).

## Impact on Profession

Understanding the differences in skill sets, academics, environment, and expectations between college and career readiness can assist parents, educators, and advisors in becoming more aware of how students destined to pursue college or a career will need to be mentored. Likewise, students making the decision to enter college or a career can be informed of the two paths by letting them picture where they best see themselves fitting to meet their overall goals. Educators need to become more aware that not all students will go to college, but all students will one day embark upon a career and thus, need to be prepared for whichever path they choose.

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**Students' Perceptions of Inquiry-based Learning  
in the High School Agriculture Classroom**

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# **Students' Perceptions of Inquiry-based Learning in the High School Agriculture Classroom**

## **Introduction**

Inquiry-based learning opportunities are those activities allowing students to pose questions, make observations, and formulate explanations for their findings (National Research Council, 2000). The inquiry-based approach to instruction has been reported as valuable but accompanied with challenges (Edelson, Gordin, & Pea, 1999). In fact, the way in which inquiry-based learning is disseminated and implemented impacts learning (Maab & Artigue, 2013). Minner, Levy, and Century (2009) found inquiry-based learning had a positive effect on the learning of content, retention of content, and the conceptual understanding of students. Numerous studies examine teachers' perceptions of inquiry-based instruction and its benefits. However, only limited research has investigated perceptions of agricultural students regarding impact of inquiry-based methods on educational growth. This study addressed the need for research related to meaningful, engaged learning in all environments, Research Priority Four of the American Association for Agricultural Education National Research Agenda 2016-2020 (Roberts, Harder, & Brashears, 2016). The purpose of this study was to determine perceptions of high school students transitioning to and using inquiry-based instruction in their agriculture classes. The objectives were as follows: (a) describe students' perceptions of the effectiveness of inquiry-based learning; and (b) describe students' perceptions of the impact of inquiry-based learning on critical thinking.

## **Theoretical Framework**

The theoretical framework was drawn from literature on the inquiry-based learning approach. Inquiry-based learning is rooted in the theory of constructivism. Constructivism is rooted in the works of Piaget and Vygotsky's theories that students' knowledge schemes are modified through activities, problem solving, and discussion (Driver, Asoko, Leach, Mortimer, & Scott, 1994; Schunk, 2012). Learners involved in inquiry-based learning construct their own mental representation of material, selecting relevant information, and interpreting all the gathered information based on existing knowledge; according to Shuell (1993), this is the basis of constructivism.

## **Methodology**

This study utilized qualitative methods following a standardized, open-interview format (Patton, 2002). Initial sampling consisted of a purposive sample of 67 high school students enrolled in agricultural classes utilizing inquiry-based learning. The teacher of the classes was trained in inquiry-based learning through the National Agriscience Teachers Ambassador program. The agricultural classes included animal science, horticulture, and career development. Out of the 67 students, 24 students returned parental consent and minor consent forms, which qualified them to participate in an interview per institutional review board guidelines. Each student was interviewed individually during the school day at a time convenient for the student and lasted approximately four to ten minutes depending on how much information the student selected to share. There were six questions included in the interview protocol. Each question sought to understand the student perspective of inquiry-based learning. Member checking was accomplished through student review of information transcribed to ensure accurate communication of thoughts. Codes were used within interview notes and a reflection log allowed

triangulation of data. The inquiry-based learning opportunities utilized the “Essential Features of Classroom Inquiry and their Variations” guidelines provided by the National Research Council (2000).

## **Results**

Students in the sample had been involved in inquiry-based learning opportunities over eight-months leading up to the study. Twenty-four students were interviewed as a part of the study: 13 females and 11 males. Student classifications were 14 sophomores, 9 juniors, and one senior.

### **Students’ Perceptions of the Effectiveness of Inquiry-Based Methods**

Students’ answers as to what was most beneficial about inquiry-based learning opportunities emerged as six themes: learn by yourself, gain knowledge, different, an experience, use prior knowledge, and entertaining. Most of the students interviewed chose to explain what they liked most about inquiry-based learning. Themes related to what they like most included: learn by yourself, variation, hands on, makes you think harder, learn new things, research, discussion, quicker, and challenge. Students were asked their opinion regarding how background information should be provided in the context of inquiry-based learning. The interviews revealed that half of the students preferred to receive background information before the inquiry-based learning opportunity, while half of the students preferred that they receive the information after they had completed the inquiry-based learning opportunity. Students were asked if there were any technologies that could be used to make the inquiry-based method more enjoyable. Those students who thought adding computers or cell phones would make the inquiry more engaging/fun wanted the technologies to be used to incorporate some type of game into the inquiry-based learning opportunity.

### **Students’ Perceptions of Impact on Critical Thinking Skills**

When asked if students felt that inquiry-based learning opportunities improved their critical thinking skills, all students answered yes. The ways in which students felt it improved their critical thinking skills varied. Themes included: learn by yourself, think harder, because you are doing, problem solving, remember better, and learn more. Most of the students felt that inquiry-based learning opportunities improved their critical thinking skills because they were required to find the answers on their own. Students also felt that their critical thinking improved because they were able to problem solve, remember the material better, and learn more.

## **Discussion and Recommendations**

These findings suggest that students who have been exposed to inquiry-based learning opportunities recognize the benefits. Akpullukcu and Gunay (2015) found that students’ favorite parts of inquiry-based learning were related to designing, application, and decision process. Similarly, all students in this study expressed that inquiry-based learning opportunities improved their critical thinking skills. Adding inquiry-based learning opportunities to agricultural classrooms might benefit students by improving their critical thinking skills and their ability to work autonomously. If we can capture the essence of how students are reacting to the use of inquiry-based learning, we can develop more effective strategies for agriculture teachers to implement inquiry-based learning. Experimental studies are recommended to examine the impact related to learning, engagement, and retention when inquiry-based learning opportunities are implemented as well as measure improvement in critical thinking.

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**Teaching Enhancement through Agricultural Laboratories Workshop: Effects on Self-Efficacy and Intent to Teach Agricultural Sciences**

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## Introduction

Many secondary students incorrectly perceive agriculture as being a production-oriented, labor-intensive industry, offering few opportunities for science, technology, engineering, and math (STEM) careers (National Research Council, 2009; STEM Food and Ag. Council, 2014). Thus, students interested in STEM often do not consider agriculture as a viable career option (Smith, Rayfield, & McKim, 2015). Infusing STEM instruction into school-based agricultural education (SBAE) programs is both a national priority (Stripling & Ricketts, 2016) and an effective method of countering misperceptions by teaching students about cutting-edge science applications and related career opportunities in the agricultural sciences (Stubbs & Myers, 2015). However, the very nature of rapidly occurring advances in the agricultural sciences, coupled with an aging teacher workforce, limits agriculture teachers' direct experience with and knowledge of modern agricultural sciences (Boone & Boone, 2007). Educators cannot teach what they do not know.

In the context of curricula, the theory of planned behavior (Ajzen, 1991) posits teachers' decisions about whether to teach particular topics (in this case, agricultural sciences and associated careers) are dependent on their attitudes toward the topics, their perceived control over teaching the topics, and their subjective norms regarding these topics. Researchers (Johnson & Wardlow, 2017; Paulsen, Han, Humke, & Olde, 2014) have found teacher workshops are effective in enhancing self-efficacy in teaching STEM topics, making teachers more likely to incorporate these topics into the curriculum. The purpose of this study was to determine the effects of a two-week, immersive workshop on teachers' self-efficacy and intent to teach agricultural sciences and agricultural science careers.

## Methods

The population for this study included Arkansas and Missouri agriculture and science teachers ( $N = 12$ ) participating in a two-week inservice workshop in summer 2017. Participants spent approximately 70% of their time in university agricultural science labs learning from and working with faculty researchers on cutting-edge science related to avian immunology, animal health, biosecurity, reproductive physiology, and genetics. Teachers spent the remainder of their time working with university teacher educators to design related lessons and laboratory activities appropriate for use in high school agriculture classes. On the final day of the workshop, teacher teams presented their lessons and activities to other participants and project staff for constructive criticism and feedback. At the conclusion of the workshop, teachers completed two instruments (based on the Science Teaching Efficacy Beliefs Instrument [Enochs & Riggs, 1989]) measuring their perceptions of and intent to teach about agricultural sciences and agricultural science careers. Each instrument contained 10 Likert-type items with a retrospective pretest (Gouldthorpe and Israel, 2013) and a traditional post-test. Nine summated items measured pre- and post-workshop self-efficacy toward teaching agricultural sciences (or agricultural science careers) and one stand-alone item measured teachers' intent to teach agricultural sciences (or agricultural science careers) in the next school year. Summated scale reliabilities ranged from .74 to .80. Eleven participants (92%) completed the evaluation instruments; one participant left early due to a family emergency. Data were analyzed using descriptive statistics; Cohen's  $d$  (Cohen, 1988) was used to describe the magnitude of changes in self-efficacy or intent to teach agricultural sciences and agricultural science careers.

## Results

Workshop participants developed increased levels of self-efficacy toward teaching both agricultural sciences and agricultural science careers because of workshop participation (Table 1). Mean scores for self-efficacy in teaching agricultural sciences moved from essentially neutral on the four-point scale to positive, while self-efficacy in teaching agricultural science careers moved from neutral to somewhat positive. The Cohen's *d* for each indicated a large effect (Cohen 1988) for workshop participation on teacher self-efficacy.

Table 1. *Effects of Workshop Participation on Teachers' Self-Efficacy in Teaching Agricultural Sciences and Agricultural Science Careers*

Attitude toward teaching:	Pretest		Posttest		Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Agricultural sciences	2.58	0.36	3.02	0.34	2.31
Agricultural science careers	2.52	0.38	2.85	0.41	1.67

*Note.* Based on a four-point (1 = strongly disagree and 4 = strongly agree) Likert-type scale.

Participants expressed a somewhat increased intent to teach both agricultural sciences and agricultural science careers because of the workshop (Table 2). However, the pretest means indicated teachers strongly agreed they would teach both topics prior to completing the workshop; workshop participation only slightly increased their level of agreement. The Cohen's *d* for each indicated a small to medium effect (Cohen, 1988) for workshop participation.

Table 2. *Effects of Workshop Participation on Teachers' Intent to Teach Agricultural Sciences and Agricultural Science Careers*

Intent to teach:	Pretest		Posttest		Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Agricultural sciences	3.55	0.52	3.80	0.42	0.47
Agricultural science careers	3.70	0.48	3.80	0.42	0.32

*Note.* Based on a four-point (1 = strongly disagree and 4 = strongly agree) Likert-type scale.

## Conclusions

The two-week intensive workshop was effective in enhancing participants' self-efficacy and intent to teach both agricultural sciences and agricultural science careers. This is consistent with the theory of planned behavior (Ajzen, 1991) in that experiences designed to enhance teachers' attitudes, perceived control, and subjective norms toward new curricular topics increase self-efficacy, which in turn, increases the likelihood of incorporating new topics into the curriculum. These findings are consistent those of Johnson & Wardlow (2017) and Paulsen et al. (2014).

### Implications/Recommendations/Impact on the Profession

In addition to increased self-efficacy and intent to teach agricultural sciences and agricultural science careers, this workshop also provided participants with both instructional materials and a professional network to assist in STEM integration. Workshops such as this provide agricultural educators with an effective and proven model for stimulating curricular change in SBAE programs. Future research will follow-up with participants to determine the extent to which they have incorporated agricultural science and agricultural science career topics into their local programs.

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**The Backyard Citrus Grower and their Level of Knowledge: What Extension can do to Communicate about Citrus Greening**

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## Introduction

The citrus greening disease causes citrus fruit to remain in the immature green fruit stage, drop prematurely from the tree, and have a bitter taste (UF/IFAS Citrus Extension, 2018). The Asian citrus psyllid is the known cause of spreading the citrus greening disease and first arrived in the U.S. in August 2005, infecting trees in south Florida first (UF/IFAS Citrus Extension, n.d.). Since then, the disease has spread across numerous states (USDA, n.d.) and has been detected in all three of the major citrus producing states of Florida, California, and Texas (USDA, 2017; USDA, n.d.). Since the 2004-2005 growing season, orange juice prices have increased by \$2.29 per to a 2016-17 price of \$6.71/gallon (Morris, n. d.). Although consumers in the citrus-producing states are experiencing impacts of the disease through increased orange juice prices, they are unaware that citrus greening is affecting their state's overall economy (Ruth, Beattie, Lamm & Rumble, 2017). Many of these same residents are growing citrus trees in their backyards. Sixty percent of homeowners in California are growing citrus residentially (Grafton-Cardwell, Daugherty, Jetter, & Johnson, n.d.). However, they are unaware that their home citrus trees are a potential host for the citrus greening disease and are promoting disease spread (Bayer, 2016). The purpose of this study was to determine if consumers' level of knowledge and concern about the citrus greening disease is different among the citrus-producing states. With a better understanding of residents' knowledge about citrus greening and its impact, plans to include them in disease containment and prevention can be more strategically developed for improved effectiveness. This study aims to contribute to literature addressing Research Priority 6: Vibrant, Resilient Communities of the American Association of Agricultural Education (AAAE) National Research Agenda (Graham, Arnold, & Jayaratne, 2016).

## Theoretical Framework

The diffusion of innovations theory guided this study (Rogers, 2003), providing a structure to explain how people in social systems do not adopt idea simultaneously but rather at different points in time (Rogers, 2003). In order for people to adopt these ideas, they must first be introduced to the idea and then the idea needs to gain traction throughout the social system for it to be recognized or adopted (Rogers, 2003). In the scope of this study, there is a need for educational programs to introduce the idea of citrus greening to the local community and for the idea of residential citrus growing best management practices to gain traction in communities throughout the consumer citrus areas.

## Methods

A non-probability, opt-in sampling technique was used to distribute an online survey to consumers in the major citrus producing states of Florida, California, and Texas (Baker et al., 2013). The survey was disseminated using Qualtrics, an online survey company. The survey generated 1,541 usable responses, yielding a 59.9% usable response rate. The data were weighted based on the 2010 U.S. Census data for each state to increase the generalizability of this study to the general population (Baker et al., 2013). This study was part of a larger study that aimed to understand public perceptions of genetic modification and citrus. The survey questions were researcher-developed and reviewed by a panel of experts. Five multiple choice questions were asked to determine consumers' knowledge of the citrus greening disease. The five knowledge questions asked about tree symptoms, how the disease was spread, where the disease originated, the tree parts that are impacted, and the states infected by the disease. Chi-square tests were used to compare the three states' correct answers to the five knowledge questions.

Consumers were also asked to indicate their feelings towards the citrus greening disease using a five-point semantic differential scale. The four polar opposite statements used to determine consumers' feelings about citrus greening are *I am very concerned about the citrus greening disease/I am not at all concerned about the citrus greening disease*, *citrus greening disease directly affects me/citrus greening disease does not directly affect me*, *I am bothered by citrus greening disease/I am not bothered by citrus greening disease*, and *I care a great deal about finding a cure for citrus greening disease/I do not care at all about finding a cure for citrus greening disease*. An index was created to reflect consumers' perceived attitude of citrus greening. The index was found to be reliable ( $\alpha = .86$ ). An ANOVA test was run to determine if there were differences between states in their attitude of citrus greening.

### Results

The chi square test indicated a significant difference ( $X^2 (2) = 14.3, p = .001$ ) for the question referring to *how the citrus greening disease was spread*. However, the data did not suggest there was a significant difference for the remaining questions. The ANOVA indicated there was a significant difference in the mean index score among the different states of residence ( $p = .01$ ). Table 1 indicates the mean composite index score for Florida respondents was significantly greater than the composite opinion index for California and Texas.

Table 1

*Attitude of Citrus Greening of Residents in Citrus Producing States*

State	<i>n</i>	<i>M</i>	<i>SD</i>
California	525	3.24	.95
Texas	501	3.24	.95
Florida	520	3.40	.97

### Conclusion/ Recommendations

When asked specific questions about citrus and citrus greening, of the five questions in total, only one question, pertaining to how the disease was spread, showed significance. This indicated a couple of things. There is a relationship between individuals in citrus producing states and knowledge of how citrus greening disease is spread, but individuals are not well informed about other aspects of the disease. Educational programs about citrus greening, such as those provided through the Cooperative Extension Service, could address multiple aspects of the disease, what it means for not only citrus growers but also individuals with citrus trees, as well as possible solutions to the problem. Florida residents seemed to be the most concerned about the impact of citrus greening as they have experienced citrus greening for the longest period of time compared to the other citrus producing states (Bove, 2006). Given the large amount of backyard citrus in these states, and the difference in levels of knowledge across the citrus producing states pertaining to aspects of the citrus greening disease, it is vital to help residents know how to prevent and protect against the spread of the disease. According to Rogers' (2003) diffusion of innovations theory, people must be aware of the idea before adoption of the innovation can begin. The results of this study suggest that backyard citrus growers must first become aware and knowledgeable about the citrus greening disease before they can begin adopting practices that will positively impact the citrus industry.

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**The Good, the Bad, and the Ugly: Agricultural Educator Perceptions of Job Attributes**

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**The Good, the Bad, and the Ugly: Agricultural Educator Perceptions of Job Attributes****Introduction/Need for Research**

The number of open agricultural educator positions in the United States has exceeded the number of agricultural education graduates since 1980 (Blackburn, Bunch, & Haynes, 2017). The shortage has stemmed from a large number of retirements, but also from agricultural teachers leaving the profession before retirement age (Blackburn, et. al, 2017). Some of the noted reasons for leaving the profession include low self-efficacy, work-life balance, and burn out (Blackburn, et. al, 2017; De Lay & Washburn, 2013; Lemons, Brashears, Burris, Meyers, & Price, 2015). Positive work environments and professional relationships are factors that help teachers stay in their career for long term (Blackburn, et. al, 2017). Motivation to begin a teaching career can be linked to a passion for a subject, teaching seen as a socially important profession, and a desire to work with children (Fokkens-Bruinsma & Canrinus, 2014). Understanding why agriculture teachers choose to teach and why they choose to leave the profession can help agricultural education professionals in recruitment and retention efforts. The purpose of this study was to describe the perceptions of current agricultural education teachers surrounding the positive and negative aspects of their careers.

**Theoretical Foundation**

Social cognitive theory was used as the theoretical foundation for this study. Bandura (2011) stated that human actions are based on the dynamic interaction between personal, environmental, and behavioral factors. Through this study, we examined the interaction between the personal and environmental factors related to being an agricultural educator, and the behavioral factor of resilience in the profession.

**Methods**

This qualitative case study employed the use of a focus group. Focus groups can help researchers conduct a discussion of more depth as participants build on topics initiated through other participants (Burgess-Allen & Owen-Smith, 2009; Morgan, 1996). Our study was reviewed and deemed exempt through the [University] IRB panel prior to recruiting participants. The population of this study were the agricultural education teachers in [State]. The focus group activity was held at the [State] professional agricultural educator organization summer in-service meeting. Participants included 91.8% of all [State] agricultural educators.

Participants were assigned to groups in order to diversify experience level, program size, and regions in the state within each group. Groups were asked to consider their answers to the following questions: what is the best part of being an agriculture teacher, and what is the worst part of being an agriculture teacher? Focused time was allotted for group discussion and groups summarized their conversations on large papers at the center of the table. Group responses along with researcher notes were collected, photographed, and transcribed into a digital format. Lofland and Lofland (1995) state that self-gathering, photography, and field notes are all methods of data collection with a focus group. A panel of three researchers individually completed open coding of responses. The research team then used axial coding procedures to group responses into central themes. Data were organized using Microsoft Excel.

Trustworthiness was established by maintaining field journals, recording onsite interactions, triangulating, and maintaining an audit trail (Lincoln & Guba, 1985).

### **Results/Findings**

The question “what is the best part of teaching agriculture?” yielded 20 codes in the open coding process. The question “what is the worst thing about being an agriculture teacher” yielded 27 codes. Axial coding yielded three themes for the best part of teaching and five themes for the worst part of teaching.

#### What is the best part of teaching agriculture?

The first research question resulted in three emergent themes; being an educator, program characteristics, and working with students. Participants stated that having curriculum diversity along with SAE engagement and FFA experiences all made their job enjoyable, it was apparent that most groups considered the holistic. Being an educator was the second most popular theme. One participant stated that the most positive part of their job was “the firm belief in the value of what we do.” The professional relationships and networking were also noted as positive attributes. One participant group stated that a positive associated with their job was “the opportunity to network with other ag teachers around the state.” Teachers also noted the joys of working with students, specifically noting the opportunity to interact with students and a positive classroom environment as some of the best parts of their career.

#### What is the worst part of teaching agriculture?

There were five themes which emerged related to the negative aspects of being an agricultural educator. Negative administrative relations was the most prominent of these themes. Also noted were uncooperative and unmotivated students, a lack of time for family life, meeting community expectations, and workload. Respondents noted that all of the negatives were related to being unable to meet expectations at home and at work, or misalignment in the expectations of administrators and stakeholders. Specifically mentioned by all groups was the negative impact of paperwork on workload.

### **Conclusion, Implication, Recommendations**

Lemons, et. al (2015) found that a major reason for attrition of secondary agricultural teachers are long hours, low budgets, and amount of work. This aligns with the findings of this study. Groups specifically noted “complexity of paperwork” and “time away from home” as some of the negative aspects of the profession. Professional teaching organizations and teacher educators can use this information in preparing new teachers and conducting continue education to help with the balance of workload.

State leaders can also use the information in this study to help recruit new teachers into the agriculture education profession. Highlighting the themes of positive publicity and salary and compensation, along with student success can help to encourage future agricultural educators. Using the information from this study to help early career educators can help to decrease the rate of attrition and help with the overall teacher shortage.

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## **University Faculty Perspective on Student Entitlement**

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## University Faculty Perspective on Student Entitlement

### Introduction and Theoretical Framework

Grades and letters of recommendation are accepted as the core of college student evaluations (Rosovsky & Hartley, 2002). However in recent years, faculty are experiencing increased behaviors of academic entitlement (AE) that impact grades. The behaviors may include students lobbying for higher grades, expectations of special accommodations, asking for concessions that relate to their needs, requesting class notes, or asking for grades they have not earned. Many students become distressed if a grade less than an A is the expected outcome. Students' sense of entitlement is reinforced by professors providing high marks for minimal to average effort by the student. Inflated grading reinforces the view that favorable academic outcomes are given rather than earned (Twenge & Campbell 2009). Benton (2006) felt that the culture of self-indulgence is due in part to the consumer mentality of students and the failure of professors to maintain expectations. This demand creates tension for faculty who know that student evaluations influence promotion, so accommodations are made for customer satisfaction (Benton, 2006).

Academic entitlement is "the tendency to possess an expectation of academic success without taking personal responsibility for achieving that success" (Chowning & Campbell, 2009, p. 982). Greenberger et al. (2008) defined academic entitlement as the "expectation of high rewards for modest effort, expectations of special consideration and accommodation by teachers when it comes to grades, and impatience and anger when their expectations and perceived needs are not met" (p. 1194). Twenge (2014) calls this narcissistic entitlement where feeling good about yourself is more important than good performance.

### Methods

The population of study was a stratified random sample of university faculty at the [University] Participants (544 tenured, 294 tenure-track, and 560 non-tenure) were stratified, based on the number of faculty representing each college or school and rank, resulting in a selected sample size of 500. Sample size was calculated by total population ( $N = 1,398$ ) with a confidence interval of 95% with an acceptable margin of error equaling 5% resulting in a sample size needed of 302 participants. Researchers chose to increase the participant list based on the use of an electronic instrumentation system (Qualtrics). University IRB approval was gained (#16-02-540) and the [University] Office of Institutional Research stratified and provided the needed electronic list. The instrument was a modified version of a reliable and valid student entitlement instrument (Greenberger, et al., 2008) where slightly modified phrasing was used for adaptation in this study. Questions about personal and academic entitlement ( $N = 22$ ) were used. Responses were indicated on a Likert-type scale that ranged from 1 (strongly disagree) to 6 (strongly agree). Demographic data were correspondingly gathered through the instrument.

### Results

Crosstabs were used to analyze participant responses. When gender was utilized to categorize responses, no significant differences were found, except when viewing responses to the statement *If students have completed most of the reading for my class, they deserve a B in the course*. Males ( $n = 81$ ) more strongly disagreed than females ( $n = 68$ ) with this statement and the overall mean was 1.89 ( $SD = .85$ ) with a mode of 2. When asked about their position to the

statement, *I tend to provide students with higher grades than they have earned because I worry about my annual performance evaluation being influenced by student evaluations*, faculty at the assistant professor level responded in agreement as opposed to other faculty ranks. Instructors, Associate Professors, and Professors most often disagreed with this statement. When asked their position on the statement *I feel poorly when I don't respond the same day to an e-mail a student sent*, Instructors ( $M = 3.49, SD = 1.53$ ) and Professors ( $M = 3.43, SD = 1.43$ .) most often agreed whereas Assistant ( $M = 3.11, SD = 1.39$ ) and Associate Professors ( $M = 3.13, SD = 1.39$ .) were divided between agree and disagree.

### Conclusions

Entitlement is a topic of much discussion in today's educational settings. The differences between age groups (student and faculty) towards their values and beliefs should be investigated to determine best practices in educational settings. It is apparent through analysis of the participants (overall) that gender does not play a role towards entitlement views of faculty at any level (i.e. instructor to professor). It was interesting to note that males tended to disagree more than females towards student grades based on information intake required of a course. We must understand that each participant might view the requirement differently based on their course needs but overall faculty did indicate that just by accomplishing an assignment does not indicate their deserving of an acceptable grade (B).

Additionally, when analyzing participants (based on rank), assistant professors were concerned about student evaluation and therefore grade inflation was viewed as an acceptable alternative. It is easy to determine that this rank of faculty more easily viewed this as acceptable because of their tenuous stance in the academic profession. Furthermore, it was curious that professors most often agreed to "feeling poorly" when not responding quickly to student emails. It is assumed that instructors who are strongly tied to students through extensive teaching loads would agree to this statement but the emergence as professors who also felt this is intriguing.

### Implications/Recommendations

The immediate question based on the findings of this study is how to alleviate the idea to non-tenured faculty that grade inflation, based on perceived student perceptions, is not optimal for student learning or a founded view of attainment of course goals based on actual performance. How should the academic field gather perceptions about teaching yet reduce the mitigating factor of how student evaluations will be shown? Do we adopt the secondary school practice of having outside evaluators assess faculty teaching performance?

Further study of this topic is imperative. It should be realized that the largest segment of university faculty (nationwide) is part-time faculty members (AAUP, 2017). A further investigation into their perceptions should be undertaken. We recommend that this research continue to explore public (land-grant and non-land grant) and private university systems. Understanding the views of academic professionals will shed light on the diversity of student and faculty views of entitlement and education and may allow a more holistic view on student and faculty responsibilities of learning.

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**Where's the Expert? Understanding the Expertise Gap in  
Preservice Agricultural Educators**

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## Introduction

Many preservice agricultural education teachers voice a commitment to experiential learning practices (Baker, Robinson, & Kolb, 2012), but the profession is unsure whether their choice of pedagogical practice supports this stance. It has been asserted agricultural education aligns with experiential learning theory (ELT) (Roberts & Ball, 2009). A previous study by Roberts, Baker, and Goosen (2016) found a lack of continuity between preservice teachers' articulated epistemological views and how those beliefs were operationalized. For this mixed methods study, the Kolb Educator Role Profile (KERP) self-assessment (Kolb, Kolb, Passarelli, & Sharma, 2014) was adapted as an observational instrument within a semi-structured interview to 1) determine the least common educator role preferred by preservice agricultural education teachers in an upper division teaching methods course at Oklahoma State University and 2) investigate preservice agricultural education teachers' lack of preference for the lowest ranked educator role. Addressing the American Association for Agricultural Education's National Research Agenda Priority Five: Efficient and Effective Agricultural Education Programs (Thoron, Myers, & Barrick, 2016), this study seeks to explain why an *expertise gap* exists among preservice teachers, with the subject expert role preferred least among the four educator roles.

## Conceptual Framework

The Educator Role Profile (ERP), rooted in ELT, provides understanding for how educators approach the learning process (Kolb, 1984; Kolb et al., 2014) and aids educators in matching learning styles and the concepts of ELT into a model for engaging learners in all modes of the learning cycle (Kolb et al., 2014). The KERP self-assessment identifies the most common educator role teachers adopt, influenced by the educational activities preferred and their relation to the four learning cycle modes of experiential learning (Kolb et al., 2014). The four educator roles adopted are coach, facilitator, standard setter/evaluator, and subject expert (Kolb et al., 2014). Just as ELT posits learners engage in all four modes of the learning cycle (Kolb, 1984), the ERP proposes teachers develop the flexibility to use all educator roles (Kolb et al., 2014). Identifying an educator's most common role with the KERP brings about self-awareness for one's own preferred teaching role and identifies opportunities for additional educator role adoption to improve the learning environment for learners (Kolb et al., 2014).

## Methodology

A concurrent triangulation mixed methods approach was utilized for this study (Creswell, 2003), with the structured KERP items comprising the quantitative strand and the non-structured probing interview questions comprising the qualitative strand. Semi-structured interviews facilitated the administration of an observational instrument containing the KERP items, allowing for probing questions to better understand participant responses (Creswell, 2003). The population was a convenience sample (Privitera, 2017) of preservice agricultural educators enrolled in the agricultural education teaching methods course at Oklahoma State University during the fall 2017 term with intentions of completing their program student teaching requirements the following semester. Eleven interviews were recorded, transcribed, and analyzed to determine the preservice agricultural educators' most common educator role and to identify key themes. Credibility, transferability, dependability, and confirmability principles were followed to ensure rigorous and trustworthy results (Lincoln & Guba, 1985). The frequency distribution of preferred educator roles was calculated (Privitera, 2017). Qualitative data were analyzed using In Vivo and pattern coding methods (Saldaña, 2013). Researcher biases were identified and controlled through self-reflexivity, maintaining the integrity of data interpretation (Tracy, 2010).

### Findings

The distribution of preservice agricultural educators' most common preferred educator roles were: 72.73% ( $n = 8$ ) preferred the coach role, 9.09% ( $n = 1$ ) preferred facilitator, and 18.18% ( $n = 2$ ) preferred standard setter/evaluator. With zero preservice agricultural educators preferring the expert role (0.00%), it was determined to be the least preferred educator role. This finding supports the conclusion of preservice agricultural educator weakness in the subject expert role (Baker & Twenter, 2016).

After analysis of the interview transcription, the following themes regarding preservice teachers' conceptualization of the subject expert role emerged: *apprehensions*, *image of an expert*, *how learning occurs best*, *most valued knowledge type*, and *expectations of school-based agricultural educators*.

### Conclusions/Implications/Recommendations

A goal of agricultural teacher education programs is to prepare students with the knowledge of teaching and learning to be effective teachers in the secondary classroom (Barrick & Garton, 2010; Myers & Dyer, 2004). According to ELT and the ERP, this can be accomplished when educators develop the ability to adopt all four educator roles and engage learners in all modes of the learning process (Kolb, 1984; Kolb et al., 2014). Results imply an expertise gap, indicated by preservice agricultural educators' consistent ranking of subject expert as the least preferred role (Baker & Twenter, 2016).

Highlighted by the *apprehensions* theme, preservice agricultural educators hesitate to adopt the subject expert role because it is believed agricultural educators cannot know everything about their subject content and fear they cannot be expected to know the breadth of agriculture. As made evident by the *image of an expert* theme, preservice agricultural educators believe a right or wrong answer does not exist to everything and find the subject expert role to represent unengaging lecture-based teaching methods unable to apply and put content into practice for learners. The preservice agricultural educators hold a firm belief that *learning occurs best* hands-on, focusing on practice and application rather than the acquisition of key concepts and principles in agriculture. When discussing a preference for types of knowledge, real world and practical skills are emphasized as more *valued knowledge* than content-based knowledge in agriculture. Although four themes representing the data explain why preservice agricultural educators do not prefer the subject expert role, the *expectations of school-based agricultural educators* theme provides insight into why the role is viewed necessary, even when it is not the preference. The preservice agricultural educators believe agricultural teachers should know the content bring taught and must be able to demonstrate knowledge for students to increase interest in learning. However, preservice agricultural educators believe the expectation to be an expert cannot be met and lack confidence in their own agricultural content-knowledge capacity.

Understanding why the expertise gap exists for preservice agricultural educators is paramount to agricultural teacher educator programs. Strategies should be developed and studied to increase preservice agricultural educator efficacy in subject expertise, such as those techniques recommended by Baker and Twenter (2016), to improve flexibility within the subject expert role.

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