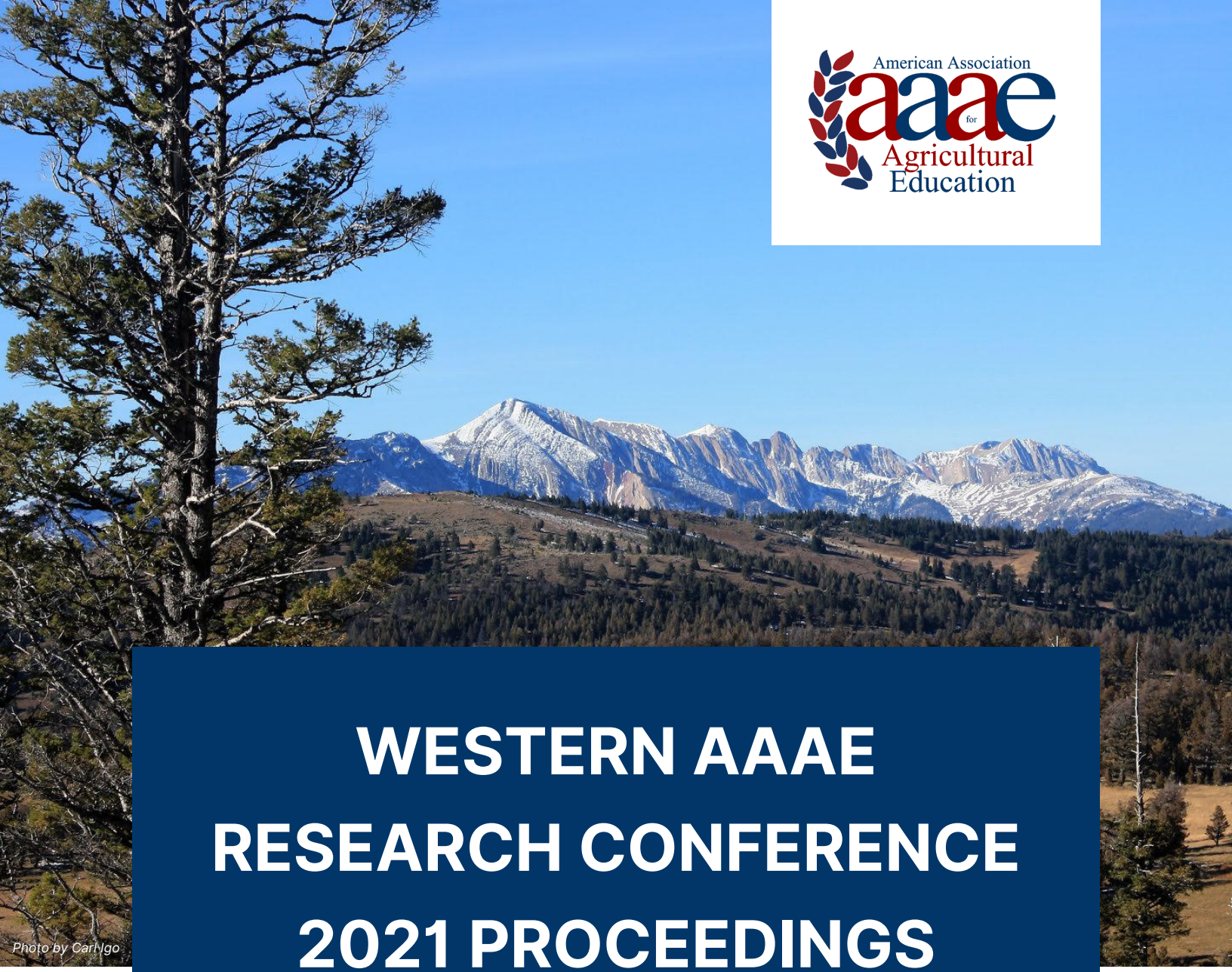

American Association for Agricultural Education

WESTERN AAAE RESEARCH CONFERENCE 2021 PROCEEDINGS

Volume 40

SEPTEMBER 27-29
BOZEMAN, MONTANA

Research Conference Chair
Dustin Perry, Montana State University
Poster Chair
Theresa Murphrey, Texas A&M University

2021 Western Region AAAE Research Conference Research Paper Review Process

The 2021 Western Region AAAE Research Conference Call for Papers was issued via the AAAE listserv in February 2021, with a submission deadline of June 4th, 2021. Authors were invited to submit abstracts via FastTrack™ at http://aaae.expressacademic.org/login.php.

The 2021 Western Region AAAE Research Conference received 66 total abstracts. Personal identifiers were removed from research papers before released to invited reviewers. Authors were notified of paper acceptance at the completion of the review process. Abstracts were blind-reviewed by a designated panel of reviewers for the conference. A total of 28 abstracts were accepted for presentation.

Our appreciation to Andrew Thoron, the AAAE Conference Manuscript Submission and Review Manager, for providing technical assistance and overseeing the paper review process using the FastTrack™ system. We also want to thank the panel of reviewers for their work in reviewing all manuscripts.

Finally, thank you to all of the AAAE members for their submissions.

2021 Western Region AAAE Research Panel of Reviewers

Thank you to the professionals listed below who volunteered their time and expertise in the review process.

Dwayne Cartmell	Oklahoma State University
Avery Culbertson	California State University - Fresno
Kellie Enns	Colorado State University
Nellie Hill	Kansas State University
John Rayfield	Texas Tech University

Western Region AAAE Research Conference History

Year	Location	Chair(s)	University
1982	Austin, TX	Gary E. Briers	Texas A&M University
1983	Rio Rico, AZ	Phillip A. Zubrick	University of Arizona
1984	Oklahoma City, OK	David Cox	Cameron University
		James P. Key	Oklahoma State University
1985	Boise, ID	John E. Slocombe	University of Idaho
1986	Las Cruces, NM	Paul R. Vaughn	New Mexico State University
1987	Logan, UT	Gilbert Long	Utah State University
1988	Ft. Collins, CO	Ramsey Groves	Colorado State University
1989	Sparks, NV	Joseph G. Harper	University of Nevada, Reno
1990	Fresno, CA	James. G. Leising	University of California, Davis
1991	Seattle, WA	Marvin D. Kleene	Washington State University
1992	Cody, WY	Carl L. Reynolds	University of Wyoming
1993	Bozeman, MT	Van Shellhamer	Montana State University
1994	Honolulu, HI	David Cox	University of Arizona
		Frank C. Walton	University of Hawaii
1995	Phoenix, AZ	Glen M. Miller	University of Arizona
1996	Moscow, ID	Jim Connors	University of Idaho
1997	Stillwater, OK	James White	Oklahoma State University
1998	Salt Lake City, UT	Gary S. Straquadine	Utah State University
1999	Corpus Christi, TX	Lance Keith	Texas Tech University
		Jacqui Lockaby	Texas Tech University
2000	Las Cruces, NM	Brenda Seevers	New Mexico State University
2001	Carmel, CA	William Kellogg	Cal Poly, San Luis Obispo
		J. Scott Vernon	Cal Poly, San Luis Obispo
2002	Spokane, WA	Michael K. Swan	Washington State University
2003	Portland, OR	Gregory W. Thompson	Oregon State University
		Brian K. Warnick	Oregon State University
2004	Honolulu, HI	Martin J. Frick	Montana State University
		Michael K. Swan	Washington State University
2005	Prescott, AZ	Billye B. Foster	University of Arizona
		Edward A. Franklin	University of Arizona
2006	Boise, ID	Lori L. Moore	University of Idaho
2007	Cody, WY	Carl L. Reynolds	University of Wyoming
2008	Park City, UT	Rudy S. Tarpley	Utah State University
		Brian K. Warnick	Utah State University
2009	Lake Tahoe, NV	Vernon Luft	University of Nevada, Reno
2010	Great Falls, MT	Shannon K. Arnold	Montana State University
		Carl G. Igo	Montana State University
2011	Fresno, CA	Mollie Aschenbrener	California State University, Chico

Western Region AAAE Research Conference History

(Continued)

Year	Location	Chair(s)	University
2012	Bellingham, WA	Michael Swan	Washington State University
2013	Lubbock, TX	Lori Moore	Texas A&M University
		Theresa Pesl Murphrey	Texas A&M University
2014	Kona, HI	Scott Burris	Texas Tech University
		Jon Ulmer	Texas Tech University
2015	Corvallis, OR	Misty Lambert	Oregon State University
		Jonathan Velez	Oregon State University
2016	Tuscon, AZ	Edward A. Franklin	Arizona State University
2017	Fort Collins, CO	Michael J. Martin	Colorado State University
2018	Boise, ID	Kasee Smith	University of Idaho
		Kattlyn Wolf	University of Idaho
2019	Anchorage, AK	Kattlyn Wolf	University of Idaho
2020	Virtual	Dustin Perry	Montana State University
2021	Bozeman, MT	Dustin Perry	Montana State University

Research Sessions

Research Session I – Tuesday, September 28, 2021
9:00 – 10:30 AM

Scarce Water in Site: A Content Analysis of News Coverage of the Sites Reservoir Project
Richard Austin-Castillo, Dr. Cara Lawson, & Lauren LaGrande, Oregon State University

The Communication Preferences of University of Idaho Extension Professionals and their Constituents
Klae O'Brien, Sarah A. Bush, Kattlyn J. Wolf, University of Idaho; & Maggie Elliot, Washington Hop Commission

The Influence of 4-H Instructor Beliefs on Teaching Animal Food Production
Shauni Jarvis & Amber H. Rice, The University of Arizona

Implementing a Needs Assessment to Evaluate Extension Agent Onboarding and Training
Kelsey J. Joseph, Josh Stewart, & Haley Q. Traini, Oregon State University

Agriculture Majors' Perceptions of Studying Agriculture: A Q Method Examination
Kasee L. Smith, Emma Winkle, Chrissy Hofgen, Hannah Ruth Pettyjohn, James Uhlenkott, Kiera Packer, Sarah Stevenson, Bobbie Sharp, & Abby Zurcher, University of Idaho

Ag. Skills Survey: Skills Sought by Employers in the Agricultural Industry
Sharon Freeman, Avery Culbertson, Steven Rocca, Cameron Standridge, Jasmine Flores, & Morgan Henson, California State University, Fresno

Using Virtual Reality to Determine Professional Development Needs of Beginning Welders
Brittney Heibel, Ryan Anderson, Texas State University; Marshall Swafford, Arkansas Tech University; & Bradley Borges, Texas State University

Student Teaching through the Pandemic: A Comparison of Experiences for the Spring 2020 Cohort to Previous Cohorts
Erika Derma, Jessica M. Toombs, Robert Terry, Jr., Jon W. Ramsey, & Nathan Smith, Oklahoma State University

SBAE Preservice Teachers' Comfort in Teaching Diverse Students
Jessica M. Toombs, California State University, Chico; Courtney P. Brown, Oklahoma State University; & Nicole Stevens, Mustang Public Schools

Research Session II – Tuesday, September 28, 2021
1:15 – 2:45 PM

Investigating the Effect of Consumers' Knowledge on their Acceptance of Functional Foods: A Meta-Analytic Review
Matt Baker, Peng Lu, Jean Parrella, & Holli Leggette, Texas A&M University

"I Want a Sea Turtle Selfie!" Effects of a Social Marketing Campaign to Encourage Sustainable Wildlife Viewing of Non-Threatening Species
Dr. Katie M. Abrams, Colorado State University; Amanda Molder, University of Wisconsin-Madison; & Kirsten Leong, Pacific Islands Fisheries Science Center

Tractor and Machinery Instructor Training: Impact of Sequential Professional Development
Rebecca G. Lawver, Michael L. Pate, Utah State University; Scott W. Smalley, Iowa State University; Dustin K. Perry, Montana State University; Alyx Shultz, Murray State University; & Kjersti Clawson, Utah State University

How does Training and Onboarding Differ between Career Stage of Oregon Extension Agents?
Kelsey J. Joseph & Josh Stewart, Oregon State University

Faculty use of Learning Management Software during Covid-19: The Effect of Age and Time
Merritt L. Drewery, Ryan G. Anderson, Emily Catalan, & Pratheesh Omana Sudhakaran, Texas State University

Primary Student Perceptions of Agriculture: A Content Analysis of Oklahoma Ag in the Classroom Posters
Steven Baringer, Jon W. Ramsey, Ruth Inman, & Kevin Allen, Oklahoma State University

Relationship between Resilience and Commitment to Teaching across Montana Agricultural Educator Career Stages
Joshua Toft & Dustin Perry, Montana State University

Assessing the Influence of Welding Sequence Training on Student Performance
Rhett Sykora, Ryan Anderson, Texas State University; Marshall Swafford, Arkansas Tech University; & Bradley Borges, Texas State University

Self-Perceived Wellness of School-based Agricultural Education Teachers: A Q Methodology Study
Nicole Stevens, Robert Terry, Jr., Angel Riggs, & J. Shane Robinson, Oklahoma State University

Research Session III – Tuesday, September 28, 2021
3:15 – 4:45 PM

A Systematic Metaphor Analysis of Gene-Editing in Agriculture in Online U.S. News
Nellie Hill, Kansas State University; Courtney Meyers, Texas Tech University; Nan Li, University of Wisconsin-Madison; David Doerfert, Texas Tech University; & Venugopal Mendu, Texas Tech University

A Case Study: Communications Strategies Used to Establish a School of Veterinary Medicine
Lindsay Kennedy, Texas Tech University & Nellie Hill, Kansas State University

Application of the Theory of Planned Behavior: Exploring Utah Stakeholders' Intentions to Implement Farm to School Programming
Michelle Burrows & Kelsey Hall, Utah State University

Tis the Season for the Warm Embrace of Kith and Kin: Organizational Culture in Western Region AAAE Programs
Danny Johnston, Shields Valley Public Schools, MT; Steve Fraze, New Mexico State University; Timothy Murphy, Texas A&M University; Erica Irlbeck, Texas Tech University; Robert Strong, Texas A&M University; Sarah Cantrell, Cypress Creek High School, TX; Peng Lu, & Matt Baker, Texas A&M University

Changes in Academic Rigor and Faculty Perception of Student Learning During Covid-19
Kayra Tasci, Merritt L. Drewery, & Ryan G. Anderson, Texas State University

Determining the Impact of a College of Agriculture Living Learning Program
Logan Hirsch, Jon W. Ramsey, Robert Terry, Jr., & Deb Vanoverbeke, Oklahoma State University

Pandemic Pedagogy: How Early Career Agriculture Teachers Reflect on Their Practice
Grant L. Ermis, California Agricultural Teachers' Induction Program; Sharon Freeman, California State University, Fresno; Ann De Lay, California Polytechnic State University, San Luis Obispo; Jalisca Thomason, Bakersfield College; & Mike Spiess, California State University, Chico

The Impact of Course Changes on Preservice Teachers' SAE Self-efficacy
Jessica M. Toombs, California State University, Chico & J. Shane Robinson, Oklahoma State University

Table of Contents

Scarce Water in Site: A Content Analysis of News Coverage of the Sites Reservoir Project

Richard Austin-Castillo, Oregon State University
Dr. Cara Lawson, Oregon State University
Lauren LaGrande, Oregon State University

Introduction and Theoretical Framework

Since the early part of the twentieth century, the federal government and state of California have implemented policies to construct a vast grid of canals, dams, pipelines, and reservoirs to store and transport the nearly 200 million acre-feet of water from north to south (California Department of Water Resources 2021; Stokstad, 2020). California has nearly 1,500 reservoirs, 240 of which account for 60% of the state's water storage capacity (Escriva-Bou et al., 2021). The state takes water management seriously; however, a drought that began in 2011 and ended in early 2019 revealed the state's water storage and management capacities were in need of review (National Integrated Drought Information System, 2021). A reprieve from the drought lasted sixteen months, returning in early 2020 (NIDIS, 2021). The need for more water storage in California through reservoirs and other surface water supplies has been established (Yates et al., 2009). Faced with a dwindling fresh water supply, Californians seek water storage solutions such as the proposed Sites Reservoir (Kasler & Sabalow, 2019).

The Sites Reservoir project was first suggested four decades ago (Water Education Foundation, 2021). The project is a multibillion-dollar proposal partly funded by bonds issued through the Water Quality Supply and Infrastructure Improvement Act of 2014 (California Natural Resources Agency, 2015). The reservoir's aim is to collect water during high flood periods and store the collected water for future use (Northern California Water Association, 2019). The Sites Reservoir project offers potential solutions to a state eager to conserve and better manage water. In total, the reservoir will be able to hold enough water to cover between 1.2 and 1.8 million acres of land (Kasler, 2017). The water is earmarked for uses related to agriculture, ecosystem improvement, drought preparedness, and statewide water system improvement (California Natural Resources Agency, 2015). The project is slated for completion in 2030 (Municipal Water Leader, 2021).

The Sites Reservoir project involves complexities from a variety of standpoints and stakeholder perspectives. For example, political activities are intertwined with water management (Greenhut, 2021) and the media communicates to the public of the role of policy and political opinion in water management (Sheeler, 2020). For science issues such as water conservation, elected officials and others utilize media platforms to advocate for the audiences' preexisting interests (Weigold, 2001). Scientists can also engage in media efforts, but find challenges when seeking to explain unfamiliar and complex concepts, potentially contributing to misinterpretation (Liang et al., 2014).

To better understand the ways in which this issue is being communicated, framing theory was used to guide this study. Gamson and Modigliani (1989) argued that framing is the "central organizing idea or storyline that provides meaning" (p. 143). Framing further encompasses the notion that emphasis on certain issue elements over others creates potential to impact the ways in

which the public views the issue (Chong & Druckman, 2007; Scheufele & Tewksbury, 2007). When an issue is complex, frames help make sense of relevant events (Gamson & Modigliani, 1989). In turn, frames help to communicate information about an issue by defining problems, diagnosing causes, and suggesting remedies (Entman, 1993). An exploration of frames used to communicate about the water issues in California can help shed light on this complex topic.

Past studies regarding the Sites Reservoir project have lacked analysis from a social science perspective and have largely focused on environmental assessments involving water, sediment, and mercury levels (Rytuba et al., 2015; Suchanek et al., 2010). A review of literature revealed a lack of research regarding how this particular project was being framed in the mainstream media. While few studies have researched communication surrounding water concerns (VanDyke & Callison, 2018), Dobelbower (2018) examined how the future of the Ogallala Aquifer was framed in both agricultural and mainstream media publications in the southern and midwestern regions on the United States. In this study, Dobelbower (2018) found the mainstream media to implement frames associated with policy and the environment, and for government officials and farmers to be common sources.

As water scarcity awareness and concerns increase on a national level, so does the need to generate constituents' support for water issues (VanDyke & Callison, 2018). Individuals who are not involved in agriculture or natural resources commonly use mainstream news publications such as newspapers, magazines, and social media to information regarding current policies, weather, events, technology, and more (Dobelbower, 2018). The media display information which influences the public's perceptions of what important issues are in their worlds. Additionally, in some cases the mass media may be the only contact many people have with certain topics, which can shape their opinions on these topics depending on how the topic is framed (McCombs & Shaw, 1991). In the case of the Sites Reservoir project, the frames employed and sources relied upon by *The Sacramento Bee* newspaper from 2010 to 2020 can provide insights regarding the nature of this complex issue and the media's role in communicating about it.

Purpose and Research Objectives

When complex issues arise, the media promote frames that are influenced by a variety of factors. As issues with California's water resources continue to unfold, a range of media frames are possible. The purpose of this study was to investigate how *The Sacramento Bee* framed the Sites Reservoir project from January 1, 2010 to December 31, 2020. The following research objectives guided this study:

1) Identify and compare news frames utilized in media coverage pertaining to the Sites Reservoir project.
2) Determine the frequency of news media coverage pertaining to the Sites Reservoir project.
3) Determine the sources utilized for information about the Sites Reservoir project.

Methodology

Quantitative content analysis was used to determine how the Sites Reservoir project was framed in *The Sacramento Bee* from January 1, 2010 to December 31, 2020. Quantitative content analysis refers to "the systematic assignment of communication content to categories according to rules, and the analysis of relationships involving those categories using statistical methods" (Riffe et al., 2014, p. 3). Content analysis involves objective, systematic analysis of message characteristics (Neuendorf, 2002). Newspaper articles were selected as the source of data for this project because traditional news coverage in convenient for readers and has been linked to gains in trust (Baranowski, 2019). While the Sites Reservoir project affects communities outside of Sacramento, *The Sacramento Bee* was selected for analysis given its status as a top newspaper by circulation (Agility PR Solutions, 2021) and its proximity to the proposed project site.

Articles were collected via the NewsBank Database using the term "Sites Reservoir" from January 1, 2010 to December 31, 2020. This timeframe was selected in order to compare frames over the period of time in which California faced its longest drought. A total of 79 articles were initially collected, but a final sample of 64 articles were subsequently analyzed after the removal of duplicate articles and articles unrelated to the issue. The primary instrument for this study was a researcher-developed codebook and code sheet. Using the emerging coding method, the categories were established after some initial data observations (Stemler, 2001). Sections in the codebook included 1) general article information, 2) frame, and 3) sources. Article information collected prior to coding included publication date, article title, and article type. The codebook included a detailed definition for each frame in order to assist the researchers in identifying the frame within each article. Frames were coded as 1 = *present*, and 0 = *not present*. Sources were coded when an individual, organization, or other entity was quoted or mentioned as the originator of information.

After the codebook was developed, two instructors were trained to utilize the codebook and verify its clarity. Intercoder reliability is used to evaluate the validity of data and aid in future replication of a study (Riffe et al., 2014). A pilot study using similar articles from a different newspaper was completed first. No standard for subsample size in reliability assessments has been established (Neuendorf, 2002), but 10% to 25% of the sample has been recommended (Wimmer & Dominick, 2011). With this recommendation in mind, the coders analyzed 16 articles independently. The results between coders were visually analyzed and inconsistences justified further discussion and revisions to the codebook to better refine and reach a stronger comfort level with the strategy for coding (Neuendorf, 2002). A second coder training was held to discuss inconsistencies and revisions to the codebook. Following the second coder training and a new coding sample, acceptable Krippendorff's alpha levels were achieved with scores ranging from 0.70 to 1.0 across frames (Riffe et al., 2014). The researcher coded the remaining 32 articles.

Findings

Objective one sought to identify and compare news frames utilized in media coverage pertaining to the Sites Reservoir project. Table 1 details the frequency of each frame. Newspaper articles discussed the Sites Reservoir primarily through the "policy/government" frame (32.8%,

n = 21). This frame focused on elected and government officials' involvement in the project in terms of new policy, programs, initiatives, law, bonds, regulations, or other measures. The newspaper's second most frequently utilized frame was "water conscious" (26.6%, *n* = 17), which typically focused upon the water supply and need for storage.

Table 1
Frequency of Frames Used in Articles About Sites Reservoir (n = 64)

Frame	*n*	*%*
Policy / Government	21	32.8
Water Conscious	17	26.6
Economic	14	21.9
Advocacy Awareness	10	15.6
Other	2	3.1
Total	64	100.0

Objective two sought to determine the frequency of news media coverage pertaining to the Sites Reservoir project (Table 2). News articles increased overall within the timeframe analyzed with the exception of 2019 and 2020 (1.6%, *n* = 1), which saw the least amount of coverage. The year 2016 saw the most coverage (23.4%, *n* = 15) followed by 2015 (21.9%, *n* = 14) and 2018 (20.3%, *n* = 13).

Table 2
Frequency of Coverage per Year Articles Referred to Sites Reservoir (N = 64)

Year	*n*	*%*
2010 - 2013	7	10.9
2014 - 2018	56	87.5
2019 - 2020	1	1.6

Objective three explored the sources used for information about the Sites Reservoir project (*N* = 115). The most referenced source was elected officials (33.0%, *n* = 38), which included officials at the local, state, or national level, or their representatives (Table 3). Also, highly-referenced sources were government agency representatives (27.8%, *n* = 32) from organizations including the U.S. Environmental Protection Agency, Department of Fish and Wildlife, and county water boards. Other sources included farmers (*n* = 3) and attorneys (*n* = 2).

Table 3
Source Types Referenced in Articles of Sites Reservoir (N = 115)

Source	*n*	*%*
Elected Official	38	33.0
Government Agency Representative	32	27.8
Nonprofit Representative	22	19.1
Sites Reservoir Representative	8	7.0
Community Member	5	4.3
University Representative	5	4.3
Other	5	4.3

Conclusions and Recommendations

Given a lack of studies focused on communicating water concerns (VanDyke & Callison, 2018), this study sought to determine how a top newspaper framed a complex water issue facing California. As the water crisis persists, studies such as this should be conducted again in the future to determine any changes in frames over time and as future related events unfold. Although water conservation is not a new topic the findings lend insights to stakeholder involvement and specific areas of concern within this issue. In this study, elected officials and government agencies were the most referenced sources, and the most prominent frame was policy / government. These findings support the argument that political activities are linked with water management (Greenhut, 2021) and that the media tend to focus upon the role of policy and political opinion in water management issues (Sheeler, 2020). Further, the prevalence of the water conscious frame suggests a potential attempt to advocate for audience interests (Weigold, 2001). It is possible, given the nature of these frames, that one influences the other as policy makers seek to address issues facing their constituents through policy and legislation.

The volume of articles appearing between 2014 and 2018 coincided not only with some of California's most devasting drought years, but also significant election years which suggests the potential for the promotion of water topics as political issues at the forefront of policy decisions. The year 2016 saw the largest number of articles in this study, and also occurred simultaneously with a national election. It is possible this peak in articles was observed due to the potential for federal aid to address water conservation issues. While issues with drought continue to plague California, and an increase in articles in the years 2019 and 2020 were expected due to another drought, the increased winter precipitation at that time and likely dominance with coverage regarding the Coronavirus pandemic explain the absence of coverage. Despite similar findings in terms of common frames, unlike the Dobelbower (2018) study, this research found little evidence of a first-hand farmer voice promoted in a popular mainstream newspaper. This finding could be due to regional differences in reporting preferences or, given the complicated nature of water conservation, there may be nuance within frames between regions that affect the sources media outlets look to for information. As such, future studies should more closely investigate distinctions in frames presented by media outlets between different regions afflicted with water conservation issues.

Addressing issues with water conservation will take the involvement from stakeholders of all sectors. As effects of climate change continue to evolve, solutions to manage future needs must be developed. For California, addressing the water crisis is key to maintaining the economy, agriculture production, and community health. Long-term plans are required in order to reduce reactive responses. When communicating on the topic of water conservation, journalist and reporters should look beyond politicians and focus on stakeholders such as farmers, environmentalist, and scientist for longer-term solutions and different perspectives. To capture the degree of severity on the issue, local leaders within areas highly impacted by the issue should relied upon by journalists. The Sites Reservoir project offers potential to aid California in its efforts to conserve water, but support from constituents will be needed (VanDyke & Callison, 2018). Media outlets such as *The Sacramento Bee* can be used to provide information and updates on complex issues in agriculture and natural resources.

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The Communication Preferences of University of Idaho Extension Professionals and their Constituents

Klae O'Brien, University of Idaho
Sarah A. Bush, University of Idaho
Kattlyn J. Wolf, University of Idaho
Maggie Elliot, Washington Hop Commission

Introduction and Theoretical Framework

The Cooperative Extension Service (CES) provides reliable, research-backed information from land-grant universities to people, communities, and businesses (Seevers & Graham, 2012). Although CES was designed to communicate with the public, it has been referred to as the "best kept secret" and needs to be promoted to remain relevant (Ray et al., 2015). CES was found for agricultural and rural constituents and their needs. However, currently only 17% of the U.S. population resides in rural areas (NIFA, 2021) and 10.9% of the employment is related to agriculture and food with 1.3% directly accounted for on farms (ERS, 2020). This can pose a gap in communication strategies in urban-based programs because the foundation of communication might differ from the needs and norms (Webster & Ingram, 2007). CES has broadened and adapted programming to encompass an increasingly urban audience, but to ensure longevity they need to continue evolving to meet the needs of rural and urban audiences (Ray et al., 2015).

CES professionals act as communicators and liaisons of research-backed information and help to assist in the cyclical nature of communication (Kurtzo et al., 2019). These individuals must rely on new media channels and social trends to determine how to broadcast their messages widely. CES professionals utilize many communication channels to send messages to their constituents including electronic sources, face-to-face, phone, print, etc. (Kurtzo et al., 2019). CES professionals suggested that understanding how to communicate effectively is an important aspect of their job and specifically includes listening to constituents and reciprocating effective communication (McDowell & Mizuno, 1987). For example, age and gender have shown to have an impact on communication preferences (Lamm et al., 2016). Understanding constituents needs, characteristics, and demographics can help a CES professional tailor their communication efforts specifically and increase the likelihood of understanding and acceptance (Agunda, 1998).

Diffusion of innovation (DOI) and framing theories served as the theoretical foundation for this study. DOI theory describes the process of spreading and eventual acceptance or rejection of new innovations through a social system (Rogers, 2003). DOI theory can be initiated by the presentation of research-based information from CES professionals, who often serve as opinion leaders and influence the decision to accept or reject new information. An opinion leader is someone who influences others to believe or behave a certain way (Rogers, 2003). Those who understand their roles as communicators and opinion leaders can utilize the innovation-decision process to effectively share information on new research and innovations (Rogers, 2003).

The concepts of framing theory can help to increase the effectiveness of a CES professional's communication (Daamen et al., 2001). Framing theory postulates messages that are specifically designed for a target audience are more easily understood and accepted

(Robinson, 2013). Understanding and utilizing the concepts of framing theory can help CES professionals modify their messages and programming to fit their constituents and aids in laying a better foundation for the message to be used (Robinson, 2013). Framing and DOI theories together can allow information to be specifically tailored for the target audience and effectively presented to increase the likelihood of it being accepted. In the conceptual model guiding this study, the framing of the information, as impacted by the extension professional's identity and the audience, will then have influence on the communication types and channels utilized. Communication types, individual, group, or mass communication, dictate which communication channels are then utilized for the diffusion of information (Rogers 2003; Telg & Irani, 2012). Additionally, it was essential to consider how COVID-19 restrictions impacted the communication usage of CES professionals to both minimalize the limitations to the study and assess potential long-term changes related to communication and program delivery.

Purpose and Objectives

The purpose of this research was to examine the communication preferences of University of Idaho (UI) CES professionals and their constituents and the communication types and channels most commonly used. Further, we examined the impact of COVID-19 on communication type and channel usage. The objectives for this study were: (1) Examine differences in personal and constituent communication channel preference of UI CES educators and faculty, (2) Examine differences in communication channel usage before and during COVID-19 of UI CES educators and faculty; and (3) Examine differences in time spent communicating and communication type usage before and during COVID-19 of UI CES educators and faculty.

Methods

We used a cross-sectional descriptive census survey design for this study. We administered the survey through Qualtrics and recruited via email. Our target population consisted of UI CES faculty and educators. The individuals in this category have obtained a master's or doctorate degree and work at a county office, UI campus, or research and experiment station. We sent the survey to 139 individuals and received 72 full responses for a response rate of 52%. To handle non-response bias, we compared early and late respondents using Mann-Whitney and t-tests (Linder et al., 2001). There were no significant differences in responses.

We used Dillman's et al. (2014) Tailored Design Method to develop a survey that included 10 questions regarding usage of different communication types and channels and nine demographic questions. Respondents indicated how often they used communication channels during a typical year, before and during the COVID-19 pandemic on a 6-point Likert scale: never, monthly, biweekly, weekly, daily, or more than daily. Respondents provided the percent of their time they spent communicating, preparing communication materials, and how often that time was spent in each communication type, in a typical year, before and during COVID-19. They then ranked their personal preferences for communication channels from most preferred to least and their perceived constituent communication channel preferences from most preferred to least preferred by constituents. We analyzed the data via descriptive statistics, Wilcoxon signed rank tests, and paired samples t-tests. We used descriptive statistics to describe the respondents

preferred communication types and channels. We conducted Wilcoxon signed rank tests to compare personal and constituent preferences for communication channels and changes in channel usage based on the COVID-19 pandemic. We implemented paired samples t-tests to examine differences in the time spent communicating and preparing communication materials and usage of communication types before and during COVID-19.

Results

Of the 72 respondents, 34 (47.22%) were male, 36 (50%) were female, and 2 (2.78%) preferred not to say. Most respondents indicated their race was Caucasian (*n* = 65, 90.3%). Of the respondents, 44 were from rural (61.17%) and 20 were from urban (27.78%) counties. Urban counties are those that have one or more urbanized area, 50,000 or more people, or have outlying areas that economically intertwined with the urbanized area (ERS, 2019). Time working in Extension ranged from .5 years to 39 years with a mean of 12.19 years (*SD* = 10.12).

Table 1
Wilcoxon Signed Ranks Tests of Communication Channel Preferences (n = 71)

	Constituent		*Personal*			
	M	*SD*	*M*	*SD*	*Z*	*p*
Social Media	4.66	2.67	5.66	2.84	-2.76	.01*
Walk-in	2.92	2.22	2.25	1.73	-2.72	.02*
Text	5.08	2.60	4.97	2.33	-0.31	.76
Phone Call	3.27	1.84	2.73	1.50	-2.55	.01*
Email	2.99	1.48	3.08	1.66	-0.24	.81
Mailed Newsletter	6.83	1.95	7.45	2.10	-2.37	.02*
Online Newsletter	5.83	2.06	6.15	1.87	-1.22	.22
Website	6.39	2.19	6.38	1.93	-0.69	.49
Magazine	8.83	1.51	8.65	1.75	-1.26	.21
Radio	9.85	0.91	9.48	1.07	-2.56	.01*
Television	10.73	0.99	10.62	1.03	-0.96	.34
Other	10.62	3.04	10.56	3.22	-0.59	.56

Note. Significance at the *p <.05 level, 2-Tailed. 1 is most preferred, 12 is least preferred.

Wilcoxon signed-ranks tests were utilized to compare the respondents' personal communication channel preference with what they indicated as their constituent's preferred communication channel preferences (Table 1). Constituent preferences were ranked statistically significantly higher than personal for social media (Z = -2.76, p = .01) and newsletters (Z = -2.37, p = .02). Personal preferences were ranked statistically significantly higher than constituents for walk-in (Z = -2.72, p = .02), phone calls (Z = -2.55, p = .01), and radio (Z = -2.56, p = .01). The differences between rankings for personal and constituent preference for text, emails, online newsletters, website, magazines, television, and other communication channels were not statistically significant. Wilcoxon signed rank tests were used to compare the communication channels before and during COVID-19 restrictions (Table 2). The usage of the following communication channels were statistically significantly higher during COVID-19: Facebook (Z = -4.07, p = .00), Instagram (Z = -2.33, p = .02), YouTube (Z = -4.33, p = .00), and magazine (Z = -2.31, p = .02). The following communication channels usage were statistically

significantly lower during COVID-19: walk-ins (Z = -6.16, p = .00) and radio (Z = -2.81, p = .01). There was no statistical significance for other communication channels.

Table 2
Before COVID and During COVID Communication Channel Usage (n = 69)

	Before COVID		*During COVID*			
	M	*SD*	*M*	*SD*	*Z*	*P*
Facebook	2.70	1.58	3.09	1.67	-4.07	.00*
Instagram	1.49	1.13	1.59	1.29	-2.33	.02*
Twitter	1.13	0.38	1.26	0.76	-1.63	.10
YouTube	1.72	1.21	2.28	1.42	-4.33	.00*
Other Social Media	1.46	1.12	1.62	1.24	-1.75	.08
Walk-in	4.07	1.40	2.43	1.28	-6.16	.00*
Text	3.83	1.79	3.90	1.76	-0.81	.42
Phone Call	4.77	1.23	4.71	1.24	-0.86	.39
Email	5.14	1.18	5.20	1.16	-0.23	.82
Mailed Newsletter	1.78	0.86	1.67	0.72	-0.89	.38
Website	2.83	1.63	2.88	1.53	-0.33	.74
Magazine	1.45	0.68	1.33	0.63	-2.31	.02*
Radio	1.51	1.13	1.32	0.95	-2.81	.01*
Television	1.23	0.94	1.25	1.01	-1.00	.32

Note. Significance at the *p <.05 level, 2-tailed. Likert scale: 1 = Never to 6 = more than daily.

Table 3
Differences in Participants' Time Spent Communicating Before and During COVID (n = 72)

	M	*SD*	*t*	*p*
Pair 1				
Before COVID % Spent Communicating	28.89	17.87	-1.92	.060
During COVID % Spent Communicating	32.25	21.58		
Pair 2				
Before COVID % Preparing Communications	18.35	14.81	-6.44	.000*
Before COVID % Preparing Communications	28.39	19.40		
Pair 3				
Before COVID % Individual Communication	36.53	19.91	1.01	.316
During COVID % Individual Communication	34.22	22.75		
Pair 4				
Before COVID % Group Communication	39.56	19.31	1.86	.067
During COVID % Group Communication	35.43	18.15		
Pair 5				
Before COVID % Mass Communication	14.75	10.71	-4.30	.000*
During COVID % Mass Communication	23.40	19.15		

Note. Significance at the *p <.05 level, 2-Tailed.

A paired samples t-test was conducted to compare how participants spent their time communication before and during COVID-19 restrictions (Table 3). There was a significant

difference in time spent communicating with constituents through mass communication before COVID (M = 14.75, SD = 10.71) and during COVID (M = 23.40, SD = 19.15), $t(72) = -4.3$, $p = .00$ and in percentage of time spent preparing communication material before COVID (M = 18.35, SD = 14.81) and during COVID (M = 28.39, SD = 19.40), $t(72) = -6.44$, $p = .00$. There was not significant difference in the percentage of time spent communicating, individual communication, or group communication before and during COVID-19.

Conclusions/ Recommendations/ Implications

The highest ranked communication channels of UI CES professionals were individual communication, with one channel falling under group. This finding was consistent with the most prevalent communication type usage and previous research that suggests constituents believe individual communication is more reliable and tailored to their specific needs (Licht & Martin, 2007; Rogers, 2003). Individual communication provides an opportunity for messages to be specifically framed for the individual (Jenkins et al., 2020), but lacks the reach of other group and mass communication types, such as social media. Results for ranking of social media fell in the middle for both personal and constituent preferences and indicated varied preferences based on high standard deviations and a range from 1 to 12 for both preferences. The variance may be based on the influence demographics and backgrounds have on preferences (Agunda, 1998).

The traditional foundation for communication in CES, based on rural needs (Henning et al., 2014), might explain why participants prefer individual communication more than their constituents. This lack of alignment can cause communication gaps. Understanding the audience's needs, preferences for communication, and access to resources aids in efficient communication and is essential due to UI CES professionals reporting they spend nearly 60% of their time communicating and preparing communication before and after COVID-19 restrictions. Once the audience's needs are understood, the concepts of framing theory can be applied to specifically target messages, which can increase the likelihood of adoption (Daamen et al., 2001). UI CES professionals can utilize audience segmentation to better serve their constituents through tailored dissemination of research-based information (Lamm et al., 2016).

The COVID-19 pandemic required UI CES to rapidly adapt to regulations, which is consistent with their need to adjust with the changing times (Narine & Meier, 2020). UI CES professionals responded with an increase in time preparing materials and mass communication to combat the decreases in-person and individual communication. Technology has become heavily relied upon during COVID-19 restrictions. However, not all of Idaho has access to a reliable internet connection that allows constituents to access social media and other technology-based content. Understanding what resources constituents have available and how they prefer to receive their information can help to maintain relationships with rural audiences. UI CES professionals face a unique challenge in meeting demographic needs due to Idaho's growing and urbanizing population. Understanding audience's demographics can help to better tailor programming and communication materials (Curtis et al., 2012).

It is recommended that this research be adapted and replicated to understand the constituent's perspective. There is no indication that the information provided directly aligns with constituent's actual communication channel preference. Additionally, responses may have

differed if respondents were asked to segment their audiences regarding specific demographic groups. Further research about how constituents prefer to communicate with CES professionals would help to uncover this phenomenon. There were limited respondents who indicated they used mass communication most often. Mass communication can serve as a fast and efficient way to communicate with many constituents at once. Further research could reveal why more CES professionals do not use mass communication more often.

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The Influence of 4-H Instructor Beliefs on Teaching Animal Food Production

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Introduction

Agricultural literacy education initiatives are essential to tackle emergent local, national, and global challenges related to agriculture and food production (Trexler, 2000). Agricultural literacy is the understanding and knowledge necessary for individuals to effectively synthesize, analyze, and communicate information regarding agriculture (Frick et al.,1991; Meischen & Trexler, 2003). Specifically, youth populations are a target audience for agricultural literacy education because of their current and future influence on agricultural issues (Frick, 1990). Despite the need for agriculturally literate youth, studies indicate their knowledge of the agriculture industry is limited and underdeveloped (Hess & Trexler, 2011; Kovar & Ball, 2013). These findings illustrate the need for youth agricultural literacy education, which can occur outside of the formal classroom through 4-H Cooperative Extension (Frick et al., 1995).

For programs like 4-H to be effective in agricultural literacy education, instructors must possess content knowledge (Van Driel & Berry, 2012) in agriculture and the necessary pedagogical knowledge and pedagogical content knowledge (PCK) needed to teach content (Loughran et al., 2004). Belief systems act as a driving force in forming teachers' PCK and PCK influences teaching decisions that impact student understanding (Rice & Kitchel, 2017). Studies exist exploring teacher beliefs within a specific agricultural subject (e.g., sustainable agriculture) (Muma et al., 2010); however, there is a paucity of research focusing on teacher beliefs in non-formal teaching settings. Due to the lack of enforced curriculum or guiding content standards within non-formal teaching settings like 4-H, instructors' personal beliefs may have a greater influence on the content being taught and pedagogical strategies employed.

The conceptual framework guiding this study is derived from the work of Martin and Enns (2017) on agricultural ideologies. Martin and Enns (2017) highlight two specific ideologies within the agriculture industry that can be used to identify general beliefs about agriculture-agrarian populist and neo-agrarian. Neo-agrarian ideologies consist of values associated with environmentalism, social justice, small scale production, and organic agriculture; while agrarian populist ideologies encompass values associated with tradition, science, efficiency, and rural communities. These ideologies exist on a continuum where most individuals tend to gravitate towards one ideology, though it is possible to have split ideologies (Martin & Enns, 2017). These ideologies can be applied to the specific context of animal food production. 4-H instructors are directly involved in the agriculture industry and likely gravitate towards one of the ideologies. This can influence the content they choose to teach and the strategies they utilize for teaching.

The theoretical framework guiding this study was derived from the work of Jones and Carter (2007) who developed the sociocultural model of embedded belief systems (SMEBS) to explain how the belief systems of science teachers impacts their teaching. The agriculture ideologies from Martin and Enns (2017) can be used in conjunction with the SMEBS to unpack how the personal beliefs of 4-H instructors influences their teaching of animal food production to youth. The SMEBS is a blended model derived from various theoretical models in social

psychology (Jones & Carter, 2007). The belief systems of instructors, paired with their epistemologies (which includes their beliefs about science, science learning, and science teaching), impacts instructors' attitudes toward instruction and implementation. While the original model focuses on science, it can be adapted to agriculture as an applied science (Huffman & Evenson, 2006). Instructors' epistemologies also directly impact their knowledge, skills, and motivations. Knowledge, skills, and motivations of instructors make up the perceptual filter through which instructors decide which instructional practices to use when teaching their students. The environmental responses to these instructional decisions influence practice, and practices impact the environmental responses instructors receive (Jones & Carter, 2007).

Purpose and Research Question

The purpose of this study is to explore how the personal beliefs of 4-H instructors influence their teaching of animal food production to 4-H youth populations within a specific southwestern state. This study aligns with the American Association for Agricultural Education National Research Agenda priority area five (Roberts et al., 2016). The following central research question guides the study: how do the personal beliefs of 4-H instructors influence their teaching of animal food production to 4-H youth in the non-formal teaching setting?

Methods

I utilized a phenomenological approach to investigate my central research question. Phenomenology enables researchers to articulate a common meaning between multiple individuals that share a lived experience (Moustakas, 1994). Phenomenology was chosen as the research design due to the exploration of personal beliefs of 4-H instructors, which is an individual and internal construct, and its potential influence on their teaching of animal food production. Utilizing a social constructivist lens, I sought to understand the phenomenon of the impact of beliefs on teaching. Social constructivism is a theoretical perspective in which individuals create realities through the actions of individuals and through collective actions (Bryant & Charmaz, 2007). I relied on participant experiences expressed through interviews in constructing my understanding and analyzed their responses to identify patterns of meaning (Moustakas, 1994). It is also important to reveal any potential bias to aid in trustworthiness (Creswell, 2013). My positionality includes growing up on a production livestock operation, raising livestock for fairs, 4-H youth participation, and 4-H volunteer efforts. I remained mindful of my positionality and attempted to bracket my experiences (Creswell, 2013).

Twenty participants agreed to participate in the study. Instructors must have taught for at least one year and taught more than one lesson in animal food production to better ensure their instructional decisions were purposeful versus reactional. 4-H is a non-profit organization and is largely supported by volunteers who often teach lessons (Smith, 1993); therefore, instructors interviewed included paid employees and volunteers within the 4-H system. I used in-depth, semi-structured participant interviews as my data source. Interviews were chosen to allow participants to communicate their own lived experiences and to elicit the internal construct of beliefs (Moustakas, 1994). Interviews lasted between 45-60 minutes and were not conducted in alignment with a specific lesson because the purpose was to inquire into the impact of beliefs on the instructors' summative teaching experiences. Interview questions included exploration into

participants' ideologies, content being taught, strategies and methods utilized in teaching content, and the impact of beliefs on teaching and learning. Data were collected in spring 2020.

Data were analyzed by horizontalizing the transcribed interviews and coding for meaning and meaning units (Moustakas, 1994). The meaning units were then clustered into categories and subsequent themes to develop descriptions of the lived experience and the essence of the phenomenon (Moustakas, 1994). Moustakas (1994) further identifies strategies for phenomenological analysis including: considering statements of significance, recording relevant statements, purging of repetitive and overlapping statements, listing of nonrepetitive and nonoverlapping statements, clustering meaning units into themes, determining meaning units and themes into descriptions of the experience, and producing a description of the essence. I utilized deductive analysis techniques using the Jones and Carter (2007) framework and Martin and Enns (2017) ideologies literature. I also conducted inductive analysis to include emergent items not captured by the frameworks (Creswell, 2013). To ensure trustworthiness, I engaged in member checking of my findings, rigor, rich and thick description through participant quotes, and the bracketing of my personal experiences throughout analysis (Creswell, 2013; Tracy, 2010).

Findings

Five themes emerged from the data: agricultural beliefs of 4-H instructors largely align with agrarian populist ideology, lack of 4-H curriculum to teach animal food production, beliefs of 4-H instructors served as a central driver in how content was taught and assessed, context of the community impacted 4-H instructors' strategies for teaching animal food production, and animal food production ultimately taught as raising animals for fair projects. The essence of the phenomenon was the fear and anxiety present in teaching animal food production and the perceived consequences of how the content was being taught on agricultural literacy. Fear was driven by beliefs, including participants' personal beliefs and other individuals' beliefs.

When instructors were asked to describe their personal agricultural identities and values, sixteen instructors indicated their past experiences led them to develop more traditional and conventional values associated with the agrarian populist ideology. One key tenant of agrarian populists is the focus on responsibility and hard work in a traditional agriculture setting. James said, "agricultural values are probably pretty ingrained in a lot of people that raise animals from day to day and a lot of them really boil down to work." Other instructors surfaced growing up on farms, being involved in 4-H as youth, and receiving formal education in animal agriculture. Four instructors aligned with the neo-agrarian ideology and described their preference for small-scale, local animal production and support for natural production practices. Some instructors also expressed slight changes in their beliefs over time, reflecting movement on the ideology continuum; however, none of them completely crossed into the opposing ideology during their careers. Regardless of their specific agricultural ideology, all 20 participants identified agricultural literacy of the general population to be low.

While most 4-H instructors recognized there is a selection of text available to purchase on the 4-H website, they also indicated there is not a specific curriculum they are required to follow or provided. Savannah stated, "I don't have a curriculum. I have never used one." The selection of text offered by 4-H was underutilized because it was perceived to be elementary content, leading to inconsistent curriculum for animal food production being taught across the state.

Instructors indicated much of their curriculum was derived from internet resources, other university Extension systems, or their prior experience. Instructors commonly used former 4-H youth in their programs to serve as guest lecturers. The choice of curriculum was largely influenced by experiences of the instructors, including their background, identity, and personal knowledge and skills. The four major content areas most instructors deemed important for youth included animal nutrition, biosecurity, quality assurance, and form and function in show animals. The most widely used curriculum resource was the quality assurance curriculum.

Regardless of the content instructors decided to teach, most used experiential learning as their primary teaching strategy. Hannah said, “It's kind of the motto of 4-H, that hands-on experiential learning.” Hands-on teaching strategies were perceived by all instructors to increase student motivation and participation and regarded as the best way for students to learn new content. The evaluation of instruction varied including pre- and post-tests, verbal comprehension questions, and some did not assess. The variance in assessment strategies led to a lack of consistency and uncertainty of student knowledge gained in animal food production statewide.

Most of the instructors felt supported by their local communities. Instructors stated community members knew what was best for their community and had a direct influence on what content was taught and how it was delivered. Community expectations, as well as environmental constraints, impacted where in the curriculum instructors would start teaching based on youth prior knowledge and geographic location. Rural communities with more conventional and traditional agricultural practices expected youth to learn about animal production and how to work within the local industry. Communities influenced where instruction began and instructor changes to the depth or sequence of content.

Every county within the southwestern state used show animals to teach animal food production. Instructors assessed student learning through the successful completion of their fair projects. Anthony said, “It’s pretty simple. I mean, that steer is completed at the end and meets certain quality standards.” These non-formal assessments provide a more concrete form of assessment when compared to previous assessment practices. While showing as the main purpose does include animal food production concepts, it also leaves out aspects of commercial food production essential to agricultural literacy. Youth are taught how to raise an animal for fair but are not usually taught the why behind the concepts. James said, “All of the show ring things people need to know, not necessarily the cuts of animals and what quality of meat they might be getting.” James illustrated the gap between teaching youth how to raise show animals and teaching youth about animal food production more broadly for commercial purposes.

Overall, instructors expressed an underlying fear of public perceptions and misconceptions related to animal agriculture, largely influenced by the current climate and agriculture skepticism of the public. The word fear was used to identify this feeling by various instructors; however, anxiety may be the more accurate term. Instructors’ anxiety was based on beliefs that did not align with their own ideology and fears of perpetuating misconceptions from consumers and youth. Instructors expressed anxiety regarding every group of people related to the agricultural industry. The perceived lack of agricultural literacy and public misconceptions led instructors to express a need to personally defend animal agriculture. Emily stated, “I feel like I sometimes have to get defensive about [animal production] …people can say anything and it's true.” What instructors considered to be misinformation differed depending on their personal

beliefs regarding animal production practices. Instructors' anxiety may also account for the feeling of personal responsibility to increase youth agricultural literacy.

Discussion/Implications/Recommendations

All the 4-H instructors aligned with one of the two agricultural ideologies highlighted by Martin & Enns (2017). Sixteen of the participants beliefs aligned with the agrarian populist ideology. Instructors with similar experiences in their background and perceptions of a subject, which make up the perceptual filter of Jones and Carter's (2007) model, will likely develop similar content areas to teach. While instructors' largely homogenous beliefs led to similarities in content taught, it also creates a lack of diversity in content, which may lead to youth not receiving information that instructors of different beliefs would deem essential. To mitigate this issue, instructors should be educated on agricultural ideologies and how beliefs impact teaching. Additionally, groups developing curriculum should consist of individuals with diverse beliefs.

Instructors' beliefs acted as a central driver in what content is taught, how it is taught, and how it is assessed (Jones & Carter, 2007). Instructors' personal beliefs about a subject can greatly impact what instructors are willing to teach and the methods they use when teaching (Earnest, 1989). All instructors emphasized agricultural literacy within their content as they deemed it lacking youth (Hess & Trexler, 2011; Kovar & Ball, 2013), and felt an inherent need to combat this issue. Instructors largely utilized former 4-H youth within the community to help teach content and hands-on learning was the most dominate pedagogical method. Instructors' desire to teach using hands-on strategies may stem from anxiety of mitigating misconceptions, as hands-on instruction is more difficult to dispute than other methods. Instructors did utilize one pre-packaged curriculum called quality assurance, which suggests other pre-packaged curriculums may be utilized if they met instructors' standards. The context of the community surrounding the 4-H program, including youth prior knowledge and geographic location, also influenced teaching and is supported by the Jones and Carter (2007) framework as an environmental factor influencing beliefs and practice. Additional curriculum support is desired, including highlighting different ways to teach a lesson to meet various learning preferences and community contexts, and an emphasis on assessment practices.

While raising animals for fairs and shows teach youth important lessons, using it as a vehicle to teach animal food production requires specific connections to be made to industry. These connections include structural correctness on a commercial scale, the market price of livestock verses fair prices, how quality and yield grades work, etc. Raising show animals can yield motivation and developmental benefits and increase levels of caring, contribution and character in youth (Arnold et al., 2007). If the values youth are currently learning from raising fair animals along with their motivation can be combined with lessons about how commercial animal production takes place, raising show animals can become an invaluable way to increase agricultural literacy while providing the hands-on experience instructors prefer. While this study took place within 4-H, the responsibility of educating youth about animal food production lies within all the programs and agencies involved in agriculture including FFA, commercial producers, and any other individuals involved in animal food production.

The essence of the phenomenon, centered around anxiety, can be classified as an environmental factor impacting instructors' decisions about what and how to teach animal food

production to youth (Jones & Carter, 2007). Anxiety facilitates the need to avoid communicating with strangers and creates behavior patterns during social decision making (Wu et al., 2013). These behavior patterns may impact how an instructor plans their lesson or may change what the instructor is planning on teaching when presented with an audience. Providing a curriculum to use as a guide can help instructors feel more confident that they are teaching valuable material and may dull the impact of anxiety on their teaching of animal food production to youth. Further research can provide a more detailed view of agriculture ideologies. Agriculture is frequently changing in order to sustain the growing population, and agricultural ideologies may need to be adjusted to match the current climate as it ebbs and flows. While most of the instructors had beliefs largely aligning with agrarian populist ideology, individuals with more diverse beliefs do not fit into the ideology continuum and more research can help to clarify additional ideologies. Finally, further research should also be conducted on how anxiety impacts instructors' teaching.

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Implementing a Needs Assessment to Evaluate Extension Agent Onboarding and Training

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Introduction/Theoretical Framework

County Extension Agents and faculty serve as the liaison between the land-grant institution and the community, covering a wide span of content within their areas of expertise (Seevers & Graham, 2001). In fulfilling their role as county liaisons, agents are tasked with the expectations of possessing a variety of *extension competencies*, which are "the basic knowledge, attitudes, skills, and behaviors for a given job" (Maddy et al., 2002, pp. 1). Within Oregon State University (OSU Extension Service, many competencies are employed for the purpose of community outreach and engagement, which is often met through educational programing (Extension and Engagement, 2019). However, agents have many responsibilities outside of teaching (Cooper & Graham, 2001). A recent synthesis of Extension Agent competencies found that non-teaching responsibilities include keeping records, creating research field trials and demonstration plots, organizational effectiveness, evaluation, interpersonal skills and leadership, communication, publishing peer-reviewed research, using technology, organization skills, and many more (Knight et. al, 2019). Having reviewed OSU Extension agent job descriptions, a county agent needs both content-specific skills (e.g. understanding of animal physiology or life-span development) and Extension-specific skills (e.g. developing education programming and conducting needs assessments) (Cooper & Graham, 2001). The content-specific skills are often learned from university education, evidenced by the expectation that persons applying for a position have a Bachelors and a Master's degree in an area relevant to their program area. Whereas Extension-specific skills might come from a combination of university education, lived experiences, and trainings delivered by state Extension services, such as onboarding and continuous professional development training.

In many states, County Extension Agents undergo onboarding and continuous professional development training to gain knowledge and experience in Extension competencies. Some states have in-person training models including a few sequential days, multiple days divided over a series of months, or multiple trainings divided over a three-year span (Brodeur et. al, 2011; Garst et al., 2007; Harder et al., 2016; New Extension Agent: Onboarding Self Study Guide, 2019). Other states have adopted a blended approach of in-person sessions and online modules (Harder et al., 2016). Additionally, some states have training specific to Extension program areas, such as the 4-H New Extension Agent Training (NEAT) in Virginia, while still other models have an onboarding for all program areas before separating other training based on specific program areas (Garst et al., 2007; New Extension Agent: Onboarding Self Study Guide, 2019). Within OSU Extension, content and objectives of training and onboarding are determined by state program leaders, thus creating a decentralized onboarding and training protocol (L. Shirley, personal communication, February 6, 2019).

After learning more about the decentralized onboarding and training model within different program areas in OSU Extension, we observed inconsistencies in the depth, length and content that is covered during the trainings. The program areas in OSU Extension either did not

have a solidified onboarding process or onboarding was scant as a result of minimal the budget or personnel to conduct trainings (S. Angima, personal communication, March 6, 2019; [Blinded for review], R. Riportella June 2, 2019; J. Davis, personal communication, January 22, 2020). Recent research synthesizing 20 years of Extension agent competency research revealed the breadth of competencies (503) needed by Extension agents for success in the profession (Knight et. al, 2019). Therefore, orientation and continued training for new, and veteran agents, is necessary for success in the field (Bulut & Culha, 2010; Holton, 1990; Swart et al., 2014). The discrepancy between training literature and the lack of training in OSU Extension resulted in our research team conducting a needs assessment on training and onboarding on OSU Extension agents.

Witkin and Altschuld (1995) described *need* as a discrepancy between *what is* and *what should be* (Witkin & Altschuld, 1995). Kaufman (1988; 1992) pointed out that need is the missing link between the ongoing state and the desired state. A needs assessment (NA) is an approach to identify, analyze, and make recommendations about a need (Watkins et al., 2012). Witkin and Altschuld identified three stages of a NA including, (a) pre-assessment, (b) assessment, and (c) post-assessment. The pre-assessment stage of a NA consists of defining the purpose, identifying the need areas, determining what data should be collected, and deciding methods for data collection. Phase two of a NA involves conducting the assessment, collecting the data, and analyzing the data. The final phase includes reporting the findings and distributing recommendations to internal and external partners. Utilizing a NA approach allowed us to conduct an exhaustive investigation of the training and onboarding of OSU Extension agents.

Research Questions

This study is part of a larger project, which employed Witkin and Altschuld's (1995) practical NA model for conducting an exhaustive investigation of the training and onboarding of OSU Extension agents. Our needs assessment sought to address the following research questions, which guided the study. Research question 1: What professional development competencies are accessible to agents under the current training and onboarding procedures?
Research question 2: What professional development competencies do agents believe are missing under the current training and onboarding procedures? This study aligns with the American Association of Agricultural Education's (AAAE) research priority five: Efficient and effective agricultural education programs (Roberts et al., 2016, 41-45).

Methods

To address the research questions, we administered a survey instrument to all OSU Extension agents. This research did not seek generalizable information as it was a state-specific study; however, we sought a census in hopes of a large sample size and robust understanding of the discrepancies within the training and onboarding protocols (Ary et al., 2002). We developed an original survey instrument through Qualtrics Survey Software. The developed questions and competencies included in the instrument were based on a combination of Extension competency findings, employee training literature from the fields of Personnel Psychology and Human Resource Development, and relevant needs assessment research. The developed instrument was vetted for content and face validity by administering a pilot survey to Extension agents outside of Oregon. The instrument was distributed to eleven county agents located outside of OSU

Extension and the pilot participants represented the 4-H, Agricultural and Natural Resources (ANR), and Family Consumer Sciences (FCS) program areas and the four career states (Rennekamp & Nall, 1994). Additionally, the instrument was reviewed by expert faculty in Agricultural Education and Extension, graduate thesis committee members, and doctoral graduate students for additional checks for validity.

The instrument included four sections. The first section included ten introduction questions, such as "within the first year of your employment, did you receive any training?", and "was any of the training your received during your first through third years in the profession mandatory training?" The second section asked specific questions about 20 competencies identified by past research (Knight et. al, 2019), and validated by Extension professionals. The 20 competencies were: (a) Communicating research, (b) Communications, (c) Conducting needs assessments, (d) Conducting applied research, (e) Ethics, (f) History of Extension, (g) Leadership, (h) Learning theories, (i) Marketing, (j) OSU Extension organizational leadership, (k) Professionalism, (l) Program development, (m) Program evaluation, (n) Risk assessment, (o) Teaching methods, (p) Teaching techniques, (q) Technology, (r) Theories of human development, (s) Volunteer management, and (t) Volunteer recruitment. Questions related to the 20 specific competencies asked participants to recall if they had received training on the topic, when they received the training, and if the training was provided by OSU Extension.

The third section of the instrument included additional training questions and asked participants to rate the perceived value and relevancy of training received by OSU Extension. In this section, we also gave participants the opportunity to add additional context and detail through open-ended questions, such as "What are some ways OSU Extension can improve employee training?", and "What are additional training areas that OSU Extension should provide training on?" The fourth, and final section, were demographic questions.

The survey instrument was sent out to all OSU Extension agents on an all-agent list serve. One week after the first email was sent, Regional Directions and Program-area Leaders emailed their respective employees to encourage participation in the survey. A final reminder email was sent five days before the survey closed. The survey was open for 20 days. The raw data collected in the instrument was exported from Qualtrics Survey Software to Microsoft Excel. There were 60 usable responses resulting in a 36% response rate. Data were analyzed using the Statistical Package for Social Sciences (SPSS Version 26) to address the research questions for this study. To report the findings of our research questions, frequencies and descriptive statistic were used.

Results

This research sought to further our understanding of the professional development competencies currently accessible and uncover missing elements in onboarding procedures and professional development opportunities for OSU Extension agents. We received 60 usable responses. With regard to the seven Extension program areas in Oregon, 59% (n = 35) of the data was representative of the most populous program areas of 4-H, Agriculture and Natural Resources (ANR), and Family and Community Health (FCH) program areas. Additionally, 21% (n = 13) of collected responses were from the four remaining program areas, and a notable 20% (n = 12) did not identify their program area (accounting for the 12 that did not complete the

entirety of the survey). Over half of the participants (63%, *n* = 38) identified they received training during their first year of employment, 55% (*n* = 33) identified they received training during their second through third years of employment, and 31% (*n* = 19) identified the training they received during their first through third year was mandatory (Table 1).

Table 1

Reported training received during the first through third years of employment (*n* = 60)

	Yes	No	Maybe	I don't remember	I did not receive training
I received training by OSU Extension during my first year of employment	38	17	4	1	N/A
I received training by OSU Extension during my second and third year of employment	33	20	6	1	N/A
The training I received by OSU Extension during my first through third year was mandatory	19	24	5	5	7

The second section of the instrument narrowed the focus of training and onboarding to twenty Extension-related competencies (Knight, et. al, 2019). Of the 20 competencies, 15 competencies had a higher frequency of agents who *did not* receive training than those who *did* receive training on the competency. A higher number of respondents reported being trained on *Ethics, Leadership, Marketing, and Extension organizational leadership* than had not been trained. Comments from an open response section included:

> "I had one day of training from my immediate supervisor when I was hired; since [my immediate supervisor left] I have received close to zero training." – ANR agent, 2 years of experience
>
> "[Training] needs to start earlier. It took about three years before I could attend a new staff orientation. I was out of the 4-H position for about 10 years and then received no orientation to come back in [after moving to second agent position]." – 4-H and FCH agent, 26 years of experience
>
> "My initial formal training was two hours [and we] discussed the paperwork, then, "go and do good work". Then nothing unless I asked." – ANR Faculty, 5 years of experience
>
> "I started over 30 years ago. We did none of this [referring to survey competencies] and survived." – SeaGrant Faculty, 30 years of experience

Participants were also able to identify different competencies they thought were lacking under the current training and onboarding procedures. The list includes but is not limited to: community building, conflict resolution, content/program area training, diversity, equity, and inclusion; facilitation skills, history and culture of Extension, intersectionality of program areas, leadership, research effectiveness, technology, volunteer management, volunteer recruitment, work-life balance, work-place communication, and working with other Extension programs.

The data revealed over half of OSU Extension agents *do* receive training, however, a higher frequency of respondents indicated they had not received training in 75% of the competency areas, compared to those reporting to have received training in those areas. It is important to bring attention to the gap between these two variables. While we can conclude that agents *are* receiving training, the data revealed the training in which they are participating does not align with what past Extension scholars have published as being critical to success in Extension. Additionally, participants were asked to identified competencies that were not offered, or sparsely offered, within current training and onboarding model. From the responses, we identified the competencies could be divided into two categories, professional development skills (such as communications, conflict resolution, grant writing, leadership, teaching methods, and volunteer management and recruitment), and administrative skills (such as data tracking, digital measures, and OSU Extension leadership and structure). From the responses, there were three times more professional development skills mentioned than the administrative skills.

Conclusion and Recommendation

Considering the results of our data, we offer two recommendations. The first recommendation is for OSU Extension Service to create consistent onboarding training materials to be used by all program areas, at least partially eliminating the problem of decentralization. This recommendation aligns with the work of Swart et al. (2004). Consistent training materials should include a new curriculum, a new process for delivering the curriculum, and a uniform evaluation system for the training. The second recommendation is to establish a centralized onboarding model for all newly hired Extension agents. This study has provided evidence that the current decentralized training is intermittent, at best. A more intentional, centralized training may ensure agents are actually receiving training that can help them be more successful in their jobs. We further recommend looking at the works of other States with centralized training model as an example.

This study examined what training and onboarding is available to OSU Extension Agents as well as what competencies agents believe are missing from the current training models. The mission of OSU Extension Service is to *"Engage [with] the people of Oregon with research-based knowledge and education that strengthen communities and economies, sustain natural resources, and promote healthy families and individuals"* (Extension and Engagement, 2020). Highly qualified agents are needed to ensure OSU Extension puts their best effort into meeting this mission. Results revealed disparities within current training procedures related to the 20 competencies explored in this study and evidence supports the need for improved training materials and a more consistent training model.

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Agriculture Majors' Perceptions of Studying Agriculture: A Q Method Examination

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Introduction/Theoretical Framework

Agriculture is an ever-evolving industry which is influenced by technological advancements, political changes, economic stability, and many other factors (NASEM, 2019). There is a national shortage of agricultural workers (Charleton, et al., 2018; Rivera & Alex, 2009). To address the shortage, researchers point to the need for more people to know about and pursue agricultural careers, which is best achieved through purposeful agricultural education (Rivera & Alex, 2008). Agricultural education takes many forms, from formal school-based programs in elementary, secondary schools, and post-secondary arenas to informal education for both producers and consumers of agricultural products (National Research Council, 2009; Rivera & Alex, 2008). There are differing opinions, even within agricultural education, about why people should study agriculture (Rice & Kitchel, 2017; Roberts & Ball, 2009).

In formal education, choosing to learn about agriculture can be influenced by many factors (Dyer & Breja, 2003; Myers, et al., 2004; Rayfield, et al., 2013; Torres & Wildman, 2001). Researchers note that choosing to learn about agriculture could be motivated by a desire to uphold family traditions (Mat Taib, et al., 2019), provide consumer education (Myers, et al., 2004; Rice & Kitchel, 2017), or it may be appealing because of the multiple career opportunities available within agriculture (Esters & Bowen, 2005; Rayfield, et al., 2013). Learning about agriculture is not just for formal education, consumer education often emerges in the literature as an important component of agricultural education (Rice & Kitchel, 2017). The impacts of learning about agriculture are noted by many (Lindner, et al., 2020). Learning about agriculture can increase consumer confidence, help producers adopt new practices, and help bring new employees into agricultural careers (Rivera & Alex, 2008).

Missing from the literature is information about individual beliefs surrounding the purpose for learning about agriculture from a perspectives point of view. For college students, these individual beliefs about agriculture could help determine why someone would choose an agriculturally related major and pursue an agricultural career (Torres & Wildman, 2001). Knowing the perceptions of students who have made the choice to enroll in an agricultural major could help provide insight into the motivations for their choice and could provide information needed to help recruit more students into agriculture careers (Rayfield, et al., 2013; Torres & Wildman, 2001). This study was designed to examine the perceptions of College of Agriculture and Life Sciences (CALS) undergraduate students related to why they feel people should learn about agriculture.

The theoretical framework for this study was rooted in Ajzen and Fishbein's (1980) theory of reasoned action. Within the confines of the theory, beliefs and attitudes surrounding the purpose for studying agriculture are based on both attitudes about agriculture and subjective norms related to studying agriculture. In this study, we were less concerned with the behavioral

intention or outcome behavior of studying agriculture, but instead focused on factors which may have contributed to the initial attitudes and views of the subjective norm surrounding studying agriculture.

Purpose/Objectives

This study was conducted to determine University of Idaho College of Agriculture and Life Sciences (CALS) undergraduate student perceptions of the reason people should be educated about agriculture. To meet this purpose, we worked to fulfill the following objectives:

1. Define the concourse of beliefs and attitudes surrounding perceptions of studying agriculture.
2. Examine University of Idaho CALS students perceptions related to studying agriculture.
3. Determine which, if any, personas exist among University of Idaho CALS students regarding the purpose for studying agriculture.

Methods

We used a Q method research design, to meet the objectives of this study. Q method is a way to identify personal beliefs, opinions, or subjective meaning to define general types or patterns of perspectives held by a particular group (Stevenson, 1936). This method allows researchers to examine the respondents rather than instrument items as a dependent variable and measures respondent similarities (Leggette & Redwine, 2016). A Q method study includes three main components: the Concourse (population of ideas on a given topic), Q set (sample of ideas that will be analyzed), and the P Set (or the participants who will sort statements in the Q set). The Q method allows the Q set and P set to be analyzed and interpreted through factor analysis (Watts and Stenner, 2014; Van Exel & de Graaf, 2005). Using Q method in this study allowed us to describe types of patterns or perspectives held by undergraduate CALS students related to their answer to the question: *Why should people learn about agriculture*?

The process of Q method allows respondents to use personal preferences to sort a set of statements into a forced quasi-normal curve (Stephenson, 1953). We selected a 40 statement Q set, following the recommendation to use a more flattened curve in situations when respondents have large amounts of subject knowledge (Watts & Stenner, 2012). To generate the statements, or Q-set, Watts and Stenner (2012) recommend conducting an exhaustive literature review of the concourse. For this study, we developed a concourse to include concepts relevant to agricultural literacy, agricultural education, extension education in agriculture, and intent to study agriculture. The literature review included examination of 320 scholarly works from which we generated 102 issues, theories, findings, and recommendations related to the concourse. Concourse refinement included organization and condensing these concepts to generate 40 unique Q set statements balanced across the concourse (Watts & Stenner, 2005). The 40 Q-set statements were validated by a group of four CALS faculty members, and a semantic review of questions by graduate students allowed further refinement of 3 statements. Statements were placed into an online Google Jamboard format to allow digital completion of the Q sort process. A member of the research team guided the process in person with each respondent.

A ten-question paper questionnaire accompanied the Q sort. The instrument allowed collection of demographic characteristics (age, gender, ethnicity), academic information (current and previous majors and minors, time in school, expected graduation), and agricultural background (personal experience, agricultural related organizations).

Watts and Stenner (2012) recommend 20-30 participants from varying backgrounds and beliefs for a Q sort in which viewpoints have been previously attributed to the participant population. As all P-set members were CALS students, we determined they would have a viewpoint related to the research question. We developed a list of potential variation in the population including academic rank, major and minor, background in agriculture, gender, and intended career path. Potential participants were noted for each combination of factors and members of the research team reached out via email to recruit members. It is important to note the purposive sampling used in this study and note that results are not intended to be generalized to a broader population. Our final P-set consisted of $n = 32$ participants representing every CALS department, 22 different majors within CALS, and participants from each academic level (freshman through senior. Once agreeing to participate, P set members identified a time and location to join the research team and complete the components of the study.

Data were collected in April and May 2021. Data collection for each participant occurred in four phases: questionnaire, presorting process, Q sort, and follow up interview. Participants were asked to begin the Q sort by presorting the 40 statements into piles according to if they agreed, disagreed, or were indifferent to the statement. Watts and Stenner (2012) recommend presorting to measure general agreeability of a participant to the Q set. During the Q-sort procedure, participants ranked the Q set statements based on their psychological significance (Watts & Stenner, 2012). The stem, or common set of words "Learning about agriculture…", preceded each statement (Watts & Stenner, 2012). Participants placed statements they most agreed with on the positive side of the curve (0 through +6) and statements they least agreed with on the negative side (0 through -6). It is important to note that our study was not designed to ask why respondents chose to study agriculture themselves, but rather why people in general should study agriculture. Questions asked during the post-sorting interview included an explanation of the items placed at extremes, personal meaning for certain statements, and items the participant felt were omitted (Watts & Stenner, 2012).

To analyze the Q-sorts, we used PQMethod software that examined the location of ranked statements in relation to other items to identify similar types of participants (Schmolck, 2014).To begin, we calculated a correlation matrix to show the level of agreement and disagreement between all completed ($n = 32$) sorts (Watts & Stenner, 2005). These groupings of shared meaning and viewpoints were extracted to serve as our factors (Van Exel et al., 2005). We made an *a priori* decision to only extract factors with an eigenvalue of 1.00 or higher to indicate a factor's statistical strength (Guttman 1954; Kaiser, 1960).

We interpreted each factor through a holistic inspection of distinguishing Q-set statements, the items in the exemplary sorts, and post-sorting interview data (Watts & Stenner, 2012). Significant differences between the three factors were interpreted by referencing z-scores at a $p < 0.01$ level. The z-scores were converted into a factor array to further aid in the interpretation process. A factor array is a single Q sort configured to represent the viewpoint of a

specific factor that forms the basis of persona development (Watts & Stenner, 2012). We worked through each factor array and placed statements into categories to identify perspectives about which each factor was polarized relative to other factors.

Results/Findings

A total of *n* = 32 Q-sorts were intercorrelated and factor-analyzed. Of the *n* = 32 Q-sorts, 28 loaded significantly to one of three factors. Factor 1 accounted for 30.9% of the variance. Factor 2 accounted for 18.2%, and Factor 3 accounted for 16.4% of the variance. The three extracted factors combined to account for 65.5% of the study variance. We calculated the correlation between factors and determined that the extracted factors were dissimilar enough to be considered distinctive viewpoints (Watts & Stenner, 2012). Factor characteristics related to defining sorts, reliability and standard error of z-scores are exhibited in Table 1.

Table 1
Factor Characteristics

Characteristic	Factor 1	Factor 2	Factor 3
No. of defining sorts	9	12	7
Eigenvalue	3.60	1.72	1.28
Explained variance	30.9%	18.2%	16.4%
Average reliability coefficient	0.81	0.79	0.80
Composite reliability	0.97	0.98	0.96
Standard Error of factor z-scores	0.12	0.14	0.18
Correlations between factors			
Factor 1	--	0.37	0.43
Factor 2	0.37	--	0.52
Factor 3	0.52	0.43	--

The exemplar sorts in each factor were combined to create a typical Q-sort for each factor, called a factor array. We interpreted the factor arrays through a careful and holistic inspection of the items in each array (Watts & Stenner, 2012) paired with information from the questionnaires and post-sorting interviews to fully explain the viewpoint captured by each factor. We described Factor 1 as *Production-Focused.* All individuals who sorted to this factor had personal and family background in agricultural production and included members who were at higher academic ranks. Distinguishing statements in this factor included agreement with statements related to lifelong learning in agriculture, the viability of agriculture as a career, and agricultural education as a vehicle for learning other concepts. Factor 2 included participants who were *Heritage-Focused*. This group all had strong family background in agriculture but may or may not have self-identified as an agricultural producer. Distinguishing statements in this category included strong beliefs in agriculture as a legacy and way to connect consumers to producers. This group believed in educating those not involved with agriculture about agricultural topics and did not see education to increase production or change practices. We describe members sorting to Factor 3 as *Data-Focused*. This group was comprised of freshman and sophomore students from science-heavy majors (e.g., entomology, food science). This group

sorted statements favorably related to producer improvements as the purpose for learning about agriculture and were largely indifferent about educating consumers on agricultural topics.

Participants had a general level of agreement on all statements, with a mean of $M = 31.3$ (SD 1.2) of the 40 statements sorted in the agree pile in the first sort, indicating positive regard for studying agriculture. We identified two statements all participants were in consensus on. All respondents agreed with the statement "learning about agriculture can open opportunities for your future" $M = 4.3$ on a ±6 scale) and the statement "learning about agriculture helps youth see the relevance of the industry" $M = 4.2$ on a ±6 scale).

Conclusions/Recommendations/Implications

Participants in this study agreed with many of the reasons extracted from the concourse about why people should study agriculture. This is promising as positivity about studying a topic may indicate likeliness of retention in the industry after graduation (Mat Taib, et al., 2019). The three identified factors align with findings from previous studies conducted within secondary and post-secondary populations which noted different personal motivations for studying agriculture (Dyer & Breja, 2003; Myers, et al., 2004; Rayfield, et al., 2013; Torres & Wildman, 2001).

We recommend tailoring educational opportunities to fit each of the personas identified. Reaching *Production-focused* students might include allowing them the opportunity to develop producer education and outreach and allowing this group to share practical solutions to solving problems in production agriculture. Retention and career longevity for *heritage-focused* students may include allowing them to share the stories of agriculture and note the places where tradition can come into modern practice. This group should also be tasked with outreach to those without an agricultural background, as they have a strong desire to share agriculture with consumers. *Data-focused* respondents were largely focused on the science behind agricultural improvements and may be helpful to conduct research and collect data related to changes in production practices. For post-secondary agricultural degree recruitment, we recommend highlighting the impact of agricultural degrees in a threefold approach. To interest *Production-focused* students we recommend highlighting how knowledge can impact yields, return on investment and productivity, for *heritage-focused* we recommend sharing how agricultural careers can preserve the best traditions of an agrarian society, and for *Data-focused* respondents we recommend talking about how agricultural careers can improve the science behind agricultural production.

During the interview process, none of the participants responded by naming a person (either through role or name) when asked to identify why they chose to study agriculture themselves. This is a slightly different take than studies which asked respondents to identify the most influential person on their choice to pursue an agricultural career (Dyer & Breja, 2003; Myers, et al., 2004; Rayfield, et al., 2013). We recommend further examination of this finding to determine how guiding beliefs and attitudes about personal choices to pursue agriculture are developed within the context of learning about agriculture, and what influence individuals have in the creation of those perceptions.

By examining the perceptions surrounding why people believe others should study agriculture, we may find new ways to disseminate information and recruit an agricultural

workforce (Rivera & Alex, 2008). While it is important to know why students pursuing an agricultural degree think people should study agriculture, we strongly recommend applying this Q set to additional populations including faculty members, secondary agricultural education teachers and students, consumers, producers, and agricultural employers to identify potential similarities and differences in perceptions between groups.

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Ag. Skills Survey: Skills Sought by Employers in the Agricultural Industry

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Introduction/Theoretical Framework

The American Association of Agricultural Educators (AAAE) has identified soft skills development as a research priority in the National Research Agenda by stating, "employers are demanding employees have soft skills, often referred to as 21st century skills, upon entering the workforce" (Roberts et al, 2016, p. 30). Additional researchers agree with AAAE's belief in the importance of soft skills. "If we don't succeed in adapting the education skills of young people to get a good job and good career, the very foundations of our democracy are at risk" (Almada et al, 2018, p. 6). Furthermore, "Soft Skills are ranked most important by employers and alum, while Discipline Knowledge is ranked most important by faculty and students" indicating there is a disconnect in soft skills development between education and industry (Crawford et al, 2011, p. 10). "Students in the Agricultural Sciences Department at Clemson University consistently ranked career skills as a top priority need..." (DiBenedetto & Willis 2020, p. 13). The demand for soft skills, such as work ethic, problem solving, teamwork, and communication have been reported by educators and employers across the country amongst many disciplines (NACE, 2020; The Chronicle of Higher Education, 2020).

The Ag. Skills Survey was created to identify skills most needed by employers in the agricultural industry for the development of a new Career Readiness Certificate Pathway to promote Soft Skills and Career Readiness Practices for agriculture students. Funded by a $1 million dollar United States Department of Agriculture (USDA) Hispanic Serving Institutions Education Grant, collaborators from the California State University, Fresno and Texas A&M, Kingsville are working together to create a transferrable pathway that recognizes students' experiential learning activities and awards them an industry-backed certificate as proof of their career readiness development. Examples of experiential learning include public speaking, leadership involvement, job shadowing, and supervised agriculture projects. Numerous studies have identified the need for additional development of soft skills and career readiness (AACU, 2020; Conley, 2013; Crawford & Dalton, 2012; Crawford & Dalton, 2016; Easterly et al, 2017; Saunders & Zuzel, 2010; SCANS, 2001; Soland et al, 2013; Stone & Lewis, 2012). Current research indicates that soft skill development is even more critical. "With the outbreak of the COVID-19, the world is undergoing tremendous change and it has been argued that coping and succeeding in the changing reality of the 21st century globally requires a wider set of skills than before, many of which are soft, social-emotional skills" (Schneider et al, 2020, p. 2).

There are two theoretical frameworks used for this study. First, DiBenedetto and Meyers' (2016) Conceptual Model for the Study of Student Readiness in the 21st Century. "Opportunities and experiences for students to engage in learning skills, academic and technical knowledge and

skills and employability skills are provided within a system that includes the home and the parent, the school and the teacher" (DiBenedetto & Meyers, 2016, p.32). Secondly, Kolb's Experiential Learning Model (Kolb, 1984) will be used to explain the importance of experiential learning in real-world environments through building partnerships between education and industry. "Experiential learning is prevalent in secondary agricultural education programs and the broad family of university agricultural education programs" (Roberts, 2006, p. 26). Rayfield, Murphy, Briers, and Lewis (2012), also support the value of experiential learning in their statement, "Agricultural education has always relied heavily on hands-on experiential learning as a method of instruction" (p. 48).

Purposes/Objectives/Research Questions

Program developers understood the need to identify current skills sought by employers in the agriculture industry and created an Ag. Industry Subcommittee, made up of stakeholders for the new Certificate Pathway, to develop and administer an Ag. Skills Survey. The purpose of this survey was to identify skills that agricultural employer's value at varying positions in their workplace to strengthen requirements for the Soft Skills and Career Readiness Certificate Pathway. In addition, the purpose of this survey was to determine skills that employers deemed most lacking in current applicants and determine if agricultural industry employers would value a 'Skills Certificate' when hiring employees. The research questions included the following:

1. What are the top five skills (soft or hard skills) that you want to see in employees applying for entry-level positions (High School Diploma), mid-level (2-Year Degree), and upper-level (4-Year Degree)?
2. What are the top three skills that you believe job applicants are generally lacking that can negatively impact their employability?
3. How would employers respond to a skills certificate included in a job application?

Methods/Procedures

After obtaining IRB approval, the Ag. Skills Survey was administered online utilizing the Qualtrics system. The survey included 19 questions to determine general information about the employer, type of business, and their willingness to provide career development opportunities for students. In addition, the survey included open-ended questions for participants to identify both technical and soft skills needed at all three educational levels, allowing for qualitative analysis of the responses. To facilitate a peer-to-peer communication chain, members of the Ag. Industry Subcommittee, including agriculture industry representatives, USDA agencies, commodity groups, Farm Bureau staff, and educational leaders utilized their personal contact lists to introduce the survey to agricultural employers and initiate its subsequent dispersal throughout the industry. The survey was made available for three months to ensure sufficient circulation amongst employers, from December 15, 2020 through March 15, 2021.

Researchers utilized the Dedoose ® Social Science Analysis platform to code (group) the data. After an initial review and discussion of the responses, the research team began to establish codes to capture the skills identified by employers. Forty-five parent and child codes were established, reviewed, then amended based on team member input. A practice coding session allowed members to become familiar with the codebook and to calibrate their coding to improve

reliability. To reduce coding bias, two individuals coded each survey response. After the first 25% of the data was coded, the coding team completed an inter-rater reliability test. The inter-rater reliability test yielded Pooled Cohen's Kappas (de Vries et al., 2008) for each reviewer between .70-.95, which suggested a good level of agreement on coding application. A second inter-rater reliability test taken after 50% completion and yielded Pooled Cohen's Kappas for each reviewer between .82-.88, which suggested an excellent level of agreement. The team analyzed the code count, application frequency, and standard deviation to determine the survey results.

Results/Findings

The Overall Top 10 Skills, the Top 10 Skills for each education level (high school, 2-year, and 4-year), and the Top 10 Skills Lacking were determined. In addition, employers' reactions to seeing a skills certificate listed in a job application were described. The sample size included 117 employers mostly located in California, which resulted in 2,106 individual responses to the open-ended questions. The employers reported the following number of employees: 0-25 (47.54%), over 100 (34.43%), 50-100 (11.48%), and 25-50 (6.56%). The agriculture industry sectors represented were Agriculture Business (24.26%), Other (20.79%), Plant and Soil Science (14.85%), Animal Science (12.87%), Agriscience (11.39%), Agriculture Mechanics (7.43%), Forestry 5.45%), and Ornamental Horticulture (2.97%). Table 1 includes the Overall Top 10 Skills and a breakdown by educational level for high school (HS), community college (2-Year), and university (4-Year) representing each level of the certificate pathway. The Overall Top 10 Skills were *work ethic* (253), *communication* (224), *dependability* (199), *task oriented* (188), *life-long learner* (176), *agriculture industry knowledge* (171), *time management* (166), *teamwork* (149), *written communication* (147), and *ambition* (146).

Table 1.
Code Application Frequency for the Top 10 Ag. Skills and Standard Deviation

Top 10 Ag Skills	H.S.	2-Year	4-Year	Overall	SD
Work Ethic	112	80	61	253	36.45
Communication	77	74	73	224	2.94
Dependability	82	67	50	199	22.64
Task Oriented	58	81	49	188	23.34
Life-long Learner	80	56	40	176	28.47
Ag Industry Knowledge	46	58	67	171	14.90
Time Management	82	50	34	166	34.56
Team Work	54	47	48	149	5.35
Written Communication	44	56	47	147	8.83
Ambition	49	53	45	146	4.97

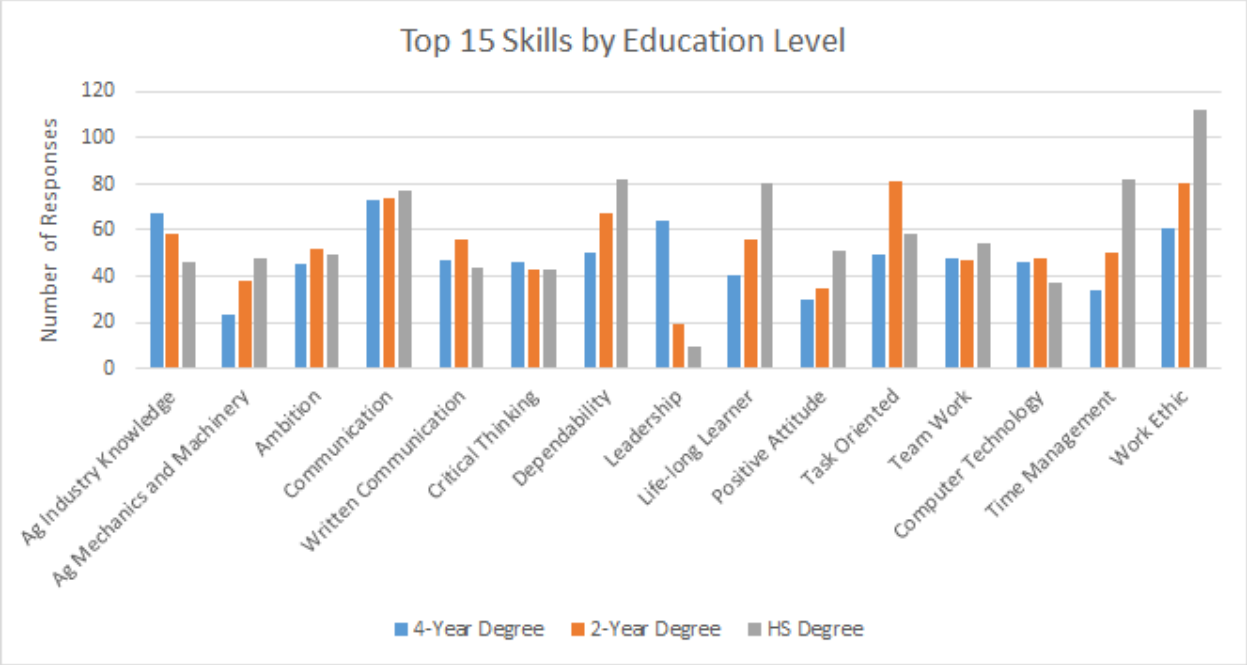
Table 1 provides the code frequency counts for HS, 2-Year, and 4-Year. The highest frequency counts for each of the top 10 skills are highlighted in yellow. The HS level has seven out of 10 of the highest frequency counts, 2-Year has two of the highest frequency counts, and 4-Year has one highest frequency count. The top three skills for HS were *work ethic, dependable,* and *time management*. For 2-Year, the top three skills were *task oriented, work ethic,* and

communication. Lastly, the top three skills for 4-Year were *communication, agriculture industry knowledge*, and *work ethic*. *Work ethic* was identified in the top three in all levels.

The code frequency fluctuation between the educational levels indicates that there were different skill sets identified more often at entry-level positions vs. upper level positions. The standard deviation for *work ethic* (36.45), *dependability* (22.64), *life-long learner* (28.47), *agriculture industry knowledge* (14.9), and *time management* (34.56) indicated greater differences between lower and upper education levels. Standard deviation for *communication* (2.94), *teamwork* (5.35), *written communication* (8.83) and *ambition* (4.97) indicated that the skills were more uniformly reported across all education levels.

Expanding the data analysis to include the top 15 skills across all educational levels, as shown in Figure 1, provides a better examination of the frequency differences between educational levels and reveals emerging trends of skill importance. Figure 1 depicts that upper level positions need employees with additional *agriculture industry knowledge* and *leadership* skills while applicants for lower level positions requiring a high school degree need *dependability, life-long learner, positive attitude, time management, and work ethic* skills. *Task oriented and written communication* were the skills that ranked the highest for the community college education level. In addition, several skills were more evenly required across all educational levels such as, *ambition, critical thinking, teamwork, and computer technology*.

Figure 1
Code Application Frequency for Overall Top 15 Ag Skills per Educational Level



Technical skills relating to the agriculture industry identified through the *agriculture industry knowledge* parent code included nine separate child codes. The child codes used to identify the following technical skill areas were: *accounting and finance, agriculture mechanics and machinery, animal science, irrigation systems, marketing, plant production, technology,*

computer technology and *data analysis*. The technical skill areas with the largest code application frequency included *computer technology skills* (131), *agriculture mechanics and machinery* (109), and *plant production* (77). Employers identified the Top 10 Skills Lacking in the agriculture industry to be *work ethic* (74), *ambition* (61), *communication* (54), *dependability* (48), *agriculture skills knowledge* (40), *time management* (40), *negative attitude* (37), *oral communication* (35), *critical thinking* (35), and *written communication* (30). There were seven skills that were identified in both the Overall Top 10 Skills Needed and Top 10 Skills Lacking categories: *work ethic, communication, dependability, agriculture industry knowledge, time management, written communication* and *ambition*. In response to how employers would react to a 'Skills Certificate', 46.8% of employers stated that they would recognize the skills certificate and give the applicant an advantage, 22.5% stated that they would move the applicant into the interview process, and 16.8% stated that they would allow the applicant to move past the initial screening process.

Conclusions/Discussion/Implications

The Ag Skills Survey has identified technical and soft skills needed for entry, mid, and upper level positions in the agriculture industry. Work ethic (253) was included in the top three skills for HS, 2-Year, and 4-Year, making it the most valuable overall skill needed in today's workforce. The standard deviation between some skills indicate that particular skills are more needed based on level of position. *Agriculture industry knowledge* and *leadership* aligned with upper level positions and *time management* and being a *life-long learner* aligned more with entry-level positions. Nine skills identified in the top ten are soft skills, with one representing technical skills. The results of this research study align with the results of prior career readiness studies indicating the need for soft skills development and the possibility of a skills gap existing between the skills employers are seeking and what educational programs are providing. The creators of the Conceptual Model for the Study of Student Readiness in the 21st Century (DiBenedetto & Willis 2020) have continued their work to close this skills gap and have recently completed another study that ranks career readiness skills as number one by students at Clemson University. To assist in mitigating this gap, skills identified in this study will be included in teacher training modules and curriculum resources developed for high school, 2-Year, and 4-Year Certificate Pathways, keeping in mind the skills most needed for each educational level and job position. Seven skills identified in the Overall Top 10 Skills matched those identified in the Top 10 Skills Lacking category making the message very clear from employers that they highly value *work ethic, communication, dependability, agriculture industry knowledge, time management, written communication* and *ambition*.

It is recommended that agricultural educators include soft skills and career development activities across all three levels (HS, 2-Year, 4-Year) of education, such as leadership development, job shadowing, and supervised agricultural projects. Relationships with local agriculture industry representatives need to be cultivated to provide experiential learning activities for students in real-world environments and to heighten their awareness of Career Readiness Skills Certificates. Lastly, continued research and development are recommended to establish K-16 career readiness curriculum and assessments to further implement the Career Readiness Practices Standards identified in the Agriculture and Natural Resources Career Technical Education Framework for secondary and postsecondary agricultural education programs.

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Using virtual reality to determine professional development needs of beginning welders

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Introduction

Welding is a highly valued skill that requires advanced psychomotor dexterity, cognitive capacity, and kinesthetic proficiency traditionally developed through standardized welding training (Bland-Williams, 2017). Along with the costly and often time-consuming requirements to develop these skills from traditional welding training, there remains a looming "welder deficit" across the US (Croy, 2016). By year 2025 there will exist a predicted shortage of about 400,000 welders in the US (Croy, 2016). This welder deficit will ultimately result in the need to recruit, train, and develop skilled welders at a more urgent rate. Incorporating virtual reality (VR) simulation technology in educational environments, including various agricultural studies (Shoulders & Myers, 2013; Wells, 2019), has shown to be effective, specifically because it allows training of any kind to remain safe and efficient while providing meaningful learning (Whitney & Stephens, 2014). VR systems revolve around three key components: (1) user immersion, (2) ability to navigate, and (3) ability to manipulate (Potkonjak et al., 2016). VR's exceptional interactivity has led to heavy use across diverse educational settings including architecture, aviation, medicinal surgery, and military combat training (Bailenson et al., 2008; Whitney & Stephens, 2014).

Benefits of integrating VR into training programs, welding for example, include flexible training conditions, customizable system configurations, and modifiable parameters within virtual environments (Potkonjak et al., 2016). As well as offering flexibility, VR training offers a safe learning environment by removing the threat of burning metal, fumes, and sparks. Additionally, as noted by Wells and Miller (2020), technology usage is fundamental regarding teaching and learning processes within agricultural education settings (Phipps et al., 2008). Employing VR training simulations to develop professional welding skills, specifically in university-level agricultural education environments, has produced valuable results (Wells & Miller, 2020). The Lincoln Electric VRTEX 360 aims to improve welding training by providing a realistic virtual welding environment. The VRTEX 360 supplies visual and audial feedback in real-time to allow welders to adapt their welding methods (VRTEX® 360® Single User Virtual Reality Welding Training Simulator on Pallet, 2021). Instructors can employ parameter cues while users perform welds that identify correct work angle, travel angle, travel speed, position, and contact-tip-to-workpiece distance (Stone et al., 2013). Effects of supplying cues for beginning welders during training is something that has been studied minimally but offers a promising training method (Wells & Miller, 2020). Moreover, Kneebone (2005) explains that although there are methods to successfully integrate VR training into numerous fields, such as weld process training, it has yet to be identified which is the most successful.

Studies using VR in tandem with weld process training provide evidence of genuine, pragmatic experiences that aid in the development of psychomotor skills required of welders.

Stone et al. (2011) found the mean quality scores of (four) distinctive weld qualifications were higher for welders who received 50% virtual reality integrated weld process training and 50% traditional live weld process training (VR50 Group) as opposed to those who received 100% traditional live weld process training (TT Group). Furthermore, in all training outcomes Stone et al. (2011) found the VR50 Group outperformed the TT Group regarding AWS certification qualification, as well as amount of training time used. Results suggest that VR simulation applications in the welding training sector are valuable in that they provide positive skill transfer, decreased total training time, and yield a more cost-efficient alternative to traditional welding training (Stone et al. 2011). Byrd et al. (2018) analyzed welding sequence training using either VR or live weld training to measure welders' dexterity levels. Over a one-week training period, welders who received 100% VR training saw a significant increase in dexterity for all three dexterity tests (Byrd et al., 2018). All dexterity tests were statistically significant compared to the pass/fail rates for 1G and 2F welds. Due to the training duration limitation, Byrd et al. (2018) recommended altered replication occur under lengthened training periods.

Theoretical Framework

The overarching framework of this study is guided by the skill acquisition theory. Skill acquisition theory explains how the development of skills occurs in three stages: declarative, procedural, and automatic (DeKeyser, 2020). Through the declarative stage, learners being understanding the skills and procedures required of their task, also called declarative knowledge (Wells & Miller, 2020). Next, the learner transforms their declarative knowledge into procedural knowledge by applying their basic understanding of a concept into action. This takes place by means of practice, targeting increased accuracy and time efficiency, and thus underpins the procedural stage. With adequate practice, the learner will be guided into the automaticity stage. A learner is identified as having reached automaticity when they are able to alter their focus as they complete a task (DeKeyser, 2020). These stages are present throughout all five levels of skill development which include novice, advanced beginner, competence, proficiency, and expertise levels (DeKeyser, 2020). The goal of any effective training is to facilitate learners progressing from one level of skill to the next in an efficient and meaningful manner.

Moreover, this study aligns with Ausubel's (1962) assimilation theory in that the main interest is to provide beginner welders with meaningful learning via weld process training. The assimilation theory explains that repetitious learning, for example traditional welding training, is less effective than meaningful learning in helping students develop their metacognition and self-regulated learning (Ausubel, 1962; Schunk, 2008). Simply, repetitious learning alone is not enough to establish cognitive learning and thus retention of skills (Ausubel, 1962). Meaningful learning can be employed by providing three main variables: 1) an appropriate level of inclusiveness of relevant concepts to the task; 2) clear stability and cohesivity of concepts; and 3) distinguishability from the learning task (Ausubel, 1962). In this study, virtual reality will provide meaningful learning by providing visual and audial cues, allowing for development of weld performance skills, and sufficient practice time over a four-week span.

Purpose and Objectives

This study aligns with the American Association for Agricultural Education National Research Agenda Research Priority Area 3: Sufficient Scientific and Professional Workforce That Addresses the Challenges of the 21st Century (Stripling & Rickets, 2016). Providing efficient yet meaningful, experiential learning to beginner welders will equip them with entry-level welding skills required to enter the welding industry. The purpose of the study is to identify the professional development needs of beginning welders by employing various weld cues using the VRTEX 360 welding simulator. The VRTEX 360 measures welding skill performance by tracking five integral weld variables: (1) travel speed, (2) travel angle, (3) work angle, (4) contact-to-workpiece distance (CTWD), and (5) position (VRTEX® 360® Single User Virtual Reality Welding Training Simulator on Pallet, 2021). These scores are used to calculate an overall score for the weld. As the VRTEX 360 provides visual/audial cues to beginner welders, weld scores given by the VRTEX will be analyzed to determine the most effective form of personalized feedback. The main objectives of this study are to:

1. Identify participant travel speed scores with and without travel speed cue assistance
2. Identify participant position scores with and without position cue assistance
3. Identify participant travel angle scores with and without travel/work angle cue assistance
4. Identify participant work angle scores with and without travel/work angle cue assistance
5. Identify participant CTWD scores with and without CTWD cue assistance

Methods and Procedures

This four-week study, conducted during the Spring semester of 2021, consisted of (n=44) undergraduate students at Texas State University. Upon Institutional Review Board approval, students enrolled in all sections of the Introduction to Agricultural Engineering course (n=47) were selected to participate in this experiment. Three students' involvement in the study were discontinued as they failed to complete all training sessions. As this is a part of a larger study, we used a quasi-experimental design in which students were randomly assigned, using Excel randomization formulas, to one of three experimental sequence groups. Each sequence group involved live, augmented reality (AR), and VR weld process training, tackling one training method per week. The order of training for the three sequence groups is as follows: Sequence Group 1 –VR training, AR training, live weld training; Sequence Group 2 –AR training, live weld training, VR training; Sequence Group 3 –live weld training, VR training, AR training. Following the Week Three training rotation, during Week Four all students participated in further live weld process training in which they spent their lab period performing single-pass, 2F filet welds on ¼" mild steel. Upon completion of the training period, students submitted their best weld to the live weld instructor and AWS Certified Welding Inspector (CWI) for evaluation.

VR weld process training involved an introduction to the VRTEX 360 set to original factory settings, a demonstration by the researcher, and explanation of scoring procedures. Students were given score sheets to track their parameter and overall weld scores and all necessary welding PPE (weld jacket, gauntlet gloves, etc.) then asked to complete three rounds of four 2F filet practice welds (with cue assistance) and one test weld (no cue assistance) on (virtual) ¼" mild steel coupons using the Gas Metal Arc Welding (GMAW) process.

VRTEX 360 cues manifest in the virtual welding environment as either gauges or icons located at the tip of the user's MIG gun. The travel speed cue measures the speed at which a user moves their gun across their workpiece, appearing as a gauge. The travel/work angle cue measures the angle at which the user holds their weld gun. Presenting as a target, the cue moves as users adjust their horizontal (travel) and vertical (work) angles. The position cue presents as an extended aim line from the user's weld gun, indicating arc aim. Lastly, the CTWD cue appears as a colored arrow that hovers over the weld gun, indicating arc distance. All parameters are scored on a 100-point scale, then averaged to compute the overall weld score.

Each student within Sequence Group 1 completed one full round of GMAW process training on the VRTEX 360 with a researcher present. One round includes five runs: Practice Run 1 is performed using the Travel Speed cue, Practice Run 2 using the Position cue, Practice Run 3 using the Travel/Work Angle cue, and Practice Run 4 using the CTWD cue. The final Test Run is performed with no cue assistance. Following each weld pass, the students select "End Pass" displayed on the VRTEX 360 score screen which prompts the system to grade the weld. Students recorded all five parameter scores and overall weld scores for each pass, totaling 30 values per round. Three rounds were selected as the set number of rounds for all participants as to maintain identical amounts of VR weld process training across all sequence groups. The same procedures were followed for sequence groups in Week Two and Three. All participants completed paper-based demographics survey adapted from Wells and Miller (2020) to provide descriptive statistics regarding demographic and prior welding experience information. These results are not presented in this manuscript. Series of paired-samples t-tests were used to analyze mean parameter and overall weld scores for each round completed by study participants.

Results and Implications

This study collected data from 44 participants, with a majority identifying as female (f = 23; 52.3%) with an average age of 21.84 years (SD = 5.17). Most participants (81.8%) reported being right-hand dominant while completing most tasks, however, a larger portion (88.6%) reported being right-hand dominant while welding. Most participants within the study had never welded before (f = 29; 65.9%). None of the participants had ever used virtual welding simulators or had previously obtained a welding certification. Table 1 reports descriptive statistics using paired-samples t-tests regarding all parameter scores (N=132) for all participants using the VRTEX 360. The mean travel speed score for participants' welds while employing the travel speed cue was 85.42, while the mean travel speed score for participants' test welds (without cue assistance) was 87.98. The mean position score while employing the position cue was 87.52, while the mean position score for test welds was 83.42. The mean travel angle score for welds while employing the travel/work angle cue was 92.88, and the mean travel angle score for test welds was 88.89. The mean work angle score while employing the travel/work angle cue was 93.45, and the mean work angle score for test welds was 87.83. Mean CTWD score while employing the CTWD cue was 84.80, while the mean CTWD score for test welds was 64.99. All differences between parameter scores with and without cue assistance were statistically significant (p<0.05).

Table 1

Participant VRTEX Welding Scores With and Without Parameter Cue Assistance (n = 44)

Parameter	Cue Assistance	*N*	Mean Score	*SD*	*t*	*p*
Travel Speed	On	132	85.42	13.53	-2.43	0.02
	Off	132	87.98	9.55		
Position	On	132	87.52	7.92	3.808	<0.001
	Off	132	83.42	11.76		
Travel Angle	On	132	92.88	7.84	4.54	<0.001
	Off	132	88.89	9.98		
Work Angle	On	132	93.45	11.36	4.70	<0.001
	Off	132	87.83	10.35		
CTWD	On	132	84.80	9.10	8.87	<0.001
	Off	132	64.99	27.12		

Results show that by employing weld parameter cues within the VRTEX 360 participants receive meaningful learning through personalized feedback and display professional weld skill acquisition. Results of this training method show statistically significant ($p<0.05$) impacts on participants' pass rates for a single pass 2F weld using the GMAW process. Excluding travel speed, all parameter scores for participants across the board were four points higher when cues providing personalized feedback were activated when compared to scores of welds performed without cues. Results identified the welding skill beginning welders struggled with most was CTWD. It is possible that employing the CTWD cue first, allowing users to improve their CTWD score, then employing the next cue could provide the most meaningful training.

It is recommended that further replication include VR training for more complex weld configurations including horizontal, vertical, and overhead positions, as well as different weld processes. It is also recommended that this study be replicated using a larger sample size. Additional subjects will provide a better understanding of parameter cues' effects on beginner welders (Lenth, 2012). Future research should explore the effects of VR training over longer durations to determine the impact of VR training in scenarios which better reflect professional training programs, as well as tackling research to understand effectiveness of alternative cue employment sequencing within VR weld training.

Welding instructors seeking to incorporate VR into their weld process training programs should provide learners with adequate practice time utilizing one cue at a time. Once learners are capable of consistently scoring 90 or higher for each parameter and weld scores, indicating they have reached automaticity regarding that cue, they should then move on to practicing with the next cue. Training with these structured, meaningful learning experiences will prepare beginning welders with the skill development required of potential future welders.

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Student Teaching through the Pandemic: A Comparison of Experiences for the Spring 2020 Cohort to Previous Cohorts

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Introduction and Theoretical Framework

The COVID-19 pandemic brought a breathtaking amount of change to the nation's schools in a matter of weeks (Malkus et al., 2020). During the first wave of the pandemic in the spring of 2020, general population-based control measures were introduced, closing many schools to in-person instruction (Rozhnova et al., 2021). On March 16, 2020, Joy Hofmeister, State Superintendent for Public Education in Oklahoma, called an emergency meeting of the State Board of Education to authorize the closure of all Oklahoma schools from March 17 until April 6 (Oklahoma State Board of Education, 2020a). That closure was later modified to distance learning for the remainder of the academic school year (Oklahoma State Board of Education, 2020b). Educators had to transition from in-person to online course delivery while navigating their own uncertain circumstances (David et al., 2020).

The impact of these changes extended to agricultural education students from Oklahoma State University (OSU) during their 15-week student teaching field experience. Experiencing the opportunity to teach across the curriculum can be essential to student teachers' growth Robinson et al., 2010). Typically, the spring semester is a busy time of year for school-based agricultural education (SBAE) programs in Oklahoma (Robinson et al., 2010). The diverse SBAE curriculum provides multiple opportunities for student teachers to teach areas such as agricultural mechanics, animal and plant sciences, horticulture, and greenhouse production, (Moser & McKim, 2021). Fortunately, the student teaching experience can meet the needs of student teachers by exposing them to real life situations, including their allocation and use of work–related time (Torres & Ulmer, 2007). In addition to classroom instruction, SBAE student teachers are exposed to a variety of Supervised Agricultural Experience (SAE) facilitation and student leadership (FFA) advising tasks (Smalley et al., 2015). For competence to be acquired, student teachers need exposure to these roles during their student teaching experience (Robinson et al., 2010).

The theoretical base for this study is Kolb's (1984) Experiential Learning Theory (ELT). The theory centers on the idea that learning is a "process whereby knowledge is created through the transformation of experience (Kolb, 1984, p. 38). The concept has been applied to a multitude of contexts in agricultural education (Baker et al., 2012). For student teachers, experiential learning prepares them for what their future career will be like (Knobloch, 2003).

Purpose and Research Objectives

The purpose of this study was to determine how the COVID-19 pandemic impacted the experience of student teachers during the Spring 2020 semester. Specifically, this study was to determine the number of hours each student teacher cohort dedicated to the three components of an agricultural education program in comparison to a typical student teaching experience. The following objectives guided this study:

1. Describe the amount of time SBAE student teachers from OSU were engaged in selected activities during the Spring 2017, 2018, and 2019 semesters.
2. Describe the time SBAE student teachers from OSU were engaged in selected activities during the Spring 2020 semester.
3. Compare the experiences of the Spring 2017, 2018, and 2019 student teachers to those of the Spring 2020 SBAE student teachers from OSU based on time engaged in selected activities.

Methods and Procedures

This study was a comparison between typical experiences for student teachers of the agricultural education program at OSU during a spring semester and those of the Spring 2020 cohort. Data were collected from journal report forms submitted by student teachers on a weekly basis throughout their 15-week field experience. The Weekly Report form was updated to its current format prior to the 2016-2017 academic year. Consequently, *typical experiences* of spring student teachers were based on reports from the Spring 2017, Spring 2018, and Spring 2019 student teacher cohorts. These three cohorts had 48 student teachers who submitted a total of 720 reports. The Spring 2020 class had 28 students, yielding 216 reports. The forms included tables in which student teachers recorded class periods they observed, taught, or team taught. Student teachers were also required to record FFA activities and events in which they participated, specifying the number of students involved and hours spent. They also recorded, the number of hours they spent supervising SAE projects and specifying the SAE category (Entrepreneurship, Placement or Exploratory). Data from weekly reports were transferred to a Microsoft Excel spreadsheet designed by Robinson et al. et al. (2010). Categories associated with teaching were (a) Taught and (b) Observed. Categories for SAE were separated by SAE type (a) Entrepreneurship, (b) Placement, and (c) Exploratory. Categories for FFA activities included (a) Livestock Exhibition, (b) CDE/LDE Related, (c) Leadership Conference, (d) Service, (e) Award Application Preparation, and (f) Promotion/Public Relations. During our analysis of the reports, we categorized student teachers' account of their FFA activities. These data were then inputted to SPSS for analysis.

Objective 3 was to compare experiences of the Spring 2019 and Spring 2020 SBAE student teachers. All semesters failed the Shapiro-Wilk test of normal distribution, indicating a need for nonparametric tests. Therefore, the Mann Whitney *U* test was used to compare the student teaching cohorts (Field, 2009). A comparison of interest existed between in-person and state-mandated distance learning. The mandatory shutdown of in-person classes on March 16, 2020, by the Oklahoma State Board of Education occurred at the end of the eighth week of the student teaching field experience. For this comparison, weeks 1 – 8 were considered to compose the first half of the student teaching field experience when 2017-2020 Spring student teachers were engaged in in-person instruction and weeks 9-15 composed the second half when those student teaching in 2020 were not allowed to meet with students in an in-person format.

Findings

Objective 1 sought to describe the hours student teachers engaged in selected activities during a typical spring semester. These data are displayed in Table 1. On average, student teachers were engaged 36.50 hours (SD = 18.28) of student teaching activities each week. The

average week was split nearly evenly between Instruction (46.41%) and FFA (46.66%) with the remaining 6.93% spent in SAE related activities. Six activities define the differences between Weeks 1-8 and Weeks 9-15. Student teachers spent an average 3.37 fewer hours observing their cooperating teacher during the second half of their internship. Average weekly SAE hours fell by 80% during Weeks 9-15, with nearly all that time coming from supervising entrepreneurship SAEs. Although total time engaged in advising FFA activities remained constant over the internship experience, the focus of that time changed from a majority of livestock exhibition (73.98%) to CDE/LDE coaching and leadership conferences.

Table 1

Average Hours/Week Spent by Spring 2017, 2018, and 2019 Student Teaching Cohorts in Each SBAE Program Component

	Weeks 1-8		Weeks 9-15		Weeks 1-15	
Activities	*M*	*SD*	*M*	*SD*	*M*	*SD*
Instruction	17.29	9.01	16.60	9.31	16.94	9.16
Taught	11.27	7.95	13.95	8.61	12.47	8.36
Observed	6.02	6.88	2.65	4.59	4.49	6.17
SAE	3.96	8.25	0.83	5.34	2.53	7.24
Entrepreneurship	3.71	8.04	0.81	5.34	2.39	7.08
Placement	0.22	2.22	0.02	0.19	0.13	1.64
Exploratory	0.03	0.63	0.00	0.00	0.02	0.47
FFA	17.68	19.01	16.36	15.63	17.03	17.55
Livestock Exhibition	13.08	19.76	3.31	11.77	8.63	17.29
CDE/LDE	1.99	4.91	8.62	11.63	5.00	9.23
Leadership	0.26	1.77	3.10	9.44	1.55	6.64
Service Related	0.26	1.12	0.19	1.44	0.22	1.27
Award Applications	0.77	2.49	0.10	0.81	0.46	1.94
Public Relations	1.33	3.32	1.04	3.65	1.20	3.47
Total	38.93	19.57	33.80	16.06	36.50	18.28

Objective 2 sought to describe hours student teachers engaged in selected activities during the Spring 2020 semester. As shown in Table 2, this cohort spent an average of 19.26 hours (*SD* = 22.14) per week engaged in these activities. FFA activities composed the greatest portion (41.07%) of this time with 7.91 (*SD* = 13.24) average hours per week. Spring 2020 student teachers spent 37.18% of their time in instruction activities (*M* = 7.16, *SD* = 8.32) and 19.47% of their time in SAE activities (*M* = 3.75, *SD* = 9.03). This cohort had a sharp decline of engaged hours during Weeks 9-15. They reported fewer activities when in-person school activities ended. The average total time engaged in student teaching activities decreased by 84.49% during the second half of the student teaching internship in 2020.

Table 2

Average Hours/Week Spent by Spring 2020 Student Teaching Cohort in Each SBAE Program Component

	Weeks 1-8		Weeks 9-15		Weeks 1-15	
Activities	*M*	*SD*	*M*	*SD*	*M*	*SD*
Instruction	12.15	7.40	2.50	6.01	7.16	8.32
Taught	8.82	6.62	2.38	5.67	5.79	6.97

Observed	3.33	4.80	0.12	0.72	1.82	3.87
SAE	6.94	11.47	0.16	1.16	3.75	9.03
Entrepreneurship	6.25	11.35	0.15	1.14	3.38	8.83
Placement	0.41	2.59	0.02	0.21	0.22	1.90
Exploratory	0.28	1.64	0.00	0.00	0.15	1.20
FFA	12.87	15.83	2.34	5.72	7.91	13.24
Livestock Exhibition	7.60	14.81	0.00	0.00	4.02	11.41
CDE/LDE	1.17	3.42	0.02	0.12	0.63	2.55
Leadership	0.05	0.60	0.00	0.00	0.03	0.44
Service Related	0.51	3.46	0.00	0.00	0.27	2.52
Award Applications	0.40	1.83	0.01	0.07	0.22	1.35
Public Relations	3.13	4.37	2.32	5.70	2.75	5.05
Total	31.97	22.38	5.01	9.72	19.26	22.14

Objective 3 was to compare the time Spring 2017, 2018, and 2019 SBAE student teachers spent in selected activities during field experience to that of the Spring 2020 cohort. Statistically significant differences were found in most of the Mann-Whitney *U* tests (see Table 3). In comparing the entire 15-week experience, all but total time in SAE, entrepreneurship SAE, and placement SAE returned statistically significant differences between Spring 2017-2019 student teaching cohorts and those student teaching in Spring 2020. Hours spent in instruction, teaching, total FFA, CDE/LDE, and total hours returned medium effect sizes (r = 0.30 to 0.49) for Weeks 1-15 comparison. All other effect sizes were small (r = 0.10 to 0.29) or negligible (r < 0.01). Further analysis of differences between the spring student teaching cohort impacted by COVID 19 and those who were not revealed statistically significant differences in both Weeks 1-8 and 9-15. In the first half of the internship, all activities except CDE/LDE yielded statistically significant differences. Total time in instruction returned the largest effect size (r = 0.30) for Weeks 1-8. Weeks 9-15 continued to display statistically significant differences between the two groups. Only placement and exploratory SAEs were found to be not statistically significant. On a side note, neither group entered any hours engaged in exploratory SAEs during Weeks 9-15. Effect sizes were higher in Weeks 9-15 than in Weeks 1-8 or Weeks 1-15. Six activities reported large effect sizes (r > 0.50), one held a medium effect size (r = 0.30 to 0.49), and four were found to be small effect sizes (r = 0.10 to 0.29).

Table 3

Comparison of Time Spent Engaged in Each SBAE Program Component Between Complete and Incomplete Student Teaching Internships

	Weeks 1-8		Weeks 9-15		Weeks 1-15	
	Mann-Whitney *U*	*r*	Mann-Whitney *U*	*r*	Mann-Whitney *U*	*r*
Instruction	25557.50*	0.30	6474.00*	0.68+	62978.50*	0.46
Taught	32795.00*	0.14	7226.50*	0.65+	72594.00*	0.40
Observed	30826.00*	0.19	17945.50*	0.42	98562.00*	0.26
SAE	32420.00*	0.16	26844.40*	0.16	131962.00	0.04
Entrepreneurship	34567.00*	0.11	26785.00*	0.16	135559.50	0.01
Placement	37832.50*	0.10	29161.00	0.05	134972.00	0.05
Exploratory	38273.00*	0.13	29498.00	0.00	135955.00*	0.09
FFA	33241.50*	0.14	9970.50*	0.58+	82311.50*	0.34

Livestock Exhibition	32396.00*	0.17	25872.00*	0.55+	115749.00*	0.17
CDE/LDE	37284.50	0.07	13040.50*	0.25	95880.50*	0.32
Leadership	38204.50*	0.10	25186.00*	0.10	125638.00*	0.18
Service Related	37855.50*	0.09	28714.00*	0.08	132402.00*	0.09
Award Applications	37026.00*	0.09	28861.50	0.15	131137.50*	0.08
Public Relations	28693.50*	0.27	25867.50*	0.58+	110053.00*	0.21
Total	28860.00*	0.23	3466.60*	0.75+	64235.00*	0.45

Note. * Indicates statistically significant difference at $p < .05$. + Indicates a large effect size ($r > 0.50$)

Conclusions, Recommendations and Implications

Findings of this study lead us to conclude student teachers engage in a wide range of activities associated with SBAE. The amount of time spent engaged in those activities, however, varies greatly among individual student teachers. The standard deviation for each variable in the study was high for both cohorts of student teachers. This variation of experiences among individuals aligns with findings by Robinson et al. et al. (2010) and should not be surprising to experienced teacher educators. Student teaching field experiences are individualized; by virtue they take place in different locations under the daily supervision of the local SBAE teacher. Because local SBAE programs vary, experiences of student teachers will vary. During a typical spring semester, student teachers spend the greatest proportion of their time engaged in instruction and FFA-related activities. Further, more than half of the time student teachers engage in FFA-related activities is for livestock exhibitions. These conclusions are consistent with Robinson et al. (2010). Compared to their counterparts in recent student teaching cohorts, the spring 2020 cohort invested less time and had fewer experiences in all areas of SBAE. Significant differences between the two groups were found for variables associated with instruction, SAE and FFA. These differences occurred even during the first eight weeks of student teaching, prior to the mandated school shutdown. During the last seven weeks, experiences related to FFA activities, particularly those associated with CDE/LDE and Leadership, were virtually non-existent for the Spring 2020 cohort. These activities are normally an important focus during this phase of student teaching. It is clear, the Spring 2020 cohort did not have a typical student teaching experience, so it stands to reason they have fewer experiences to draw upon as they begin their career compared to previous student teaching cohorts.

Conclusions of this study led to several recommendations for practice and further research. Variation in experiences among student teachers in each cohort is to be expected due to their placement at different schools and being supervised by different mentors. However, teacher education faculty must continue to articulate expectations and standards to student teachers and their SBAE teacher supervisors to ensure some level of consistency. Because their experiences were atypical, extra efforts should be made to provide information and experiences to teachers who student taught in the Spring 2020 semester through in-service workshops and other forms of continuing education. Focus should be placed on FFA-related activities such a preparing FFA members for CDE/LDE and leadership functions. Research should be conducted to determine how their atypical experience impacted members of the Spring 2020 student teaching cohort during the induction phase of their career. Because the effects of COVID-19 continued to impact schools, teachers and students during the Fall 2020 and Spring 2021 semesters, research should be conducted to assess the experiences of pre-service teachers who student taught during those semesters.

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SBAE Preservice Teachers' Comfort in Teaching Diverse Students

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Introduction and Theoretical Framework

The United States (U.S.) must ensure the education system is a space that welcomes culturally inclusive environments among students and educators, especially those from marginalized populations (Wakefield et. al, 2006). Enhancing relationships across cultures is incredibly important as the U.S. becomes a more culturally interdependent nation (Vincent et al., 2014). With this cultural shift, researchers have revealed student populations are becoming less homogenous, yet educators may not share the same culture or experience of the students they teach (Brown-Jeffy & Cooper, 2011). Although the rate of diversity for teachers within the public school system is slowly shifting towards increased diversity, the educator workforce does not reflect the diversity of public-school students or the nation's population in general (Wakefield et. al, 2006; U.S. Department of Education, 2016). School-based agricultural education (SBAE) teachers are even more white and homogeneous than other teacher populations (Foster et al., 2020; Vincent & Torres, 2015).

The rapid pace of student diversity surpassing that of secondary school educators could potentially lead to cultural clashes in the classroom which may haphazardly result in learning gaps for students (Gibson, 2004). This fundamental concern led scholars to examine the cultural readiness and comfortability of preservice teachers as they prepare to enter classrooms with students who may have cultural backgrounds very different from their own (Gibson, 2004). Along similar lines, Clauss-Ehlers (2006) argued in order to support teachers' development of cultural sensitivity and celebrate diversity, they should be encouraged to not only understand the difference of others but to also acknowledge their personal experiences which influences how they interact with their students.

The theoretical frame that guided this study was the Social Identity Theory (SIT), as developed by Henri Tajfel (Tajfel, 1970). He wanted to better understand how people in society who were once friends, who worked together or lived in the same community could grow to see one another as dangerous enemies, without well-founded rationale for doing so (Van Lange et al., 2011). Tajfel (1970) suggested an individual's self-esteem and identity are influenced by groups. "The social identity perspective in social psychology is commonly viewed as an analysis of intergroup relations between large-scale social categories, which rests on a cognitive and self-conceptual definition of the social group and group membership" (Abrams & Hogg, 2010, pp. 246-247). The core principle of SIT is within the space of social interaction, people see themselves and those around them as being part of a group or groups instead of viewing others primarily as individuals. SIT served to interpret the actions of individuals through behaviors and adaption in relation to their social identities (Van Lange et al., 2011).

In researching these behaviors, people tended to arrange psychological construct groups in which they assigned exaggerated positive characteristics to their own group while inflating the negative characteristics of the perceived out-group (Islam, 2014), and developed the perspectives of in-groups and out-groups. While psychologically creating these groups, three significant

cognitive processes occur: social categorization, social identification, and social comparison (Tajfel et al., 1979). Through social categorization, people categorize others similar to how they do objects to better understand and identify them. By assigning people to categories, it permits individuals to also associate behaviors and expectations to the individuals compromising the groups (Tajfel et al., 1979). Next, through social identification, people begin to embrace the identity of the group to which they assign themselves and the process of social comparison allows the members of one group to compare their group to others (Tajfel et al., 1979). Gaining a deeper understanding of the preservice SBAE teachers' self-evaluation of their comfort level around diverse students would allow for insight towards the conceptual in and out groups they may potentially form in an educational setting.

Purpose and Research Objectives

The purpose of this study was to determine the comfort level displayed by Oklahoma State University (OSU) preservice SBAE teachers in working with diverse students which is incredibly valuable for teachers as they "will consistently interact with students from varying socioeconomic backgrounds, ethnicities, and cultures unlike their own, which will require individuals to have sensitivity to individual needs" (Warren & Alston, 2007, p. 68). This addresses The American Association for Agricultural Education's third research priority including "recruiting diverse populations into agriculture and natural resource careers" (Stripling & Ricketts, 2016, p. 31). The following research objectives guided the study.

1. Describe selected personal and professional characteristics of OSU SBAE preservice teachers
2. Describe the comfort levels of OSU SBAE preservice teachers in working with diverse students.
3. Describe differences in comfort levels between student identities.

Methodology

To meet the objectives of this study, a Bogardus Social Distance Scale (BSDS) was designed. This scale is widely used to measure potential prejudice by asking participants to rate their comfort level in working and living with diverse individuals in various proximities (Maurer & Keim, 2018). Vincent and Austin (2020) designed a BSDS instrument with hypothetical student profiles. This study borrowed that format and utilized eight hypothetical student profiles with unique combinations of Black or White ethnicities, middle or lower socioeconomic class, and gay or straight sexual orientation identities. Each student was described as a new transfer. A post-hoc reliability analysis was conducted resulting in a Cronbach's alpha of 0.92 or greater for each student profile, indicating a reliable instrument (Warmbrod, 2014). See Table 1 for a description and Cronbach's alpha for each profile. The instrument was checked for face and content validity by a team of three experts in agricultural education.

Table 1

Eight Student Profiles

Profile Number	Race	Socioeconomic Status	Sexual Orientation	Cronbach's α
1	White	Middle Class	Straight	0.98

2	White	Middle Class	Gay	0.93
3	Black	Middle Class	Straight	0.98
4	Black	Middle Class	Gay	0.94
5	White	Lower Class	Straight	0.95
6	White	Lower Class	Gay	0.93
7	Black	Lower Class	Straight	0.93
8	Black	Lower Class	Gay	0.92

Participants were asked to rate their comfort level on a 5-point Likert-type scale in having each hypothetical student profile in their school, agriculture class, member of the FFA chapter, active in a competitive event (showing, CDE, LDE, etc.), attending an overnight trip, and as a chapter officer. These proximities were chosen to represent levels of student engagement in a SBAE program. An additional six items collected demographic information. Participants reported student classification, ethnicity, sexual orientation, socioeconomic status, parents' socioeconomic status, and intention to teach SBAE.

After the instrument was developed and approved by the OSU Institutional Review Board, OSU SBAE preservice teachers (N = 101) were invited to participate in the anonymous survey during the Fall 2020 semester. This group served as a time-place sample representing OSU preservice teachers in recent years (Oliver & Hinkle, 1982). A near-peer recent graduate of the teacher preparation program emailed agricultural education majors from a population frame obtained from the department. SBAE preservice teachers were reminded three times over three weeks to complete the instrument (Dillman et al., 2014). Data collection occurred at the end of the Fall 2020 semester during university-wide distance learning. A total of 52 (51.49% response rate) useable responses were collected. Six incomplete responses were omitted from analysis. Following recommendations from Linder et al. (2001), early and late responses were compared to address non-response bias. Early responses (n = 37) were defined as those who completed the instrument during the first two weeks of data collection. Late responses (n = 15) were coded for surveys completed during the final week of data collection. Responses to comfort levels related to Student 1 in the school and Student 8 as an officer were compared. Both found no statistically significant difference between early and late responses with $t(46.87) = 0.90$, $p > .05$ for Student 1 and $t(26.70) = -0.37$, $p > .05$ for Student 8.

We the authors acknowledge three limitations to this study. First is the relatively low response rate of just over 50%. This was addressed above in the tests for non-response bias (Linder et al., 2001). Secondly, this instrument included items that may be considered sensitive. To ensure participants responded honestly, they were informed none of their responses could be tied to their identity. Participants used their own electronic devices to complete the survey from an anonymous link (Tourangeau & Yan, 2007). Lastly, this self-report data is subjected to social desirability bias. Again, participant anonymity was ensured throughout the data collection process. Findings of this study are reported as the perceptions of the participants during the Fall 2020 semester (Stone & Shiffman, 2002).

Findings

Research objective one sought to describe selected personal and professional characteristics of OSU SBAE preservice teachers. Six participants did not complete the demographic items of the instrument. No participants identified as freshmen, three (5.8%) were sophomores, 12 (23.1%) were juniors, 27 (51.9%) were seniors, and four (7.7%) identified as graduate students. Of these, all indicated an intention to possibly teach SBAE in the future. The majority of participants (84.6%) identified as White with the remaining as Hispanic, Latino, or Spanish origin and American Indian or Alaska Native. About three-quarters of participants (76.9%) identified as straight and 23.1% identified as a member of the lesbian, gay bisexual, transgender, queer (LGBTQ) community. Participants were asked to classify their socio-economic status as lower, middle, or upper class. Most (82.7%) felt they were middle class. A similar question asked participants to report their parents' socio-economic status and 87.0% felt their parents were members of the middle class.

Frequency counts were used to address the second research objective to describe the comfort levels of OSU SBAE preservice teachers in working with diverse students. The majority of participants felt *extremely comfortable* in all proximities. These SBAE preservice teachers reported feeling *extremely comfortable, somewhat comfortable, or neutral* for both white and Black student profiles given they also identified as straight. Similarly, straight middle class and lower class student profiles received uniform high rankings of comfort across proximities.

A small percentage of participants (2 to 6%) reported apprehensions in teaching, advising, and coaching students who identify as gay. Other than one rating on Student 7, the profiles labeled as gay (Students 2, 4, 6, and 8) were the only students these preservice teachers felt *somewhat uncomfortable* or *extremely uncomfortable* in having in class, as an FFA member, active in a competitive event, attending an overnight trip, or serving as a chapter officer.

A set of one-way within-subjects ANOVAs were completed to address research objective three by describing differences in comfort levels between student identities. The Huynh-Feldt Epsilon adjustment was used as the data violated the assumption of sphericity (Abdi, 2010). It was determined the comfort level of student profiles for the In School, F (2.46) = 1.73, $p > .05$, In Class, F (1.78) = 2.20, $p > .05$, FFA Member, F (1.855) = 1.675, $p > .05$, and Competitive Event, F (1.91) = 2.25, $p > .05$, proximities were not statistically significant. The final two proximities, Overnight Trip, F (1.61) = 13.02, $p < .05$, and Chapter Officer, F (1.51) = 3.89, $p < .05$ were statistically significantly different in comfort level for at least one student profile. Overnight Trip carried a small effect size (0.23) while all other dependent variables had trivial effect sizes (0.04 to 0.08) (Schäfer & Schwarz, 2019).

Post-hoc analyses were conducted on the Overnight Trip and Chapter Officer dependent variables. The Bonferroni adjustment for multiple comparisons was used to maintain power in post-hoc analysis (Chen et al., 2017). See Table 2 for multiple statistically significant post-hoc analysis in the Overnight Trip proximity. Statistically significant post-hoc analyses only occurred between straight and gay student profiles for the Overnight Trip proximity. No Chapter Officer post-hoc analyses were statistically significant between student profiles.

Table 2

Pairwise Comparisons of Mean Differences for Comfort Level in Diverse Students Attending an Overnight Trip Post-Hoc Analysis

Students	2	3	4	5	6	7	8
1	-0.57*	-0.02	-0.61*	-0.09	-0.61*	-0.18	-0.64*
2	-	0.55*	-0.05	0.48	-0.05	0.39	-0.07
3	-	-	-0.59*	-0.07	-0.59*	-0.16	-0.61*
4	-	-	-	0.52*	0.00	0.43	-0.02
5	-	-	-	-	-0.52*	-0.09	-0.55*
6	-	-	-	-	-	0.43*	-0.02
7	-	-	-	-	-	-	-0.46*

* Indicates statistical significance ($p < .006$)

Conclusions and Recommendations

While the SBAE preservice teacher population at OSU represents some diversity, non-minority students constitute a larger proportion of student enrollment compared to university-wide and nationwide statistics. Agricultural education majors are approximately 85% White compared to 66% of the undergraduate population (OSU, 2020). Both statistics are considerably larger than the estimated 52% of 2018 undergraduates reported as White by the National Center for Education Statistics (2020). Warren and Alston (2007) proposed as the United States continues its rapid progression into a more culturally pluralistic society the need to provide SBAE teachers with more multicultural education opportunities is imperative.

From findings associated with research objectives two and three, OSU SBAE preservice teachers feel comfortable with straight white, Black, middle class, and lower class students in all areas of the SBAE program. However, it is clear some of these preservice teachers are apprehensive regarding working with students who identify as gay, particularly with those students attending an overnight trip. Could these preservice teachers perceive these students as those in an out group as defined by SIT? Vincent and Austin (2020) also detected a greater comfort in relation to heterosexual students in senior SBAE students.

Even with these results, we caution the reader to not label OSU SBAE preservice teachers as prejudiced or homophobic. Qualitative data in the form of interviews, focus groups, or reflective writings would shed light on the reasons these preservice teachers are uncomfortable with gay students on overnight trips. Could SBAE preservice teachers, who likely have no experience in chaperoning students on overnight trips, simply be concerned with the logistics of hotel rooms and assigning roommates across sexual orientations? Still, this would not explain the hesitancy of a few participants in relation to Students 2, 4, 6, and 8 in class, as an FFA member, participating in a competitive event, or as a chapter officer. Additional direct instruction in multicultural education is needed in SBAE (Vincent et al., 2014). Perhaps inservice teachers in diverse SBAE programs could serve as models and guest speakers to provide vicarious experience learning opportunities for preservice teachers (Bandura, 1997). Additionally, the National Association of Agricultural Educators (2021) as well as the National FFA Association (2021) have developed materials and trainings on diversity and inclusion aimed

at various audiences within SBAE. These materials can prove useful for teacher educators as they work these topics into their courses. Murray et al. (2020) identified a pressing need for research within queer populations in agricultural education. What are the views of current inservice SBAE teachers in working with diverse students? How does the SIT perceptions of SBAE teachers and students influence the experiences of LGBTQ individuals within SBAE? These lines of inquiry need to be addressed with the SBAE literature.

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Investigating the Effect of Consumers' Knowledge on their Acceptance of Functional Foods: A Meta-Analytic Review

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Introduction

Consumers' modern rapid lifestyle, characterized by low physical activity and improper nutrition intake, has contributed to the spread of chronic diseases (Plasek et al., 2020). Fortunately, however, in recent years, consumers have become increasingly aware of such health issues and more willing to modify their diet to ensure adequate nutrition intake (Sandmann et al., 2015). In response to consumers' increased awareness that diets impact overall health, functional foods were developed to reduce the risk of many chronic diseases and promote well-being (Hasler, 2002; LaBarbera et al., 2016). "Food can be regarded as functional if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either improved stage of health and well-being and/or reduction of risk of disease" (Diplock et al., 1999, p. 6), which is the widely accepted definition for functional foods.

Since the emergence of functional foods, the industry has tried to expand their functional attribute to develop novel functional products (Granato et al., 2020). Consumer research has been identified as one of the most important research areas (Guiné et al., 2020; Lu., 2015; Plasek et al., 2020) to evaluate functional food acceptance, and many studies have investigated the factors that may influence consumer's acceptance of functional foods (Szakály et al., 2019; Verbeke, 2005). Previous studies concluded that consumers were willingness to accept functional foods if such foods are perceived as healthy (Annunziata & Vecchio, 2011; Peng et al., 2006; Urala & Lähteenmäki, 2004). Thus, consumers need to link their nutritional knowledge to the perceived health benefits to make informed choices regarding functional food acceptance (Wansink et al., 2005).

Previous studies indicated that consumers who have higher levels of nutritional knowledge can better understand the health benefits from consuming functional foods and, therefore, feel motivated to purchase such products by linking the health information presenting on products' labels with their nutritional knowledge (Brečić et al., 2014; Wansink et al., 2005; Verbeke, 2005). A number of studies explored the relationship between consumers' level of knowledge and their acceptance of functional foods. However, the correlation coefficients representing the strength of the relationship reported in these studies varied greatly. For example, some studies found consumers' knowledge positively influenced their acceptance of functional foods (Brečić et al., 2014; Verbeke, 2005), whereas others found no significant relationship (Barreiro- Hurlé et al., 2008). These inconsistent findings posed problems in determining the precise effect of consumers' knowledge on their acceptance.

Theoretical Framework

We used Wansink et al.'s (2005) hierarchical model of nutritional knowledge, which depicts the relationship between consumers' knowledge and their acceptance of functional foods (see Figure 1). It is important to note that, as consumers' level of knowledge increases, so does their likelihood to consume. Wansink et al. (2005) suggested two forms of knowledge that contribute to consumers' decision to consume functional products: 1) food-specific attribute knowledge; and 2) consumption consequences knowledge. In Wansink et al.'s (2005) model, the base level represents no knowledge. The second level represents consumers who have basic knowledge about food-specific attributes (e.g., *Why does this food provide this benefit?*). The third level represents consumers who have consumption consequences knowledge (e.g., *What's the benefit of consuming such foods?*), and the last level is food consumption. Therefore, consumers who have no knowledge about functional foods are unlikely to accept them, but consumers with knowledge about functional foods are more willing to accept them. Additionally, consumers are willing to accept functional foods if they connect their knowledge about food-specific attributes to the health benefits associated with consuming them.

Figure 1

Wansink et al.'s (2005) Hierarchy of Nutritional Knowledge

Purpose and Objectives

To the best of our knowledge, no studies provide systematic evidence regarding to the relationship between consumers' knowledge and their acceptance of functional food. In order to attempt to fill the knowledge gap, the purpose of this study was to investigate the relationship that exists between consumers' level of nutritional knowledge and their acceptance of functional foods. To achieve this purpose, two objectives guided this study: (1) describe the included studies' characteristics (e.g., research design, knowledge type, sample size, functional foods type, and participants' age), and (2) identify the strength and direction of the relationship that exists between consumers' level of nutritional knowledge and their acceptance of functional foods.

Method

This meta-analysis was the second study in our investigation of factors that influence consumers' acceptance of functional foods. First, we conducted a qualitative systematic review that involved searching databases, collecting and reviewing studies, coding included studies, and

synthesizing and analyzing findings. Based on our inclusion and exclusion criteria, we included 75 studies in the systematic review. Of the 75 studies, 13 of these investigated the relationship between consumers' knowledge and their acceptance of functional foods. Therefore, we used results from these 13 studies to conduct this meta-analysis described herein and to estimate more precisely the magnitude of the relationship between consumers' knowledge and their acceptance.

We conducted a correlation meta-analysis and extracted the correlation coefficient (r) from each study to use as the estimated effect size. All 13 studies provided sufficient quantitative data to be included in the meta-analysis. Of the 13 studies, four directly reported the correlation coefficient (r) (Barreiro- Hurlé et al., 2008; Corso et al., 2018; Sandmann et al., 2015; Xin & Seo, 2019). Another four studies reported beta coefficients as the correlation coefficients, which are appropriate for use in a meta-analysis. (Dean et al., 2012; La Barbera et al., 2016; Di Pasquale et al., 2011; Peterson & Brown, 2005; Szakály et al., 2019). In addition, we calculated the correlation coefficients for three studies (Lu., 2015; Verbeke, 2005; Verbeke et al., 2009) by using the equation recommend by Borenstein et al. (2009) that uses means and standard deviations (Lu., 2015) as well as t-test results (Verbeke, 2005; Verbeke et al., 2009). We acquired correlation coefficients from two studies by connecting with the authors (Bimbo et al., 2018; Brečić et al., 2014). Then, we used R Studio software to conduct the analysis and used a random-effects model (Field & Gillett, 2010). To interpret effect size homogeneity across studies, we relied on Cochran's Q statistic and the I^2 index (Higgins et al., 2003).

Results

The meta-analysis included 13 studies, which generated 18 effect sizes. Sample sizes used in these studies ranged from 62 to 2,385, and the total number of participants included in the meta-analysis was 7,190 (N = 7,190). Most of the studies were conducted in Europe (n = 11), one study was from North America (n =1), and one study (n=1) was conducted in Asia. Among the studies included, surveys were the most common research design used to investigate consumers' acceptance of functional foods. These surveys used questionnaires administered through interviews (n = 7), online surveys (n = 3), online experimental surveys (n =1), and survey-based economic evaluation techniques (e.g., experimental auctions (n =1); choice experiments (n = 1)). In addition, the studies investigated consumers' acceptance of different functional food types, including vitamin or minerals enriched foods (n = 5), concept of functional foods (n = 3), fatty acids or vitamin-D fortified foods (n = 2), nutritional compound enhanced foods (n = 1), probiotic foods (n =1), and general foods with health claims (n = 1).

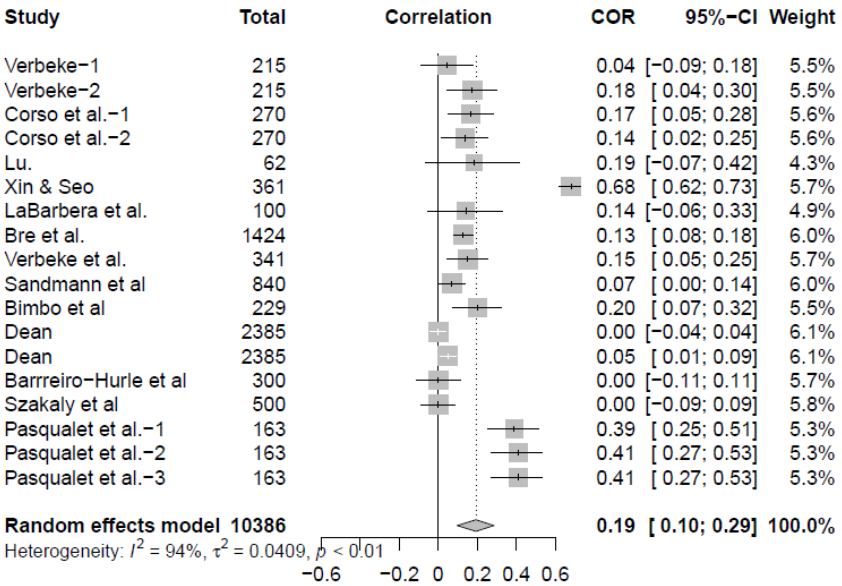
The knowledge measurements used in the 13 studies also differed. Seven studies (n = 7) measured consumers' knowledge about the concept of functional foods (e.g., *I know foods with specific health benefit impacts; I know enriched foods; How do you judge your knowledge about functional foods?*; Brečić et al., 2014; Corso et al., 2018; Di Pasquale et al., 2011; Szakály et al., 2019; Verbeke, 2005; Verbeke et al., 2009; Xin & Seo., 2019). Two studies (n = 2) measured consumers' knowledge about functional ingredients (e.g., vitamin D and lycopene; La Barbera et al., 2016; Sandmann et al., 2015). Another two studies (n = 2) measured knowledge about diet related issues (e.g., health benefits of avoiding fat and high salt intake; Barreiro-Hurlé et al., 2008; and diabetes-related issues Dean et al., 2012). One study (n = 1) measured consumers' nutrition knowledge (Lu, 2015) and one (n = 1) measured consumers' knowledge about functional foods brands (Bimbo et al., 2018). Therefore, the outcome variable in this meta-

analysis is consumer acceptance, which is defined and described using different concepts including general acceptance, willingness to pay or purchase, purchase intention, likelihood to purchase, consumption frequency, and the number of functional food purchases.

We conducted a forest plot to view effect sizes across studies to determine their precision (see Figure 2). Results indicate that the pooled correlation effect size *r* between consumers' level of knowledge and their acceptance of functional foods is 0.19 ($r = 0.19$, 95% $CI = [0.097, 0.2855]$, $z = 3.90$, $p < 0.0001$), which represents a small effect according to Funder and Ozer (2019) and Gignac and Szodorai (2016) who stated that 0.10 represents a small effect, 0.20 represents a medium effect, and 0.30 represents a large effect. Therefore, results from the meta-analysis indicate a small positive relationship exists between consumers' knowledge and their acceptance of functional foods.

Figure 2

Forest Plot of the Effect Sizes (Correlation Coefficients (r)) With Corresponding 95% Confidence Intervals



Results from Cochran's Q test of effect size homogeneity ($Q = 288.59$, $df = 17$, $p < 0.0001$) indicate heterogeneity across studies. In addition, results from the I^2 index indicate 94.1% [92.0%; 95.7%] of the variation across studies is due to heterogeneity, as opposed to chance or sampling error. Thus, because significant variation exists between effect sizes across studies, using a random effects model for analysis was most appropriate.

Conclusions/Implications/Recommendations

Meta-analyses are effective research methods to synthesize data and explore systematic evidence of a phenomenon (Quintana, 2015). To our best knowledge, this meta-analysis is the first of its kind to investigate the relationship between consumers' knowledge and their acceptance of functional foods. We identified a small, close to medium, positive relationship

between consumers' level of knowledge and their acceptance of such products. According to Wansink et al.'s (2005) *hierarchy of nutritional knowledge*, consumers lack of knowledge could hinder their acceptance of functional foods. The positive relationship we identified between the two variables emphasized the important role of consumers' knowledge in their acceptance of functional foods. Urala and Lähteenmäki (2004) found that consumers are more likely to accept functional foods if they can accept and understand the health benefits that result from consuming them. However, health benefits are communicated through the health information provided on the products' label, which requires consumers' knowledge to evaluate (Vella et al., 2014). Thus, consumers who are more knowledge about functional foods and the health benefits associated with their consumption are significantly more likely to accept functional foods (Brečić et al., 2014; Dean et al., 2012; La Barbera et al., 2016).

Results from previous studies indicate that increasing consumers' nutritional knowledge could successfully change their nutritional behavior and lead to their acceptance of functional foods. As a result, this change could improve the population's health status by leading to adequate nutrition intake (Ares et al., 2008). Therefore, we recommend that, to increase consumers' knowledge, a functional foods information campaign be created with the intent to educate consumers about the health benefits of consuming functional foods and the consequences of insufficient nutritional intake. This would likely be an effective approach because consumers are more willing to consume functional foods if they connect their knowledge to the health benefits that result from consuming them (Wansink et al., 2005). Furthermore, the primary knowledge outcomes measured in the studies we included were knowledge about the concept of functional foods (Brečić et al., 2014; Corso et al., 2018; Di Pasquale et al., 2011; Szakály et al., 2019; Verbeke, 2005; Verbeke et al., 2009; Xin & Seo, 2019), functional ingredients (e.g., vitamin D and lycopene; La Barbera et al., 2016; Sandmann et al., 2015), and diet issues (Dean et al., 2012). Thus, communication efforts should rely on the strengths of agricultural communicators and health communicators to increase consumers' knowledge about the concept of functional foods, their functional ingredients, the health benefits associated with consuming them, and the health risk associated with nutrition deficiencies (Siro et al., 2008; Vella et al., 2014).

The variation between effect sizes could be explained by the heterogeneity of the samples, the country of origin in which the studies were conducted, the research designs, the types of functional foods used, and the unstandardized measurements of variables. We recommend, when possible, future studies use nationally representative samples and standardized measurements to investigate the relationship between consumers' knowledge and their acceptance of functional foods. In addition, using experimental research designs, instead of survey methods, can provide empirical causal evidence to better explain the phenomenon. Furthermore, consumers' acceptance of functional foods depends on a variety of interrelated factors, including consumers' demographic characteristics (e.g., gender, age, educational level), affective domains (e.g., attitudes, perceptions), and situational domains (e.g., politics, economy). Therefore, future research should focus on investigating potential mediators and moderators that influence the relationship between consumers' knowledge and their acceptance to inform more precisely the development of effective communication strategies. In addition, the meta-analysis described herein focused only on consumers' knowledge as a determinant of consumers' acceptance. Therefore, we recommend additional meta-analyses be conducted that focus on other

variables (e.g., attitudes, perceptions, motivations) so that the precise effect of each can be identified. We also believe it would be valuable to include only studies in these meta-analyses that use specific populations. That way, we can begin to understand the differences in how these variables influence different consumer groups and develop audience-specific communications strategies. Last, these future research efforts should rely on existing theoretical models relating to health behavior change to transfer research into practice more effectively.

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"I Want a Sea Turtle Selfie!" Effects of a Social Marketing Campaign to Encourage Sustainable Wildlife Viewing of Non-Threatening Species

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Introduction and Literature Review

A challenge faced by wildlife managers in several tourist destinations is providing visitors with opportunities to observe rare and endangered wildlife while protecting the target species (Sorice et al., 2006). In recent decades, profiles of the stereotypical tourist interested in sun, sand, and relaxation, have changed to a sophisticated and demanding tourist who likes to learn about history, nature, and wildlife (Lück, 2016). Conservation efforts for charismatic megafauna like sea turtles have benefitted from a burgeoning global wildlife tourism industry. In Hawai'i, this intersection of tourism and threatened species management is particularly evident on the North Shore of Oahu where dozens of green sea turtles forage and swim near shore reef habitats and often rest (bask) on beaches (Lamb, 2020). This unique basking behavior makes turtles easily accessible to tourists seeking up-close encounters, photos, and videos. As the volume of tourists increases, natural resource managers have been challenged to find sustainable solutions that protect sea turtles from harassment while preserving tourism opportunities. The National Oceanic and Atmospheric Administration (NOAA) created a viewing guidance of 10 feet to prevent disturbance of the federally protected sea turtle. Although regulatory and educational signage and volunteers staffing beaches have been used for many years (Lamb, 2019), audience-centered approaches, such as those using the social marketing framework, have yet to be studied. Educational appeals about the importance of marine ecosystems and wildlife can work on audiences that are like-minded, motivated to comply, and willing to overcome factors such as social norms, lack of skills, and/or competing goals (e.g., desire for an iconic vacation) (Veríssimo et al., 2019). Approaches that instead consider characteristics of the psychology and motivators of intended audiences may be much more effective on a broader scale at encouraging people to comply with rules that help protect wildlife (Veríssimo et al., 2019).

One such approach that requires further testing for its potential to mitigate harmful human interactions with protected marine species is the social marketing framework. Social marketing is defined as the "adaptation of commercial marketing technologies to programs designed to influence the voluntary behavior of target audiences to improve their personal welfare and that of the society of which they are a part" (Andreasen, 1994, p. 110). It is both a type of marketing and a framework for approaching a problem that can be addressed in-part through communication efforts designed around behavior change theories. Andreasen (1994) describes social marketing as creating a superior exchange for the desired behavior that is

socially desirable and easily done. Lee and Kotler (2019) detail other important parts of the social marketing framework. It includes designing interventions to change or encourage *specific* behaviors, determining audience motivations and demographics, providing specific benefits to encourage the justification of effort, and implementing an intervention that uses "the 4 Ps" of marketing: product, price, place, and promotion. Lastly, evaluating the intervention's effect on behavior is key to understanding either the success of the campaign or areas to improve.

To encourage sea turtle viewing from no closer than 10 feet, previous research supports using approaches that make the desired behavior seem easy (Kollmuss & Agyeman, 2002), enjoyable (Manfredo et al., 1983), a unique experience (Cater & Cater, 2007), popular (Hunt et al., 2019), and in alignment with tourists' identities (Bryan et al., 2011) and aspirational goals for the experience (Abrams et al., 2019). Exchange theory suggests behavior change occurs when people believe they will get as much if not more than they have to give (or give up) to engage in the desired behavior (Kotler, 1972). Abrams et al. (2019) showed a social marketing-based campaign was effective for encouraging compliance with viewing distance guidance in national parks. However, the focal wildlife species in the campaign posed threat of physical injury to people so they were able to leverage risk messaging as well as enhance compliance. Relative to elk, deer, and feral horses, sea turtles are non-threatening to humans; thus, designing and testing a different messaging approach is necessary. Plus, the target audience differs in Hawai'i.

Most tourists to Hawaiʻi are from the U.S. (65%); tourists from Japan are the largest international market, followed by Canada (Hawaii Tourism Authority, 2019). To further understand the conditions that lead to tourists disturbing sea turtles, we also conducted semi-structured interviews as part of the formative research to supplement the secondary research (Lee & Kotler, 2019). We interviewed eight Hawaiian locals, including North Shore tour operators, volunteers who manage a public tourist destination for sea turtle viewing, and state regulatory agency representatives involved in sea turtle management and protection. A key insight from those interviews was that seeing a sea turtle is often a "bucket list" endeavor lasting only around 10 minutes for the tourist to get their photos or videos, which complements evidence from other studies (Cherry et al., 2018; Lamb, 2019). Finally, tourists' actions not only create an environmental problem, but they also exacerbate socio-cultural conflict over tourism in Hawaiʻi. Sea turtles are sacred and held in high regard by native Hawaiians; they are viewed as the embodiment of their ancestors (Ching, 2001). Tourists disturbing and posing close to sea turtles exemplifies the discursive tension between commodifying the species as a spectacle and views that the species is culturally and environmentally revered (Lamb, 2019). Though tourists may be interested in learning more about the species' cultural and environmental significance, that knowledge may not necessarily lead to viewing them from 10 feet (Rothschild, 1999). On the other hand, rigorously enforcing tourists and spaces where sea turtles frequent is not feasible nor warranted either. Another testable solution is social marketing because it "consists of voluntary exchange between two or more parties, in which each is trying to further its own perceived self-interest while recognizing the need to accommodate the perceived self-interest of the other to achieve its own ends" (Rothschild, 1999, p. 30). The purpose of this study was to test the effects of a social marketing campaign on people's compliance with NOAA's 10-foot viewing guidance for sea turtles. We hypothesized a social marketing-based campaign would be more effective than a combined informative and law enforcement sign on people's compliance.

Methods

For the stimuli, we developed a social marketing campaign applying the secondary and primary research about the audiences and behaviors. Specifically, through the messaging, we aligned the desired behavior with audience motivations for a unique and awe-inspiring experience and enhanced this by offering suggested replacement behaviors of taking forced perspective photos (Figure 1). To understand how it compares to education and enforcement, the study design incorporated an existing sign combining those two message approaches and is used throughout Hawai‘i near beaches frequented by turtles and people (Figure 1).

We conducted a field study using a quasi-experimental (groups not randomly assigned), between-groups design with three conditions (Shadish et al., 2002). The three conditions included: 1) the existing conditions wherein two signs on metal poles at beach entry points served as the control group, 2) a condition with two existing signs placed on the beach in a similar fashion to the signs in condition 3, and 3) the social marketing campaign condition (referred to hereafter as “Amazing from Afar”) with two signs placed on the beach and similar English and Japanese rack cards and stickers distributed to tour operators that frequented the site (Figure 1). Also, in the “Amazing from Afar” condition, a multi-language website and an Instagram page were launched. The website address was on the print materials and accessible through a QR code on the signs. The two signs on the poles at beach entry points remained in place for the other two treatment conditions; from qualitative observations, we noted these signs were not noticed by tourists. We began by alternating days between conditions 1 and 2 since condition 2 did not involve digital materials or distributing materials to tour guides. After a high enough sample size was achieved in those conditions, we launched condition 3.

Figure 1
Existing Sign and “Amazing from Afar” Double-Sided Sign

We included counts of all people within 50 yards of the basking sea turtle(s), resulting in a sample size of 1,437. To measure the effects of the three conditions on people’s interactions with basking sea turtles, 1–2 researchers inconspicuously observed and counted the number of

people who kept at least 10 feet away from the turtle(s), got within 10 feet, touched or otherwise disturbed the turtle(s), and those who were within 50 yards but uninterested. (People were counted as "uninterested" if they never paused to observe or point out the sea turtle(s). For example, many presumably locals would come through the area for another purpose such as running/walking, watching the sunset, or walking dogs.)

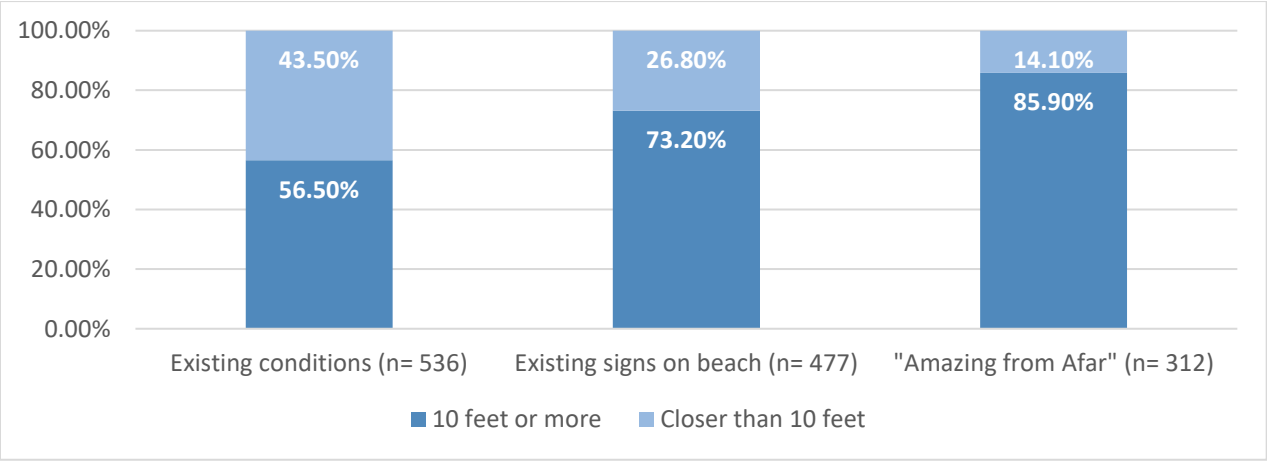
Using sticks, leaves, or rocks, we marked four points around a 10-foot radius surrounding the turtle(s) in an inconspicuous patter so as to not create any symbolic boundary at the first gap in people. This allowed accurate observations from about 30–40 feet from the action to not influence people with our own proximity to the turtles. We recorded counts using a smartphone counter app and wrote additional notes on an e-reader sized tablet. This method of disguised naturalistic observation allowed us to observe the spontaneous behavior of visitors in the most natural way possible, increasing the study's ecological validity (Carey et al., 2020). Another benefit to natural observation is it provides an opportunity to study the total context of human-wildlife interactions. It offers additional avenues of inquiry that would be missed if studied through controlled observations such as a laboratory experiment (Carey et al., 2020). The research was conducted daily from March 3 to 22, 2020, at Ali'i Beach, in Hale'iwa, HI, but data collection depended on the presence of basking sea turtles on the beach and people's presence. The Covid-19 pandemic affected our abilities to launch the tour operator materials at the scale intended and cut short data collection for the time being. Sample size in the "Amazing from Afar" condition was lower than desired but sufficient for statistical power.

Findings

We excluded people categorized as uninterested in the basking turtles (n = 112). When the new campaign was in place, 12.7% more people complied with the 10-foot viewing distance for basking sea turtles compared to a treatment condition with the combined regulatory/education signs (existing signs) set up on the beach. Compared to the existing conditions (i.e., control group) wherein the existing signs were on tall metal poles at beach entry points, 29.3% more people complied when the new campaign was in place (Figure 2).

Figure 2

Percentages of Interested People In/Out of Compliance with 10-Foot Viewing Guidance (n = 1325)



A chi-square test for homogeneity was used to further analyze the differences between the proportions of people in/out of compliance with the 10-foot viewing distance. It showed there was a statistically significant difference among the three conditions, X^2 (2, 1325) = 85.03, $p <$ .001. Post hoc analysis involved pairwise comparisons using the *z*-test of two proportions with a Bonferroni correction. The proportion of people that kept at least 10 feet away from basking sea turtles was statistically significantly higher for those in the "Amazing from Afar" condition than either of the other two conditions, $p < .001$. Also, the proportion of people that kept at least 10 feet away from sea turtles was statistically significantly higher for those in the NOAA regulatory signs condition than the existing condition, $p < .001$. Cramer's *V* formula was used to calculate the effect size, and it showed a medium effect, $V = .25$. The hypothesis was supported.

Discussion and Recommendations

Despite limitations stemming from Covid-19 interruptions, we can conclude leveraging social marketing-based messages and tactics has greater potential for attaining compliance with wildlife viewing distance guidelines over combined educational and law enforcement-based message approach. Our study helps address a lack of literature measuring direct impacts of social marketing on people's actual behavior impacting wildlife (Veríssimo & Wan, 2019). The "Amazing from Afar" approach encouraged greater compliance with the 10-foot viewing guidance for basking sea turtles at Ali'i Beach. Simply placing either sign on the beach garners greater compliance likely because the signs at the entryways are not seen by most people entering the beach. The location of the signs on the beach could have magnified the effects on people's behavior in two ways: their presence closer to the sea turtles could signify additional importance of the request to stay at least 10 feet from sea turtles and/or enhance risk perceptions of possible social shaming or ticketing. After all, it would be much harder to feign ignorance with a noticeable sign 30 feet from the sea turtle(s).

Still, we saw even greater compliance with the social marketing-based sign. Theoretically, the "Amazing from Afar" messaging was most successful because of how the desired behavior was framed in messaging. Based in exchange theory (Kotler, 1972) and through a message strategy to make the desired behavior seem easy (Kollmuss & Agyeman, 2002), enjoyable (Manfredo et al., 1983), a unique experience (Cater & Cater, 2007), popular (Hunt et al., 2019), and in alignment with tourists' identities (Bryan et al., 2011) and aspirational goals for the experience (Abrams et al., 2019). The replacement behavior of posing to create forced perspective photos only obtainable at a minimum of 10 feet away with the basking sea turtle(s) helped to further emphasize the enjoyment and uniqueness of the experience. We believe the replacement behavior was particularly impactful because it offered a superior exchange for the undesired behavior that was also socially desirable and easily done (Andreasen, 1994). Forced perspective photos are playful and popular, and even when they become commonplace (e.g., Tower of Pisa), are repeated by other tourists seeking to create their own version (Thurlow & Jaworski, 2011).

The main effects on people's behavior in this study largely came from the "Amazing from Afar" signage rather than the materials provided to tour guides or the digital channels. Though we observed two tour guides using the materials once with groups smaller than five people, most either did not return to the site or did not use the rack card and sticker with their

customers. Understandably, the tour guides were far more concerned about their livelihood due to Covid-19. Visitation to the website and interaction with the Instagram posts were also low due to fieldwork being cut short, and therefore, likely inconsequential to the effects on behavior. To increase exposure and awareness via online channels, we recommend requesting partner organizations such as state agencies involved in wildlife management, marine tourism businesses, and local sea turtle non-profits to use the hashtag to initially populate it with posts. Typically, only about 5% of a social media account's followers will view a post via organic reach. Paid advertising posts would be a better way to reach tourists who would be shown these posts when their social media app records their location within a set geographic area (Hootsuite, 2020). Search engine advertising is another suggested promotion avenue for wider reach wherein the website would appear at the top of search results when certain keywords, like "sea turtles" and "north shore" or "Hale'iwa" are used. People's compliance could be even higher with greater reach and strategic use of the digital channels, but tour guide's use of the messaging strategy employed by this campaign would be the most impactful and enhance the sustainability of the behavior and norms at sites like Ali'i Beach over time (Curtin, 2010).

In conclusion, encouraging a replacement behavior and aligning the messaging regarding more sustainable actions with tourists' aspirations for the wildlife encounter can encourage more sustainable wildlife viewing, particularly for non-threatening species.

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Tractor and Machinery Instructor Training: Impact of Sequential Professional Development

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Introduction/Theoretical Framework

Vocational and technical education programs continue to play a pivotal role in the development of workers' occupational safety and health skills in all industries (Schulte et al., 2005). However, unlike other industries, agriculture continues to employ youth less than 16 years of age as a significant part of the labor force whether paid or unpaid in a variety of tasks deemed hazardous by the Department of Labor (DOL) (National Institute for Occupational Safety and Health [NIOSH], 2014; U.S. Department of Labor, n.d.). One such example is the operation of tractors and machinery. The Federal Fair Labor Standards Act provides an exemption allowing 14 and 15-year-old youth who have completed a tractor and machinery certification (TMC) program to work for a farm employer who is not a parent. The agencies specified by the labor regulations to provide the TMC training are the cooperative Extension Service and vocational agriculture programs within secondary schools. This TMC training program came under review with proposed revisions in 2011 (76 Fed. Reg. 171, 2011). In the 2011 proposed rule change, it was reported that research documenting the impact of tractor and machinery youth certification program was limited (NIOSH, 2002).

Jepsen (2012) reported the impact of the TMC program is linked to implementation efforts of community-based instructors and emphasized that program evaluation efforts are daunting due to a variety of community-based implementation factors. This has been documented for the secondary agricultural education programs as researchers have documented variation in safety programming and student training (Lawver et al., 2016; Mann & Jepsen, 2019; Pate et al., 2016). Murphy (1992) noted that since the inception of the TMC training, the DOL has provided limited surveillance to ensure program fidelity. Unlike the OSHA Trainer certification requirements (Occupational Safety and Health Administration [OSHA], n.d.), the TMC training program requires no experience or professional development requirements for instructors other than the requirement of being employed as an extension agent or a vocational agriculture instructor. It has been documented that instructor preparation can vary widely (Rasty et al., 2017) and many teacher preparation programs have reduced capacity to provide teachers agricultural mechanics training.

To address the issue of teacher training, the Agricultural Safety Education Initiative was funded as part of the High Plains Center for Agricultural Health and Safety (NIOSH Grant No. 5U54OH008085-17) to develop an innovative multi-year educational program to be utilized by local agricultural teachers to improve safety practices and work environments that employ young agricultural workers between the ages of 14-18. It is undocumented how a multiple year experiential-based teacher training program may influence instructor development related to tractor and machinery safety knowledge. It is imperative to determine the efficacy of an agricultural safety education professional development model designed to increase TMC instructors' capacity to serve youth in developing safety competencies.

Conceptual Framework

A large body of literature has emerged related to in-service teacher professional development, teacher learning, and teacher change (Desimone et al., 2002; Desimone & Stuckey, 2014; Richardson, 2001; Richardson & Placier, 2001). While describing teacher professional development can be complex (Desimone et al., 2002), the intent of teacher professional development is to enhance professional knowledge, skills, and attitudes of teachers so that they might, in turn, impact student learning (Guskey, 2002).

This systematic evaluation of the agricultural safety professional development program aimed to ascertain outcomes and justify resources associated with the program to key stakeholders. As key stakeholders within local communities, school-based agriculture teachers interact with students often and may serve a vital role in protecting student safety by providing safety training and helping their students develop logical thinking and sound decision making (Schwebel & Pickett, 2012). Students learn safe behaviors by modeling their teachers' behaviors, particularly during supervised work experiences. These experiences facilitate experiential learning to develop skills and abilities leading to an agricultural career (Barrick et al., 1992; Burke et al., 2006). Under Kennedy's (2016a) framework, teacher professional development should be guided by a theory of action comprised of a central problem of practice and a pedagogy to help teachers enact new ideas into the context of their practice.

Our workshop content addressed the teaching challenge of portraying content for improved student comprehension by providing table-top demonstrations, tractor operations walk-through examples, and student activities. The enactment component of our program theory of action was guided by a prescription approach for integrating agricultural safety curriculum within school-based supervised agricultural experiences (Kennedy, 2016b) using the National Safety Tractor Machinery Operations Program and a Supervised Agricultural Experience Risk Assessment Protocol. A prescriptive approach reduces the amount of judgement needed by teachers on implementation of the teaching strategy and focuses on program fidelity (Kennedy, 2016b). Kennedy noted that this approach can backfire if the professional development is limited in addressing challenges facing teachers. Kennedy (2016b) also warned that from a teacher's perspective, the educational system is filled with conflicting curriculum priorities created from a variety of educational requirement placed on them. Sustaining the implementation effort by teachers could prove daunting as teachers maintain district and state requirements for students.

Purpose/Objectives

The purpose of this study was to determine the effectiveness of a multi-year professional development program to sustained teachers' knowledge and implementation of agricultural tractor and machinery safety training. This research addresses the American Association for Agricultural Education National Research Agenda under research priority five "efficient and effective agricultural education programs"(Roberts et al., 2016). This research specifically examines how professional development impacts safety knowledge and skill growth of agricultural education professionals.

Research objectives guiding the study were:

1. Describe selected demographic characteristics of school-based agricultural education teachers who participated in a multi-year agricultural safety professional

development.

2. Describe motivational factors for school-based agriculture teachers to continue participation in a multi-year professional development focused on tractor and machinery safe operation.
3. Determine the effect of sustained teacher participation on teachers' knowledge of safe tractor and machinery operation.

Methods/Procedures

During the summer of 2019, a convenience sample of secondary agricultural educators from Montana, South Dakota, and Utah was recruited for participation. Max enrollment was set at 50 participants per state. Past participants who agreed to participate in a ten-hour, hands-on agricultural safety training experience during the summer of 2017 and 2018 were notified and invited by email to participate in the 2019 seminar. Additionally, a convenience sample of teachers who had not participated was sought from Montana, South Dakota, and Utah. A recruitment invitation was sent via email to teachers who had not participated in the program in each state spring of 2019. Each state's training seminar occurred separately; however, content as well as delivery were uniform following a preset program plan. Learning activities were organized so that teachers participated together through a series of hands-on exercises (Pate et al., 2019). The human subject research protocol was reviewed and approved by Utah University's Institutional Review Board protocol 10514.

The 2019 training focused on providing teachers with curriculum to demonstrate safe operation of equipment and tractors. Teachers performed tabletop exercises focused on backing and hitching of equipment. Hand-signals were emphasized to communicate with operators. Teachers were given demonstrations on backing equipment and connecting implements followed by hands-on practice using the equipment. Teachers were given instructions on laying out a driving course for tractor safety and then practiced implementing the strategy. Teachers completed the seminar with driving a utility tractor through an obstacle course.

After the training, participants completed a paper-based exam constructed of NSTMOP knowledge items. This exam also collected demographic questions and questions on motivation for returning to the training seminar. Knowledge questions were focused on safe tractor operation, machinery safety, and general health and safety. Researchers used an open-ended item to assess participants' motivation for returning to the training seminar. Respondents were asked to indicate what would keep them returning to the training. Researchers coded responses as 1 = knowledge and 2 = curriculum. Data was initially compiled in Microsoft Excel and then analyzed in SPSS version 21. A Kruskal-Wallis test was used determine if there was a significant difference in knowledge of safe tractor and machinery operations between teachers participating in multiple years of the professional development and teachers who participated less frequently.

Findings/Results

A total of 85 teachers participated in year three of the training program. Table 1 provides the distribution of teachers. Over half (57.6%, $f = 49$) of the participants identified as "female." Chi-square test of association was used to determine if there was a significant association between first year and multi-year attendees. There was no significant association between years

of attendance and gender (χ^2 (2) = 2.98 , *p* = .084). The average age of participants was 35.0 years (*SD* = 12.39).

Table 1.
Distribution of Teachers by State

	f	%
Montana	32	37.6
South Dakota	33	38.8
Utah	20	23.5

Participants were asked how many times, including the current year participation, had they participated in the training program. Most participants (*f* = 31, 36.5%) had participated in the training at least twice. There were no teachers from [State 3] that had attended the training for all three offerings. Table 2 provides the distribution of teachers' participation experience with the training program.

Table 2.
Distribution of Teacher Attendance

	Montana		South Dakota		Utah	
Attendance	*f*	%	*f*	%	*f*	%
First time attending	8	25.0	8	24.2	9	45.0
Second time attending	12	37.5	8	24.2	11	55.0
Third time attending	12	37.5	17	51.5	-	-

For years of experience teaching, five participants had 30 or more years. There were 17 (20.0%) participants with less than or equal to one year of experience teaching. For all participants, the median teaching experience in years was 7 (*IQR* = 13). First year attendees' average age was 33.1 years (*SD* = 2.66) with an average of 8.17 years of teaching experience (*SD* = 2.23). Second year attendees' average age was 32.9 years (*SD* = 1.84) with an average of 7.7 years of teaching experience (*SD* = 1.30). Third year attendees' average age was 39.1 (*SD* = 2.60) with an average of 15.4 years of teaching experience (*SD* = 2.26). Kruskal-Wallis test was used to check for significant differences between first, second-, and third-year attendees on age (χ^2 (2) = 6.38 , *p* = .041) and years of teaching experience (χ^2 (2) = 10.15 , *p* = .006).

Teaching experience was collapsed as an ordinal variable and renamed "Teacher Life Cycle Stage" with 1-5 years of teaching experience classified as a beginning teacher, 6-15 years as mid-career, and 16 or more years as a veteran. Most teachers were classified as either beginning (*f* = 33, 38.8%) or mid-career (*f* = 33, 38.8%). There were 19 participants (22.4%) who were classified as veteran teachers. Age was recoded into an ordinal variable and renamed "age category" with 21-29 as "young adult", 30-39 as "middle aged adult", and ≥ 40 as "older adult."

The average test score was 41.9 (*SD* = 3.62) out of 50. Table 3 provides mean scores by classification of attendee. Third year attendees scored an average of 43.2 (*SD* = 3.00). Participants passed by correctly answering greater than 70% of the questions. Only two individuals (8.0%) failed the exam. To determine the effect of sustained teacher participation on teachers' knowledge of safe tractor and machinery operation, a Kruskal-Wallis H test was used. The result of the Kruskal-Wallis H was 5.91 (2) *p* = .052.

Table 3.
Test score averages by teacher attendance category

Attendance Category	Test Score	
	M	*SD*
First Time	40.8	4.41
Second Year	41.7	3.16
Third Year	43.2	3.00

A Kruskal-Wallis test was used to determine if there were significant differences in safety knowledge between teacher life cycle stages (χ^2 (2) = 2.110 , p = .348). Another Kruskal-Wallis test was used to determine if there were significant differences in safety knowledge between teacher age categories (χ^2 (2) = 2.189 , p = .335). There were no significant differences in safety knowledge between teacher age categories or teacher life cycle stages.

When participants were asked on the post-experience NSTMOP exam what attracted them to attend the training experience, 31.6% (f = 12) reported knowledge acquisition while 68.4% (f = 26) reported curriculum obtainment. Other responses included incentives as PD credit, gift card, or food (f = 9, 10.6%) and fun (f = 3, 3.5%). There were 13 participants (15.9%) who responded with an affirmative "yes" but did not indicate factors that would bring them back to the training. There were three participants that noted their return was dependent on scheduling of other professional development. Table 4 provides frequencies and percentages of attendees' justification for returning to the training.

Table 4.
Frequencies and Percentages of attendees' justification for returning to the training

	Knowledge Acquisition		Curriculum Obtainment	
Attendance	*f*	%	*f*	%
First time	1	16.7	5	83.3
Second time	8	42.1	11	57.9
Third time	3	23.1	10	76.9

Limitations/Conclusions/Recommendations/Implications

Several limitations should be noted which prevents the generalization of these results beyond the participants of this study. There was no pre-test to determine any preexisting differences in knowledge between first year attendees and those who had attended previous trainings. However, it was assumed that multiple year attendees would have higher knowledge due to their experience with the program. We conclude that age and teaching experience did not influence safety knowledge gains post-training. Based on the findings, we conclude that the training was viewed favorably by all participants. Third year attendees were more likely to be older and have more teaching experience. It should be noted that third year attendees averaged a higher score, but this result was not statistically significant. Due to the convenience sampling which violates assumptions of parametric statistical tests, non-parametric tests were used to check for statistical significance. The Kruskal-Wallis test is noted to have low power which requires a larger sample size to detect a statistically significance difference in test scores. We note that the p-value approached the .05 alpha level but conclude that a larger sample size is needed to determine if this effect is sustained. Results from this research suggest that TMC

instructors would benefit from sustained professional development activities over their teaching career. Continued research is needed to determine effective methods for addressing safety knowledge over a teacher's life cycle. It should be noted that a larger percentage of multi-year attendees were more interested in curriculum obtainment than knowledge gain. A qualitative approach to understanding teachers' motivation and interest in safety training professional development is recommended. A benefit for participating teachers in this professional development was focused on higher order instructional or alternative assessment methods for tractor and machinery safety. Desimone et al. (2002) found that professional development characterized by "active learning," where teachers are not passive "recipients" of information increases the impact of the professional development activities. Desimone et al. (2002) found a substantial benefit when teachers participated in professional development that focused on higher order instructional or alternative assessment methods. To help address barriers of implementation, efforts among professional development specialists should focus on teacher demands and areas to facilitate integration of training within existing structures used by teachers. Imel (2000) suggested "Adult educators frequently act as change agents, although they may not be conscious that they are playing this role. Like learning, change is a complex process and understanding the relationship between learning and the change process can help adult educators be more purposeful in assisting with change" (p. 5).

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How does Training and Onboarding Differ between Career Stage of Oregon Extension Agents?

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Introduction/Theoretical Framework

County Extension Agents undergo a variety of training from the beginning of their careers and throughout their time in the profession (Seevers & Graham, 2001) in order to meet many of the responsibilities for their roles and to serve as local liaisons for State Extension Services. For the purposes of this study, *training* is defined as "any formal or informal material resources for the continuous professional education of newly-hired employees so she/he may meet the need of basic Extension competencies to ensure professional success," (Safrit & Owen, 2010, para 12). Training includes both *onboarding*, which typically takes place at the beginning of a career, when they are learning basic technical skills needed to advance them forward in their Extension career (Rennekamp & Nall, 1994), and professional development. *Professional development* provides opportunities for agents to stay up-to-date on practices within their field and may include attending conferences, earning advanced degrees and taking formal coursework, international experiences, and informal learning experiences (Seevers and Graham, 2001). Professional development and onboarding, both considered training within the context of this study, can meet skill development needs.

Rennekamp and Nall (1994) described four Extension career stages: (a) entry, (b) colleague, (c) counselor and (d) advisor. The beginning of the agent's career is called the entry-stage. During the entry stage, agents are motivated to understand the organization's structure, gain basic technical skills, connect previous skills to their current work, and develop connections with their professional peers. In order for agents to advance to the next professional stage, the colleague stage, there are considerations of time in the position and development of competencies and organizational knowledge (Brodeur et al., 2011). The colleague stage is met when agents have further developed an area of expertise, have developed a professional identity, and are being more independent contributors to problem solving. Rennekamp and Nall (1994) continued to describe that agents move to new career stages when they are able to meet the professional development needs of their current career stage, but they noted some employees may never advance past the colleague stage because they may be satisfied with independent work. Brodeur et al. (2011) estimated that the entry stage is approximately the first three years of employment, however we found limited literature that discussed how long it may take an Extension professional to move into the other stages. As mentioned, Rennekamp and Nall wrote that some agents may not advance past the colleague stage, however, for the purpose of defining stages in this research project, it will be estimated that each stage is approximately three years. Therefore, we gauged that the entry stage is the first three years in the profession, the colleague stage is the fourth through sixth year in the profession, the counselor stage is approximately the seventh through ninth year in the profession, and the advisor stage is estimated as anyone serving over 10 years in the profession.

In Oregon State University (OSU) Extension, objectives and delivery methods for training and onboarding offered to agents are determined by state program leaders, thus creating a decentralized onboarding protocol (L. Shirley, personal communication, February 6, 2019). Learning about the decentralized onboarding and training model within OSU Extension led us to explore training and onboarding across the seven Extension program areas. These conversations revealed that some of the programs did not have an onboarding process. Additionally, one program leader shared that onboarding was limited as a result of minimal budget or personnel to conduct trainings (S. Angima, personal communication, March 6, 2019; R. Riportella, personal communication, June 2, 2019; L. Davis, personal communication, January 22, 2020). Little information was shared about the continuous professional development training offered, however, we did learn that all agents and staff are given the opportunity to attend Extension Annual Conference (EAC). The EAC does include professional development workshops and sessions, however, this conference is not mandatory for agents to attend. After learning about the depth, length, and content that is covered during the trainings, we noticed inconsistencies between the different program areas. Prior research related to human resource development has supported that orientation and continued training for new, and veteran employees (e.g., Extension agents), is necessary for success in the field (Bulut & Culha, 2010; Holton, 1990; Swart et al., 2014). The discrepancy between what was reported in our study of the literature related to training and onboarding and our observations of training in OSU Extension lead our research team to employ a needs assessment approach to evaluate training and onboarding among Extension agents within OSU Extension.

A *need* is defined as a discrepancy between *what is* and *what should be*. As such, a needs assessment (NA) is an approach used to identify, analyze, and make recommendations about a specified need (Watkins et al., 2012; Witkin & Altschuld, 1995). Witkin and Altschuld offered a practical model for employing a NA and their model includes three stages (a) pre-assessment, (b) assessment, and (c) post-assessment. The first stage, pre-assessment, consists of defining the purpose, identifying the need areas, determining what data should be collected, and deciding methods for data collection. Components related to the pre-assessment stage were met for this study during our review of relevant literature and the gathering of background information about current training and onboarding offered in OSU Extension. Additional aspects for pre-assessment were met while deciding our methods to explore the research question. The second stage of a NA involves conducting the assessment, primarily collecting and analyzing data, which is reported below in the results section. The final phase of a NA includes reporting the findings and distributing recommendations to internal and external partners and stakeholders. Utilizing Witkin and Altschuld's NA model allowed us to conduct an exhaustive investigation of the training and onboarding of OSU Extension Agents in order to provide data-driven feedback and recommendations.

Research Questions

These findings represent part of a larger study which conducted an exhaustive investigation of the training and onboarding of OSU Extension Agents. This segment of the larger NA addressed the following research question, which guided these findings and recommendations: How does training and onboarding differ between the four career stages of an Extension Agent in Oregon? This research aligns with the American Association of Agricultural

Education's (AAAE) research priority five: Efficient and effective agricultural education programs (Roberts et al., 2016, 41-45).

Methods

As described by Witkin and Altschuld (1995), the pre-assessment stage includes the development of methods to address the research question(s). To answer our research question, we created and administered a survey instrument to all Extension Agents in Oregon. This research is a state-specific study; therefore, we did not seek generalizable information. We sought a census in order to gain a large sample size and more robust idea of OSU Extension's training and onboarding protocols (Ary et al., 2002). An original survey instrument was developed through Qualtrics Survey Software. The questions and competencies included in the instrument were developed based on a combination of previously identified Extension competencies (Knight, et. al, 2019), employee training literature from the fields of Personnel Psychology and Human Resource Development, and relevant needs assessment research. Checks for content and face validity were confirmed by administering a pilot survey to out-of-state Extension Agents. The agents in the pilot group consisted of eleven county agents located outside of Oregon and the program areas of 4-H, Agricultural and Natural Resources (ANR), and Family Consumer Sciences (FCS) as well as the four Extension career stages (Rennekamp & Nall, 1994) were represented in the pilot group of agents. Additional checks for validity were met by expert faculty in Agricultural Education and Extension, graduate committee members, and doctoral graduate students in Agricultural Education who reviewed the developed instrument.

The distributed instrument included four sections: (a) Introduction questions, (b) individual competency questions, (c) additional training questions, and (d) demographic questions. The introduction question included ten broad introduction questions regarding training received by county agents at the beginning of their Extension career and an indication of whether or not the training was mandatory. The following section focused on training related to 20 specific competencies identified by recent research (Knight, et al., 2019), and validated by Extension professionals in Oregon. The 20 competencies included: (a) Communicating research, (b) Communications, (c) Conducting needs assessments, (d) Conducting applied research, (e) Ethics, (f) History of Extension, (g) Leadership, (h) Learning theories, (i) Marketing, (j) OSU Extension organizational leadership, (k) Professionalism, (l) Program development, (m) Program evaluation, (n) Risk assessment, (o) Teaching methods, (p) Teaching techniques, (q) Technology, (r) Theories of human development, (s) Volunteer management, and (t) Volunteer recruitment. This section asked participants to identify if they had received training on the competency, when they received the training, and if someone within OSU Extension provided the training. The third section of the instrument included additional training questions and asked participants to rate the perceived value and relevancy of training received by OSU Extension. The additional training questions asked participants to rate on a seven-point Likert-type scale the degree to which they agree with statement about training provided by OSU Extension (e.g. I believe that OSU Extension Service provides valuable training for its employees). The fourth and final section were demographic questions to help us better understand the participants and make comparisons related to training among career stages and program areas.

After the survey instrument was developed and validated, the instrument was emailed to all OSU Extension Agents on a state-wide list-serve. We asked Regional Directors and Program-area Leaders to send an email to employees they oversee and encourage them to respond to the survey. Additionally, five days before the survey closed, a reminder email was sent. The survey closed 20 days after the first email was sent. Raw data were exported from Qualtrics Survey Software to Microsoft Excel. We received 60 usable responses resulting in a 36% response rate. To address the research questions, data were analyzed using the Statistical Package for Social Sciences (SPSS Version 26). Frequencies and descriptive statistics were used to report the findings for our research question.

Results

The purpose of our research was to further our understanding of how training and onboarding differs between Extension career stages within OSU Extension. With our data collected (i.e., NA stage one), we proceeded into the second stage of this NA. Sixty agents responded to at least one survey question and 48 (80%) completed the full survey instrument. The highest account of responses was from agents in the entry stage (one to three years) (38%, n = 23) and the advisor stage (10+ years) (23%, n = 14). Fifteen percent (n = 9) of participants were in the colleague stage (four to six years), and 4% (n = 2) were in the counselor stage (seven to nine years). As previously discussed only 48 of the participants completed the survey and 20% (n = 12) of respondents did not complete the question asking how long they have worked for OSU Extension; therefore, those data could not be reported.

There were 23 agents in the entry stage and over half (n =13, 57%) received some level of training during their first through third year in the profession. However, only 30% (n = 7) of the entry stage agents reported that the training they received was mandatory. There were nine agents in the colleague stage and over half (n =6, 66%) reported they received some amount of training during their first year, less than half (n =3, 33%) reported they received training in their second through third year, and 44% (n = 4) reported the training was mandatory. There were two agents in the counselor stage and they all reported they received some amount of training during their first year; 50% (n = 1) reported they received training in their second through third year, and 50% (n = 1) reported the training received was not mandatory. There were 14 agents in the advisor stage. Over 50% (n = 8) of agents in the advisor stage reported they received some form of training during the first year of their employment, 71% (n = 10) reported they received training during their second through third year of their employment, and 14% (n = 2) reported the training was mandatory.

We focused on 20 competencies for evaluation in this study and asked each participant to identify *if* they have received training on each competency since the start of their employment in OSU Extension. We further examined the results by each career stage. Among those in the entry stage, 18 competencies had a higher number of agents *who did not* receive training in a competency area. Among the nine agents in the colleague stage, 16 of the competencies had a greater number of agents who reported they *did not* receive training. There were two agents in the counselor stage. Among those in the counselor stage, 13 competencies had higher, or equal, frequency of agents who *did not* receive training in a competency. Among the 14 agents in the advisor stage, eight of the 20 competencies had higher frequency of agents who *did not* receive training. When examining the competencies where agents *did* receive training, 19 of the 20

competencies, for all career stages, had a higher frequency of the training being taught by someone within OSU Extension. We want to emphasize, we looked at the differences in the frequency and type of training received by OSU Extension agents.

Discussion, Recommendation and Conclusion

A limitation to the study was the fact that, due to lack of statewide information, we were unable to obtain a breakdown of total agents in each career stage to know how representative our sample was of the whole agent population in OSU Extension. An additional limitation was we only examined *if* training on 20 competencies was received. We did not ask participants to identify if they believed they could complete tasks related to these competencies, as that particular question was beyond the scope of this study. For example, someone with an advanced academic degree may be competent in communicating research without Extension-provided training. However, results from the study are still meaningful to look consider training and onboarding across career stages of these participants in OSU Extension.

For participants who were in the entry stage of their career, there were 18 competencies which had a higher number of agents who reported they had not received training in the given competency areas. Considering Rennekamp and Nall's (1999) research, the entry stage is a critical stage for agents to receive training and more importantly, that training *should* reflect the work they are expected to do in the profession (Swart et al., 2004; Harrison, 2000). Onboarding, or training that takes place at the beginning of a profession, has strong implications for return-on-investment, and is one the most important investments an organization can make (Bulut and Culha, 2010). As agents advance in their profession, they are gaining and acquiring more skills and competencies that reinforce their work in the profession (Brodeau et al., 2011). However, when we examined the advisor stage (10+ years) in this study, there are still over half of the competencies that agents had not received training on, which raises concern of the type and amount of training that is offered beyond the entry stage of Extension professionals in Oregon.

Recommendations for OSU Extension Service highlighted the need to create a consistent onboarding model, including new curriculum, delivery methods, and longer-term evaluation, to be administered for agents during their first through third year in the profession. This new onboarding model should be used by all program areas, partially eliminating the problem of decentralized training. For maximum effectiveness, this onboarding training should be centralized, and administered by Extension administrative personnel. A new, centralized, onboarding model should be carefully planned and delivered to ensure agents are actually receiving training that can support their success in the Extension profession. We offered these recommendations with the hopes that a centralized onboarding model would support agents throughout the remainder of their career, while also creating a pipeline of well-trained agents moving through the Extension career stages.

Results revealed agents in the entry stage of the profession have not received training on some of the more necessary competencies related to Extension work. These results support a change in how onboarding is administered to support the success of agents and the success of Extension programs in counties across Oregon. Creating a new onboarding model would create congruency between program areas and more unity in a group of agents all working towards bettering communities in Oregon.

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Faculty use of Learning Management Software during Covid-19: The Effect of Age and Time

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Introduction and Theoretical Framework

In March 2020, Covid-19 was declared a global pandemic. The virus spread quickly with the number of reported cases in the U.S. spiking from November 2020 to January 2021. To slow the spread of Covid-19, the Centers for Disease Control and World Health Organization released guidance and recommendations for the public, such as quarantining, "social distancing", and wearing a mask. These precautions, which effectively discouraged physical interactions with those outside of one's immediate household, caused most businesses and institutions to move physical operations to online platforms.

Educational institutions were impacted by Covid-19 as education is traditionally delivered in a face-to-face format that was impossible to continue whilst obeying guidance from public health officials. Thus, educators were forced to adopt online learning, rapidly transitioning their face-to face classes to online learning systems (Murphy, 2020). Many higher education institutions have integrated online learning into their mission and strategic plans; as a result, increased pressure has been placed on faculty to adapt their pedagogy to include online delivery and other technologically enhanced methods (Walters et al., 2017). Undoubtedly, Covid-19 accelerated the implementation of online learning at higher education institutions, which forced faculty to navigate new technologies to continue delivering lessons intended for face-to-face instruction in an online format. To ensure continuity of education in the online classroom, faculty often adopt technology, such as Learning Management Software (LMS) systems (e.g., CANVAS), as it offers unique ways for students to interact and engage with their instructor and peers, an arguable necessity in online classrooms.

Faculty are given latitude in how they conduct courses; this remained true during Covid-19. Previous data indicate that faculty adopted LMS systems to communicate and increase student engagement as a result of the pandemic (Tasci et al., 2021); however, those researchers did not characterize faculty into sub-groups (e.g., gender, age) to determine if certain demographics played a role in faculty adoption of these technologies for teaching. As the millennial generation is currently matriculating into faculty positions, they may be more likely to adopt LMS for teaching than faculty from previous generations as they were raised in a more technologically rich environment. It is important to determine if faculty age factored into adoption of LMS for teaching during the transition to online learning caused by Covid-19.

The Technology Acceptance Model (TAM) and TAM 2 guided our study. TAM explains behaviors and decision-making surrounding technology adoption (Davis, 1986), especially as it relates to perceived usefulness and perceived ease of use of that technology (Venkatesh & David, 2000). An example of *perceived usefulness* is when people use a smartphone application that improves their ability to perform a task. *Perceived ease of use* is how easy or difficult technology is to use; the output or advantage from use should outweigh the effort put in to use the technology (Venkatesh & Davis, 2000). TAM 2 incorporates different factors that determine if

an individual will adopt or reject a new innovation or technology. Two of these factors are: 1) *voluntariness*, or the extent to which potential adopters perceive their adoption as non-mandatory (Venkatesh & Davis, 2000); and 2) *demonstrability of results*, or how the outcome of using the technology will directly influence *perceived usefulness* (Moore & Benbasat, 1991). Technological change can be driven by the need to improve (Skoumpopoulou et al., 2018); in the context of our study, technological change may be driven by the need to continue to deliver education in an online format due to Covid-19 making face-to-face instruction impossible. Before Covid-19, LMS was often used for teaching by faculty, largely on a voluntary basis. It is interesting to consider faculty use of LMS as a result of Covid-19, when adoption was perhaps no longer voluntary but required to facilitate communication and ensure student engagement in an online classroom. This communication and engagement is especially important in a discipline characterized by applied learning and practical concepts, such as agricultural sciences.

Purpose and Objectives

The purpose of our study was to determine what factors affected faculty response to the Covid-19 pandemic, in terms of adoption of software for teaching. This study builds off previous research published by our laboratory (Tasci et al., 2021) in which we demonstrated that faculty more frequently used LMS and LMS features as a result of, as opposed to before, the Covid-19 pandemic. Accordingly, the objective of this follow-up study was to determine how time, age, and the interaction of time and age impacted faculty adoption of LMS before and as a result of the Covid-19 pandemic.

Methods

This study was part of a larger study that employed a mixed methods approach to data collection, facilitated through an electronic survey-based questionnaire. The questionnaire was designed to assess the impact of Covid-19 on teaching in agricultural-based disciplines in higher education. The Texas State University Institutional Review Board approved this research as exempt (#7380) and all participants were provided written informed consent prior to participation. The population was faculty and instructors who held a formal teaching appointment based in agricultural sciences during the Covid-19 pandemic (spring 2020, summer 2020, fall 2020) at colleges and universities across seven southern states. Our participants were identified by searching college and departmental websites in the target states, conducted in summer 2020. Using a total population of 1,795 faculty and instructors, a sample size of 317 with a 95% ± 5 confidence interval was calculated. Data was collected using a researcher-developed instrument that contained five sections. Section 1 consisted of questions about personal and institutional demographics. Section 2 consisted of questions related to training in teaching. Section 3 consisted of questions related to the use of technology before and as a result of Covid-19. Section 4 consisted of questions related to teaching experiences during Covid-19, including questions related to course and career impacts. Finally, Section 5 consisted of questions about future training and professional development in relation to online teaching. The data presented here are from Sections 1 and 3.

Following recommendations of Gates et al. (2018) on establishing a face-validated instrument, we identified a panel of experts outside of the research team and participant group. The panel included ten Agricultural Education faculty with expertise in survey design and online

teaching. The panel assessed the questionnaire for face, content, and construct validity. Based on initial panel recommendations, we revised the questionnaire and resubmitted it for further review until the final version was approved. To establish reliability, the questionnaire was piloted by agriculture faculty from multiple sub-disciplines who were not part of the research team, participant group, or expert panel. Out of 14 faculty identified for reliability, eight responded for a response rate of 57%. Data from the pilot study were coded and entered using the Statistical Package for the Social Sciences (SPSS) 25.0 software. We calculated a Cronbach's alpha reliability coefficient ($\alpha = 0.790$) which, based on interpretations provided by George & Mallery (2003), was *good.*

Our questionnaire was available to participants from early September to mid-October 2020. Dillman et al. (2014) recommends the use of a five-point contact data collection model, including a prenotice, the questionnaire, a reminder, a second reminder, and then the invocation of a special procedure during a five-week window. Using Qualtrics, we sent a prenotice to 317 participants. Three days later, we sent an email containing the link to access the questionnaire. Over the next three weeks, we sent three reminder emails to non-respondents. Two hundred and fifty-five participants provided usable data and eighteen participants did not teach in the spring of 2020; overall, our response rate was 86.1%. With a response rate exceeding 85%, no additional procedures were used to account for non-response error, following recommendations of Lindner et al. (2001). Using SPSS 25.0, descriptive statistics were calculated for the demographic characteristics of the participants and their institutions of employment. Using R Core Team (2018), an Ordered Logit Model was used to analyze how time, age, and the interaction of time and age impacted faculty adoption of LMS and LMS features before and as a result of Covid-19. As the responses to our questions were categorical, our data were not normally distributed. Further, our dependent variable was ordinal rather than continuous. Accordingly, the Ordered Logit Model is an appropriate analytical method (Williams, 2016).

Results and Discussion

There were a large percentage of respondents who identified as male (62.6%), were White or Caucasian (81.9%), and held a Doctoral degree (84.6%). Most of our respondents were born from 1981-1996 (23.1%), 1965-1980 (36.9%), or 1946-1964 (38.0%). These ranges represent different generations: Millennials, Generation X, or Baby Boomers, respectively. As the overwhelming majority of our respondents fell within these three age ranges, we chose to only include their data in our analysis, disregarding faculty who were born from 1928-1945 (1.6%) or preferred not to disclose their age (0.4%). Most of our respondents worked at an 1862 Land-Grant institution (52.2%). There was a fairly even representation of respondents employed as Full Professors (34.6%), Associate Professors (25.2%), or Assistant Professors (26.4%). The majority of respondents taught in Texas (55.9%), Arkansas (14.6%), or Georgia (13.8%). Our respondents taught courses under the umbrella of Agricultural Sciences with Animal Science leading (20.8%), followed by Crop and Soil Science (14.5%), then Agricultural Education Extension, Leadership and Communication (13.7%) being the most highly represented.

We asked respondents about their general use of LMS for teaching before and during Covid-19, then more specifically about use of certain LMS features. For general LMS use, there was a significant effect of time ($P \leq 0.05$) such that faculty used LMS for teaching 1.94 times more often during versus before Covid-19 (Table 1). There was also an effect of age on total

LMS use, which was the combined use before and during Covid-19. Baby Boomer or Generation X faculty used LMS significantly less often ($P \leq 0.05$) than Millennial faculty; 0.47 times for Baby Boomer and 0.33 times for Generation X. The difference in total LMS use between Baby Boomer and Generation X faculty was not significant. Our interaction term, time × age, allowed us to discern if the effect of age on total LMS use was sustained during the pandemic. These interaction effects were not statistically significant. Ultimately, these data indicate that faculty used LMS more often during Covid-19. Pre-pandemic, our data indicate that Millennial faculty used LMS for teaching more often than their Baby Boomer or Generation X counterparts. However, during Covid-19, faculty age did not affect use of LMS for teaching.

Table 1.

Effect of time, age, and interaction of time and age on faculty use of LMS systems[z]

	Baseline[y]		Baseline[x]
Time		Time	
During Covid-19	1.94 (0.39)*	During Covid-19	1.94 (0.39)*
Age		Age	
BB	0.47 (0.35)*	ML	2.12 (0.35)*
GX	0.33 (0.35)*	GX	0.69 (0.29)
Time × age		Time × age	
During Covid-19 × BB	0.85 (0.49)	During Covid-19 × ML	1.18 (0.49)
During Covid-19 × GX	1.16 (0.15)	During Covid-19 × GX	1.37 (0.41)

Note. [z]Models are differentiated by baseline. The dependent variable is "Frequency of LMS use". Values are coefficients (standard error). BB = Baby Boomer, GX = Generation X, ML = Millennial; [y]Baseline: for time is "Before Covid-19", for age is "ML", for time × age is "During Covid-19 × ML"; [x]Baseline: for time is "Before Covid-19", for age is "BB", for time × age is "During Covid-19 × BB"; *denotes significance at 95% probability level.

We asked faculty about their use of LMS features to post videos of synchronous and asynchronous lectures before and during Covid-19. For both, there was a significant effect of time ($P \leq 0.05$) such that faculty used LMS platforms to post videos of synchronous lectures 10.45 times as often and videos of asynchronous lectures 7.82 times as often during Covid-19 as compared to pre-pandemic. There was not an effect of faculty age on the overall use of LMS features to post synchronous or asynchronous lectures before and during Covid-19 ($P \geq 0.05$). Similarly, we did not observe a statistically significant time × age effect. These data indicate that, even pre-pandemic, faculty age did not factor into their use of LMS to post lectures.

LMS features are often used to communicate with students; these features become especially important in an online classroom. Accordingly, we asked faculty about their use of LMS to send students individual or group messages before and during Covid-19. For individual messages, there was a significant effect of time ($P \leq 0.05$) such that faculty used LMS to send individual messages 1.89 times more often during versus before Covid-19. We did not observe the same outcome for group messages; there was no difference in use of LMS to send group messages before versus during Covid-19. There was not an effect of age on overall use of LMS to send individual messages; similarly, we did not observe generational differences in LMS use to send individual messages during Covid-19. However, there was an age effect on overall LMS

use to send group messages. Specifically, Baby Boomers sent group messages through LMS platforms 2.78 times more often than Millennial faculty ($P \leq 0.05$). Interestingly, this statistical difference did not persist during Covid-19 as we did not observe a significant interaction effect.

We asked respondents about their use of LMS to post PowerPoint slides and grades. For both, there was not a significant effect of time, indicating faculty use of these LMS features did not change during Covid-19. Interestingly, however, we observed an age effect; Baby Boomers were less likely ($P \leq 0.05$) to use LMS to post PowerPoint slides (0.46 times) and grades (0.37 times) than Millennials when considering use both before and during Covid-19. There were not significant differences between Generation X faculty and Millennials or Baby Boomers. As with our data for group messages, the statistical difference between Baby Boomers and Millennials did not persist during Covid-19 as we did not observe a significant time × age interaction for either posting PowerPoint slides or grades.

We also asked respondents about their use of LMS to take attendance, post assignments, and administer quizzes. For attendance, we did not observe an effect of time, age, or time × age on use before or during Covid-19. However, for posting assignments and administering quizzes, there was a significant increase ($P \leq 0.05$) in faculty use during the pandemic. Specifically, faculty used LMS to post assignments 3.44 times as often and to administer quizzes 5.48 times as often during versus prior to the Covid-19 pandemic. For the use of LMS to either post assignments or administer quizzes, there was not an effect of age or time × age.

Discussion and Conclusion

Our *a priori* hypothesis was that Millennial faculty would use LMS for teaching more than Baby Boomer or Generation X faculty, which was confirmed with our pre-pandemic data. However, we did not anticipate a similar percentage of faculty, regardless of age, to use LMS for teaching during Covid-19. These data align with the TAM 2 model, which explains how voluntariness factors into technology adoption. Covid-19 mandated the use of technology to communicate with others outside of one's immediate household. For educational institutions, specifically, this communication could be facilitated through LMS. Faculty likely did not perceive a voluntariness in adopting technology in their online classrooms during the pandemic. Thus, acceptance of LMS for teaching was likely forced for older faculty who had not already implemented this technology in their pre-pandemic classrooms, resulting in the similar LMS use we observed across generation. Our observation of Baby Boomer faculty using LMS for group messaging more often than Millennials may be related to their perceived ease of use of this technology, under the scope of the TAM model. As most educational institutions have LMS platforms in place, older faculty may have gravitated towards using these to communicate with students before and during the pandemic whereas Millennial faculty may have used GroupMe or similar social media applications that have been adopted by students in recent years.

The documented increase in LMS use during Covid-19 suggests that faculty may require institutional support in the form of training and updated hardware that supports frequent use of software for teaching in online classrooms. We recommend that administrators are aware of these needs and prioritize this as, after Covid-19, online learning will likely persist at a rate higher than before the pandemic. This is especially important for applied disciplines such as agricultural sciences.

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Primary Student Perceptions of Agriculture: A Content Analysis of Oklahoma Ag in the Classroom Posters

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Introduction/Theoretical Framework

In 1988, the National Research Council (NRC) released a report titled, "Understanding Agriculture: New Directions for Education" with the goal of creating a wave of change in agricultural education. Specifically, "agricultural education needs to become more than vocational agriculture" (National Research Council, 1988, p. 1). Historically, vocational agriculture has focused on preparing students for jobs in the agricultural industry. However, in the 1988 report prepared by the NRC, it was determined the agriculture enterprise is too important to only be taught to a single subset of students, that in fact, all students need a basic understanding of agriculture and its role in our society (National Research Council, 1988).

Decades later, agriculture is still perceived as a farmer wearing a straw hat and milking a cow or standing in a barnyard talking to animals (Vallera & Bodzin, 2016). According to DeWerff (1989) school-aged children interpret agriculture as the "farmer, the cow, the tractor, and the rancher" (p. 14). These misconceptions persist as Americans find themselves more than two generations removed from production agriculture. Malloy (2016) contends "a huge disconnect has been created between citizens and agriculture as we know it" (p. 1). With the growing need to feed the world's population with less resources to do so, creating an agriculturally literate society to support agriculture is still relevant (Malloy, 2016).

To combat this problem, programs like Ag in the Classroom (AITC) were created with the goal of building an agriculturally literate society. AITC is working to increase agricultural literacy in K-12 classrooms by working to improve student's understanding of agriculture "by integrating authentic, agricultural-based content as the context to teach core curriculum concepts in science, social studies, language arts and nutrition" (Spielmaker & Leising, 2013, p. 2) AITC hopes by doing so, agriculture will be valued by all (Spielmaker, 2020).

This study relied on the knowledge gap (KG) theory proposed by Tichenor, Donohue, and Olien (1970). The knowledge gap theory suggests there are two groups of people regarding common knowledge: A group with understanding and a higher level of knowledge and a group with little to no understanding therefore demonstrating a lower level of knowledge (Tichenor, Donohue, & Olien, 1970). Traditionally these groups have been split by socio-economic status and levels of education (Lamm, Taylor, & Lamm, 2016). Later research by Kwak (1999) indicated individuals may be motivated to learn more about a topic because of personal interest.

Two generations of Americans removed from production agriculture has created a knowledge gap concerning agriculture (Leising & Zilbert 1994). This lack of agricultural literacy manifests through consumer purchasing, media representation, and in some cases policy development related to agriculture (Frick, Kahler, & Miller,1992). Current agricultural literacy efforts, such as those provided by AITC, need to be measured to understand the knowledge gap

better. A better understanding of the lack of agricultural knowledge has the potential to inform program leaders responsible for AITC program development.

Purpose/Objectives

The purpose of this study was to investigate elementary students' perception of agriculture through their participation in an Ag in the Classroom poster contest. Additionally, two objectives guided this study: 1) Identify key images elementary students use to depict agriculture, and 2) Identify students' perceptions of agriculture by analyzing images displayed in student developed posters.

Methods/Procedures

Oklahoma AITC hosts an annual, state-wide, poster contest for K-12 students who have participated in AITC programs. Participants were required to incorporate the contests' theme into their design. The theme for posters included in this study was "Explore Oklahoma Agriculture." Elementary students in the third grade were selected because those classes received instruction related to the National AITC learning objective: Theme 5 – Culture, Society, Economy, and Geography (Spielmaker & Leising, 2013). One hundred and seventy-seven posters were reviewed for this study.

Content analysis was used to address the objectives. A content analysis is a systematic approach that allows researchers to indirectly observe human behavior by analyzing their communications (Fraenkel & Wallen, 2009). The researcher used a modified version of Farland-Smith's (2012) Draw-a-Scientist-Test (DAST) to inform the content analysis. Farland-Smith established three scoring categories for her DAST study. She evaluated drawings based on appearance, location, and activity, scoring each category 0-3. The modified rubric created for this study can be seen in Table 1.

Table 1

Rubric for Evaluating AITC Posters

	0 Cannot be categorized	1 Pastoral fantasy	2 Traditional	3 Broader than traditional
Appearance				
Location				
Activity				

The three main categories from Farland-Smith's rubric are intact for this study, however the descriptions of scores were revised to meet the researcher's needs. Scoring descriptions were included in a researcher developed codebook and used to operationalize the three scoring categories. The researcher retained the same score "0" (cannot be categorized) from Farland-Smith but adopted descriptors from literature for scores "1", "2", and "3." A score of "1" is considered a part of "pastoral fantasy." The Kellogg Foundation (2002) started the conversation surrounding American's perceptions of rural America and agriculture. Specht and Rutherford

(2016) contributed to that research by exploring how the movie industry has influenced Americans memory of agriculture into a pastoral fantasy. The Kellogg Foundation (2002) outlined principles of the pastoral fantasy as "small storybook family farms" with fields of crops and rolling green hills (Kellogg Foundation, 2002, p. 4). Description of images for traditional agriculture (Score of "2") were adapted from Koeller (2013). The researcher defined, "broader than traditional" (Score of "3") as anything that includes multiple elements of agriculture, a scene that is not a stereotypical or traditional barnyard and includes technology while being unique and creative.

Coders met to review the codebook and train to reach a level of reliability. Coders train to "reduce the amount of variability in how [coders] view and interpret data" (McHugh, 2012, p. 276). To calculate reliability, the two coders used a sample of 30 posters (separate from the main dataset) to reach an appropriate level of inter-rater reliability. The training scores loaded into an Excel document and analysed via an online reliability tool (Freelon, n.d..) to calculate reliability using Cohen's Kappa and percent agreement. Although there are no set standards for determining an acceptable level of reliability, Neuendorf (2002) reported the general "rule of thumb" outlined by several researchers (Banerjee, Capozzoli, McSweeney & Sinha, 1999; Ellis, 1994; Frey, Botan, & Kreps, 2000; Krippendorff, 1980; Popping, 1988; and Riffe, Lacy & Fico, 1998) and concluded "coefficients of .90 or greater would be acceptable to all, .80 or greater would be acceptable in most situations" (p.145). Coders in this study reached (0.81-1.00) agreement for all three categories signaling inter-rater reliability had been achieved. Next, the coding team evaluated the remaining 177 posters using the researcher developed code book as a lens for analysis.

Results/Findings

The first objective of this study sought to identify key images elementary students use to depict agriculture. One hundred seventy-seven posters from third-grade students were reviewed as a part of this study. Researchers kept note of reoccurring images as they conducted their content analysis resulting in those images only being counted once. Participants depicted animals more frequently (f=127) than other images, with red barns appearing on 65% of posters reviewed. Barnyard elements i.e., silos and windmills were counted 54 and 41 times respectively while hay and tractors were counted less frequently (f = 41; 32) see Table 2.

Table 2

Frequency of Key Images in the AITC Poster Content Analysis (N = 177)

Key Images*	*f*	%
Animal(s)	127	71%
Red Barn	115	65%
Silo and/or Windmill	54	30.1%
Hay	41	23.2%
Tractor	32	18%

Note. If an image appeared more than once on a poster, it was only counted once.

Researchers noted 24 additional barns that were not drawn using the color red. Eight additional posters displayed animals walking on two feet, wearing clothes, or talking with the people featured on the poster.

The second and final objective for this study was to identify students' perceptions of agriculture by analyzing images through the lens of a researcher developed rubric reflecting three categories (appearance, location and activity) to determine whether students viewed agriculture as: 1) pastoral fantasy, 2) traditional, or 3) broader than traditional. The overall average for each category ranged from 1.47-1.53. In terms of how students viewed agriculture, 119 posters (67%) reflected scores less than two (< 2) moving them into the pastoral fantasy category. Posters reflecting the traditional view comprised 26% of the sample with thirteen posters (7%) highlighting views broader than traditional. Those posters featured images relating to *agritourism* and modern farm equipment. Once coding was completed, the most common images identified were barnyard animals, a red barn with a silo or windmill, and various types of hay see Table 3.

Table 3

Participants Perceptions of Agriculture (N = 177)

Category	Percentage
Pastoral Fantasy	67.0%
Traditional	26.0%
Broader than traditional	7.0%

Conclusions/ Discussion/ Implications

The first objective of this study sought to identify key images elementary students use to depict agriculture. Researchers concluded third-grade students, who received at least one lesson from AITC, perceived the following key images of agriculture: animals (71%), red barns (65%), hay (23%) and tractors (18%). This conclusion supported a traditional view of agriculture e.g., a farmhouse and red barn surrounded by a white fence with haystacks scattered in a field (Specht & Rutherford, 2016). Other key images (silo/windmill and tractors) were much less likely to be found than animals and red barns, leading researchers to question the group's understanding of agricultural practices (Tichenor, et.al., 1970). Twenty-four more barns appeared that were not the traditional or stereotypical red barns signaling a higher level of understanding and perhaps a higher level of agricultural literacy.

An image more prevalent than the traditional red barn were animal(s); at least one animal appeared on 71% of submissions. Additionally, eight more posters featured animals talking, wearing clothes, or standing on two feet, images that are commonly found in literature and based on outdated or stereotypical views of agriculture (Koller, 2013). Our findings support images found in *Little Golden Books* where stereotypical views of animals were common (Wooten, 2019) whereas in this study, only eight posters featured animals of the pastoral fantasy style leading researchers to believe the heavy influence of animal agriculture in Oklahoma served as a lens for Oklahoma students to have a more realistic view of domesticated livestock. Ultimately

the majority of posters led researchers to conclude students' views trended towards traditional agriculture but with a significant emphasis on pastoral fantasy.

Thirteen students (7%) perceived a different level of agriculture than their peers. These posters were broader than traditional incorporating newer technologies and practices into the artwork. One poster showcased a pumpkin patch featuring a mother watching her daughters as they look through the pumpkins and corn maze. That student may not know the term *agritourism*, but they have the ability to depict the concept and how it plays a role in agriculture. Multiple posters also featured a smoothie or fruit stand on the side of the road. Others included newer technology such as tractors with an enclosed cab or one with a harvester trailer collecting the silage being harvested.

Researchers concluded students still perceive agriculture as a part of pastoral fantasy and very traditional. If improving agricultural literacy is a primary goal of AITC, emphasis on moving students from pastoral fantasy to modern day, industry-based practices should be integrated into the curriculum so students can become agriculturally literate and prepared to make informed choices related to agriculture.

Recommendations for Future Research and Practice

Researchers identified third-grade students' perceptions of agriculture and five key agricultural images. Future research should be conducted to identify students' perceptions of agriculture pre-post completion of their participation in AITC programming. Further research should be conducted to identify key images and perceptions of agriculture among all grades involved in AITC. It would also be beneficial to conduct research on the factors that influence children's perspectives of agriculture. Does gender play a role in their perceptions? Are these students from an urban or rural background or have they been involved in agriculture before? Additionally, a content analysis should be conducted using AITC curriculum to determine if the images reflected are the ones students view as primary identifiers of agriculture. Since its inception in the 1980s, has AITC adapted its curriculum to represent agriculture today or does it still reflect the past?

AITC professionals should incorporate modern agricultural practices and technology into their curriculum. Based on this study, student's perceptions of agriculture are outdated, and they do not connect modern technology with agriculture. While the traditional red barn is iconic, a rebrand of materials incorporating it and modern images of agriculture would be beneficial to eliminate outdated or stereotypical images of agriculture. Over the last two decades, STEM education has been integrated into elementary and secondary education both in and outside of the classroom. Extension and school-based, agricultural education have an opportunity to make an emphasis on agricultural literacy in the same way STEM has been incorporated into common education. The need for education in agriculture has not diminished; with two generations removed from production agriculture, the need has grown greater. This need can only be addressed if an untiring effort is made to develop curriculum that reflects modern production and husbandry practices that emphasis modern agricultural practices.

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Relationship between Resilience and Commitment to Teaching across Montana Agricultural Educator Career Stages

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Introduction/Conceptual Framework

Agricultural education is facing a shortage of qualified teachers stretching back more than a decade (Foster et al., 2015; Kantrovich, 2010). The causes of this shortage are numerous, and many cite the low retention rate of educators as the most significant factor. Substantial research has been conducted in an effort to analyze and hopefully decrease the shortage and increase retention of agricultural educators (Ingersoll, 2003; McKim et al., 2017; Osborne, 1992). This body of research has focused on several aspects related to teacher retention. For example, McKim et al. (2017) considered the effect of competency in four different areas of agricultural education; Sorenson and McKim (2014) analyzed the role of work-life balance; and Croom (2003) reviewed several potential factors including work satisfaction and accomplishment, work exhaustion, depersonalization, teacher characteristics, and school characteristics.

A more recent area of research is the concept of resilience or teacher resiliency, with agricultural education researchers exploring its effects on job satisfaction, teaching success, and engagement in professional development (Bobek, 2002; Easterly & Myers, 2018; Thieman et al., 2012; Thieman et al., 2014). Although these factors are related to the issue of teacher burnout and commitment (Sorenson & McKim, 2014), no studies thus far have directly analyzed the potential relationship between educator resiliency and commitment to teaching. Additionally, while the effect of skill competencies on commitment to teaching across career stages has been demonstrated, no study has investigated resilience and commitment to teaching across career stages (McKim et al., 2017).

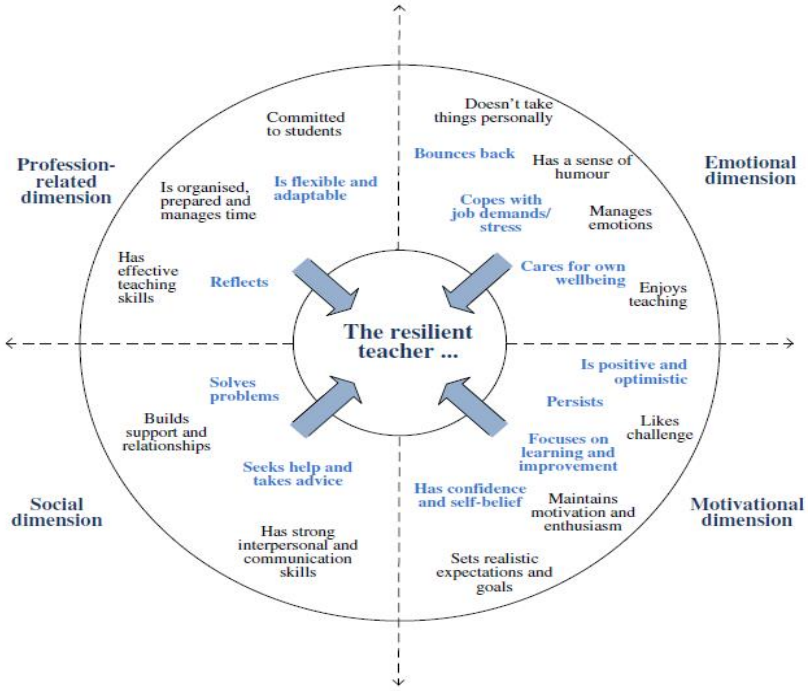
Commitment to teaching has been defined in several different ways, though Collie et al. (2011) cite evidence of a common theme of the presence of a psychological bond between the individual and object to which they are committed. Collie et al. (2011) break commitment to teaching into two different subsets, professional commitment and organizational commitment. Commitment to the school, or organizational commitment, is traditionally considered a measure of an individual's commitment to one specific organization in which they are involved (Somech & Bogler, 2002; Thien et al., 2014). Commitment to the teaching profession takes a wider view of commitment and considers the bond an individual feels towards their chosen profession as a whole.

Resilience is a difficult term to define, as its definition is often highly dependent upon the nature of the research. However, regardless of the specific definition used, one common theme in resilience definitions and research is a positive reaction to an adverse or challenging event, time or situation. The current body of research on teacher resilience has explored its influence on a variety of different factors. Bobek (2002) found relationships, competency, personal ownership and advancement, and a sense of accomplishment and humor to be vital for improving one's sense of resiliency. Mansfield et al. (2012) interviewed Australian educators to identify what

they believed a resilient educator was and then used this data to create a conceptual framework (Figure 1) for understanding the various facets, or dimensions, of resiliency. The four identified dimensions were emotional, profession-related, social, and motivational. This framework, along with the corresponding data, suggests resilient educators draw upon several of these dimensions at any given time as a way to overcome difficulties (Mansfield et al., 2012).

Figure 1

Mansfield et al.'s (2012) Four Dimensional Framework of Teacher Resilience



Purpose and Objectives

Recognizing the importance of committed and resilient educators, the purpose of this study is to determine whether perceived commitment to teach is affected by an agricultural educator's level of resiliency, as categorized by career stage (pre-service, early-career, mid-career, late-career). This study's intent serves to address AAAE's Research Priority Area Five: Efficient and Effective Agricultural Education Programs (Roberts et al., 2016). To address the study's purpose, four distinct objectives were identified:

1. Determine agricultural educators' level of resiliency.
2. Evaluate agricultural educators' perceived commitment to teach.
3. Determine if a relationship exists between agricultural educators' levels of resiliency and perceived commitment to teach.
4. Identify potential between-group differences across qualitative and quantitative measures of resiliency and teaching commitment.

Methods

A mixed methods research design was used for this study. A survey instrument based upon Wagnild and Young's (1993) Resilience Scale ($\alpha = 0.91$) was delivered in an online format via Qualtrics, for the quantitative aspect of this study. An additional commitment to teaching construct ($\alpha = 0.71$), based on the work of Thien et al. (2014), was added to the survey. The survey was delivered to all (N = 108) Montana agricultural educators representative of each career stage (pre-service, early, mid, and late). The survey yielded a 71.3% (n = 78) response rate. Quantitative data was aggregated into Excel for data analysis. Once the quantitative data was analyzed, a purposive sample of eight participants, two from each career stage, was selected for further qualitative analysis via semi-structured interviews. Pseudonyms were assigned to interviewees to preserve anonymity. Interviews were delivered face-to-face and over the phone. Data analysis was completed for quantitative and qualitative data separately, with ANOVA and correlation analyses used for quantitative data; while qualitative data was analyzed through coding procedures outlined by Ravitch and Carl (2016). Finally, the two analyses were integrated, with the qualitative analysis used to help explain and support the results of the quantitative results (Leedy & Ormrod, 2019).

Results

The mean resilience score across all participants was 145 (SD = 11.24) (Table 1); out of a maximum possible score of 175. By career stage, pre-service educators demonstrated the highest mean score (M = 152; SD = 7.57), while early-career educators had the lowest (M = 142; SD = 10.08). The mean commitment to teaching score was 20 (SD= 4.69) (Table 1) out of a possible 28. The career stage with the highest mean commitment to teaching was pre-service educators (M = 24; SD = 1.83), while early-career educators had the lowest (M = 18; SD = 4.67).

Table 1

Summary of Resilience Scores and Commitment to Teaching Scores by Career Stage

		Resilience Scale Scores		Commitment to Teaching Scores	
Career Stage	*f*	*M*	*SD*	*M*	*SD*
Pre-Service	7	152	7.57	24	1.83
Early-Career	25	142	10.08	18	4.67
Mid-Career	27	143	13.47	19	4.89
Late-Career	18	147	9.91	21	4.17
All Participants	77	145	11.31	20	4.69

A single-factor ANOVA was performed to determine potentially significant differences between the mean resilience scores and commitment to teaching scores of each educator career stage. Analyses for these groups revealed no statistically significant differences ($p = 0.15$; $\acute{\eta}^2 = 0.07$) between the mean resilience scores of any career stages. Results from the commitment to teaching ANOVA indicated a statistically significant difference ($p = .01$; $\acute{\eta}^2 = 0.14$) between at least two group means. Post-hoc analysis was completed using a Tukey Kramer test to evaluate

which groups contained statistically significant differences and only one comparison, between pre-service and early-career educators, met the required criteria for statistical significance. Table 2 provides a summary of ANOVAs.

Table 2

Analysis of Variance Summary for Resilience Scores and Commitment to Teaching Scores

ANOVA for Resilience Scale Scores						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	683.0196	3	227.6732	1.813245	0.152267	2.730019
Within Groups	9165.967	73	125.5612			
Total	9848.987	76				
ANOVA for Commitment to Teaching Scores						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	230.4363	3	76.81211	3.838543	0.013068	2.730019
Within Groups	1460.784	73	20.01075			
Total	1691.221	76				

Objective Three sought to determine if a relationship exists between educators' level of resilience and their commitment to teaching. Analysis revealed a statistically significant, "low" correlation (Ravid, 2015, p. 110) between resilience and commitment to teaching across the entire study sample, $r(76) = 0.25$, $p = .03$. Analysis of individual career stages found no other statistically significant correlations, and all other correlations were classified as low (Ravid, 2015). The mid-career educator group had the strongest correlation, $r(27) = 0.37$, $p = .06$, of any individual group; while the early career educator group possessed the weakest correlation, $r(25) = -0.14$, $p = .51$.

Objective Four sought to examine potential between-group differences across qualitative and quantitative measures of resiliency and commitment to teaching. Participant interviews revealed four major themes: distinct purpose, lifelong learners, positive mindsets, and support systems. The first, distinct purpose, was discussed by all participants regardless of career stage, level of resilience, or commitment to teaching. Each participant also linked their purpose directly with students. For example, Caroline discussed how she enjoys "seeing how they grow," seeing "the maturity occur," or watching "their dreams come true." The theme of lifelong learners was seen more among participants with higher resilience and commitment to teaching scores. It incorporated a willingness to learn, as well as a degree of adaptability as evidenced by Adam who highlighted his mentality that "there's always a way to find something… materials, activities, lesson plans" and "there's always, always room for improvement" when it comes to teaching students. Among the more experienced educators, there was an emphasis placed on focusing on the good as a means of overcoming challenge. Carter brought up his preference to remember "there's always going to be some bad, but there's also going to be a lot of good, and just to focus on the good to be able to not worry so much about the bad." This was echoed by several other teachers, who all believed the pros outweighed the cons or saw their past successes as evidence they can get through any difficulties they currently face. The final major theme revolved around the importance of support systems. Brandon was most succinct in this

connection; commenting, "I would define resiliency as being able to overcome challenges by having a good support network."

Conclusions and Recommendations

Results indicated a statistically significant decrease in commitment to teaching scores between pre-service and early-career educators. Knowledge of state-level agricultural education, qualitative data, and work by Mansfield et al. (2012) and Somech and Bogler (2002) suggests the presence or absence of support systems plays a key role in an educator's commitment to teaching. The two most important types of support appeared to be administrative and personal. Furthermore, interviews indicated administrative support is linked closely to school commitment, while personal supports are more associated with commitment to the teaching profession. Recommendations include establishing a mentoring program for early-career educators, better preparing pre-service educators to work with administrations, and conducting further research to examine primary factors influencing commitment to teaching among pre-service, mid, and late-career educators. Another statistically significant result was found regarding the correlation between resilience and commitment to teaching. The low degree of correlation was relatively unsurprising given the complex nature of both resilience and commitment to teaching. However, all interviewees saw a relationship between resilience and commitment to teaching. Additionally, though not statistically significant, mid-career educators showed the strongest correlation in the sample, which made sense based on their position in the career cycle and responses from interviewees. Both mid-career educators interviewed linked the two concepts, though neither interview nor survey data fully explained whether resilience continues to influence their commitment or if it was most active during their first few years of teaching. Based on these conclusions, it is recommended future research further examine resilience and commitment to teaching, with resilience segmented further to capture a fuller picture of what drives educators' commitment to teaching.

A practically significant finding was related to the discrepancy between educators' resilience scores and interview data; as interviewees' resilience appeared greater than their scores would suggest. This may be due to the complexity of resilience and the capability of qualitative methods to probe that complexity more effectively. For example, qualitative methods may better capture the interplay of resilience dimensions discussed by Mansfield et al. (2012). It is also noted that the growing popularity of resilience research necessitates a valid and reliable means of researching its effect on educators. As such, it is recommended the Resilience Scale instrument be examined, and a new instrument be created specifically for teacher resilience. This would allow more effective and generalizable research to be conducted on resilience. The final conclusion considers data arising from interviews and the impact of previous success on resilience and commitment to teaching. This characteristic was linked not to resilience or commitment to teaching scores, but to the level of experience an educator possessed. More experienced educators expressed how previous successes help them overcome new challenges. However, it is recognized that for this outcome to occur, one must first have the chance to experience and overcome challenge. To this end, two recommendations are presented. First, teacher educators should create opportunities for students to encounter adversity and build a bank of successes for when challenges present themselves. Second, student teaching placements should attempt to balance students' strengths with opportunities for challenges.

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Assessing the influence of welding sequence training on student performance

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Introduction

Of the various welding processes, Gas Metal Arc Welding (GMAW) is a crucial process prevalent in many industries including fabrication and agricultural mechanics (Stone et al., 2011a). As indicated by Guerra (2018) through recent projections, a deficit of more than 375,000 domestic welders will be realized by 2026. As a result, Byrd and Anderson (2012) suggested it is crucial to train welders efficiently and effectively. Since the implementation of GMAW, training techniques have emerged to safely and effectively develop the psychomotor skills required to pass the Certified Welder (CW) test (Whitney & Stephens, 2014). Welding is a skill that requires extensive practice and training to develop, which can be not only time consuming, but also costly (Wells & Miller, 2020). In traditional welding training, the trainer provides a demonstration of the correct procedure, displaying the five parameters of an acceptable weld: position, contact tip to work distance (CTWD), work angle, travel angle and travel speed (Abrams et al., 1974). Trainees then begin practicing, with their welds visually inspected by the trainer for indications of quality including porosity, proper fusion, undercut and weld profile. Using this method, the trainer is limited in their ability to observe the trainee as the weld is being performed and the majority of feedback provided refers to the finished weld. Traditional welding training's limitations make it difficult for the trainer to identify which parameter(s) are unsatisfactory, resulting in inaccurate or insufficient feedback (Abrams et al., 1974).

Previous studies (Abrams et al., 1974; Byrd, et al., 2015; Rose et al., 2013; Stone, et al., 2011b; Stone et al. 2013; and Wells & Miller, 2020) sought to determine if more effective teaching methods regarding welding training exist. Rose et al. (2015) researched the effects of training sequencing by teaching, then testing GMAW and shielded metal arc welding (SMAW). They found a statistical difference in students passing a visual examination when testing welds produced by GMAW, accrediting this higher passing rate to fewer operator-controlled variables. Additionally, Rose et al. (2015) suggested that teaching the GMAW process prior to SMAW would prove more effective. The sequence did not, however, use any VR or AR environments. Abrams et al. (1974) researched the effects of using augmented feedback in SMAW training. They reported that participants that had undergone AR training performed significantly better than those who underwent traditional training only. Furthermore, these researchers concluded that psychomotor skills involved in welding can be acquired faster and more cost-effectively using VR than traditional training methods. Byrd et al. (2015) reported that experienced welders, on average, consistently scored higher in the VR simulation than trained novice welders and had significantly less variability within scores. Byrd et al. (2015) indicated that VR welding simulators could assess individuals' existing skill level and readiness to test for certifications.

Wells and Miller (2020) used VR training simulation and traditional live training when teaching welding and found no statistically significant impact on welding skill performance.

Although no statistically significant difference was found, those participating in 100% VR weld training had the highest scores for their test welds. Wells and Miller (2020) recommended that the sequencing of the VR technology may have impacted students' performance and future research should examine the sequencing of VR technology. Currently, there is limited research investigating VR and AR training methods in short duration, and their effects on performance in the welding process (Wells & Miller 2020). To our knowledge, there have been no studies conducted using VR simulation training, AR training, and traditional live weld training in conjunction to teach welding, nor are there any studies that aim to determine the most successful sequence of these three training protocols.

Theoretical Framework

The skill acquisition theory can be applied to this study regarding how the skills of welding are developed. The declarative stage in our study occurred as the participants received a demonstration and instruction on how to perform a 2F tee joint weld. Through the demonstration, participants engaged in perceptive observation of those engaged in the skill. Through the instruction, participants gained knowledge of the skill. The procedural stage occurred as the participants practiced in all three learning environments (AR, VR, and Live). As the participants progressed through each training protocol, knowledge acquired in the declarative stage is converted into psychomotor skills. The objective of the procedural stage is to allow participants time to conceptualize and apply the skills of welding and progress into the automaticity stage (DeKeyser, 2015) As the participants continue to practice, they move closer to the automaticity stage, where cognition of the task carried out is low and performance is consistently accurate and precise. Comparing the sequence and corresponding pass/fail rates, relationships may arise, determining if the differing sequences had any impact on welding performance.

Purpose & Objectives

The purpose of our study is to determine the most effective sequencing using VR training, AR training and traditional welding training when compared to the pass/fail rate of students taking the Certified Welder (CW) test. This study aligns with the American Association for Agricultural Education's National Research Agenda Priority Area 2: New Technologies, Practices and Product Adoption Decisions (Roberts, Harder, & Brashears, 2016). The objectives are as follows:

1. Identify the Pass/Fail rate of participants using the sequence one (VR, AR, and traditional live weld training) sequence two (AR, traditional live weld training and VR) and sequence three (traditional live weld training, VR, and AR)
2. Determine if there is a difference between the three training sequences and student performance

Methods

Our study was conducted in the spring semester of 2021 in the agricultural mechanics laboratory at Texas State University and lasted four weeks in duration. The participants consisted of undergraduate students enrolled in the Introduction to Agricultural Engineering course (n = 47). The Introduction to Agriculture Engineering course included four 1-hour and

50-minute lab sections in which students were randomly assigned into one of three groups within their corresponding lab section using a computer-generated randomization program. A demographic survey was developed and distributed to participants prior to the traditional live weld training.

In order to ensure consistent instruction provided to each group, a detailed script was created for each training protocol. The scripts included technical details relating to the procedures the participants were expected to complete and included a demonstration of an acceptable weld, which was demonstrated by the researchers. The scripts were reviewed by experts in welding education and tested with students enrolled in a welding class not associated with this study. Students performed a single pass weld in the 2F position using 1/4" mild steel. Participants spent one lab period, training under each of the three protocols: VR training, AR training and traditional live training, however the sequence of the training methods differed from group to group. Following the completion of all three training protocols, participants spent the fourth lab period undergoing traditional training. Concluding in week four, a post-test was administered via a visual inspection from an AWS accredited CWI to determine the pass rate.

During the VR training protocol, participants first received a 10-minute scripted introduction to the VRTEX 360. Next, the researcher overseeing the VR training protocol provided a demonstration of an acceptable 2F tee joint weld in the VR environment. Participants then completed a total of three rounds. Each round consisted of four practice weld passes, employing a different visual cue during each pass, and one test pass with no visual cues. All participants were able to complete the rounds in the allotted time and were not required to remain present for the full duration of the lab period if completed early. Scores determined by the VRTEX 360 regarding travel speed, travel angle, work angle, position and CTWD were recorded for each run as well as the overall score. The VR weld data collected was digitally stored, however is not included in this manuscript.

During the AR training protocol, participants first received a ten-minute introduction to the REALWELD from the detailed script previously created by the researchers. Next, the researchers overseeing the AR training protocol provided a five-minute demonstration of an acceptable 2F tee joint weld in the AR environment. The demonstration for the AR training protocol consisted of two arc-off runs and one arc-on run. Participants then completed four runs using audial cues in the arc-off mode, with the scores determined by the REALWELD regarding the five parameters being recorded for each run, as well as the overall score. Participants then completed three runs using audial cues in the arc-on mode, with the scores determined by the REALWELD regarding travel speed, travel angle, work angle, position and CTWD being recorded for each run, as well as the overall score. All participants were able to complete the runs in the allotted time and were not required to remain present the full duration of the lab period if completed early. The AR weld data collected was digitally stored, however is not included in this manuscript.

During the traditional live weld training protocol, participants were allowed ten-minutes to complete the demographic survey. Then, they received five-minutes of instruction from the script previously created by the researchers followed by a five-minute demonstration of an acceptable 2F weld in the live environment. Participants were granted access to an unlimited

supply of steel coupons to practice their welds and encouraged to seek feedback from the researcher regarding quality of the weld and recommendations for improvement. Participants were instructed to complete as many welds as possible during the practice session, submitting their highest quality weld. In total, the participants were allotted one-hour and twenty-minutes to practice in the traditional live environment. Using a grading criterion developed by Herren (2009), participants provided a self-evaluation of the weld quality for the submitted weld, which was graded by the course instructor.

During the final week of the study, participants were not separated into different training groups. Upon arrival, similar to the traditional live weld training protocol, participants received a ten-minute demonstration of an acceptable weld, however on the final week, the demonstration was conducted by an independent AWS accredited Certified Welder (CW). Identical to the traditional live weld training, participants were granted access to an unlimited supply of steel coupons to practice their welds and were encouraged to seek feedback from the CW regarding quality of the weld and recommendations for improvement. In total, the participants were allotted one-hour and thirty-minutes to practice in the traditional live environment on the test week. Using a grading criterion developed by Herren (2009), participants provided a self-evaluation of the weld quality for the submitted weld, which was also graded and visually examined by an AWS accredited CWI and the course instructor. Using the grading criterion developed by Herren (2009), the CWI assigned a numerical grade to each weld. Additionally, the CWI visually examined each weld using AWS standards and determined if the weld passed the examination. Participants received a welding certificate if they passed the visual inspection.

Results

Forty-four participants provided the data reported in our study. Over half of the participants were female (52.3%). The average age of the participants was 21.84 years (*SD* = 5.17). Majority of the participants were right-hand dominant for most tasks (81.8%) however, more participants reported being right hand dominant for welding (88.6%). The most frequently reported academic major of the participants was General Agriculture (36.4%). The most frequently reported academic grade level was sophomore (43.2%). Most participants had indicated that they had no prior experience welding (65.9%). Of the participants that had prior experience welding (n = 15), the most frequently used welding process reported was SMAW (80%) with less than half (46.6%) reporting prior GMAW experience. Participants with prior welding experience reported learning and practicing welding in a variety of locations with the most frequently reported being a family farm or business (80%) and in a high school Agricultural Education program (80%) equally. All participants (100%) reported no prior experience using welding simulation systems including the VRTEX 360 training system, or the REALWELD training system. None of the participants reported possessing a welding certification.

The passing rates of each of the three training sequences are outlined below in Table 1. Training sequence group 1 (n = 16) had 12 participants pass the visual examination resulting in a 75% passing rate. Training sequence group 2 (n = 14) and training sequence group 3 (n = 14) had 9 participants pass the visual examination resulting in a 64.2 % passing rate. The overall passing rate of the three training sequence groups (n = 44) was 68.18% with a total of 30 participants passing the visual examination.

Table 1.
Passing Rates of Each Training Sequence

Training Sequence Group	Number of Participants	# of Participants Passing Inspection	Pass Rate %
1	16	12	75.0
2	14	9	64.2
3	14	9	64.2
Totals	44	30	68.18

Using a one-way analysis of variation (ANOVA), no statistically significant differences ($p > .05$) were identified in total weld scores between any of the three training sequence groups, $F(2,41) = .61$, $p = .55$ during four one-hour and fifty-minute lab periods when completing a 2F tee joint weld using the GMAW process.

Table 2.
Comparative Analysis of Welding Sequences and Certified Welding Inspector's (CWI) Scores

	SS	*df*	MS	*F*	*p*
Between Groups	153.67	2	76.84	0.61	0.55
Within Groups	5166.21	41	126.01		
Total	5319.89	43			

Conclusions, Discussion, Recommendations, Implications, & Limitations

We solely focused on the GMAW welding process in this study. As suggested by Rose et al. (2015), the GMAW process has fewer operator-controlled variables than other welding processes, making it a more suitable process to teach to beginning and novice welders. Stone et al. (2013) indicated employing multiple visual cues in the VR environment detracts from the attention given to the weld bead created. As such, we elected to only employ one visual cue per practice weld in the VR environment. Further, we selected the 2F position as Stone et al. (2013) identified the 2F position being less complex in nature, allowing for quicker skill development among novice and beginning welders. Although no statistically significant differences were identified between the sequencing of the three training protocols, when used in conjunction, the VR, AR and traditional training protocols resulted in an overall certification rate of 68.18%. Our findings are relatively consistent with Byrd's (2014) who used 50% VR training and 50% traditional training to achieve a 66.7% certification rate. Given the amount of practice time allowed to participants, Stone et al. (2011b) achieved a passing rate of ≈ 30% with 100% traditional training methods. Achieving a passing rate more than double the traditional methods alone suggests that using these three training methods provides benefits to welding education. Given the increased certification rate achieved using VR, AR, and traditional methods compared to the established certification rate of 100% traditional training methods as identified by Stone et al. (2011b), we recommend professionals involved in welding education utilize a combination of these three training protocols based upon students' needs. Stone et al. (2011b), suggested

different positions are more complex than others, resulting in higher difficulty level. As such, we recommend this study be replicated using different processes and positions.

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Self-Perceived Wellness of School-based Agricultural Education Teachers: A Q Methodology Study

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Introduction

In a 2005 study, Giacometti-Meyers found stress, frustration, and anxiety to be key influences on the retention of individuals in education careers. Giacometti-Meyers (2005) stated stress for educators could be an accumulation of the hefty workload, personal as well as professional changes, and perhaps even a change in community. Leading school-based agricultural education (SBAE) programs can elicit additional stress, requiring teachers to assume mental, physical, and even emotional loads (Smith & Smalley, 2018). Terry and Briers (2010) listed 20 distinct roles required of SBAE instructors necessitating them to regularly exceed the typical 40-hour work week. In a study of workload distribution, Torres et al. (2008) found SBAE teachers spend nearly as much of their work time on tasks that are supplemental to their classroom and laboratory teaching responsibilities.

Thieman (2012) stated SBAE programs have expectations that lead to high stress levels in its instructors. Lawver and Fraze (1995) described physical safety risks inherent with teaching SBAE. Unchecked job-related stress is a burden that can lead to a host of debilitating health problems (Bowers, 2004). Stressed teachers who fail to identify positive strategies to deal with their emotional exhaustion can potentially burnout and leave the profession (Croom, 2003). One-third of agricultural education teachers in Croom's (23003) study experienced moderate emotional exhaustion while 36% experienced moderate to high degrees of depersonalization or an indifferent or negative attitude toward students (Croom, 2003). Research clearly shows these issues contribute to teacher attrition (Chenevey et al., 2008).

Curry and O'Brien (2012) suggested understanding holistic wellness is a way to address issues and implications of teacher stress. The World Health Organization (WHO) defined the concept of wellness in the preamble of their constitution, which was adopted in 1948. That document stated, "Health is a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity" (WHO, n.d.). Rath and Harter (2010) expounded on the concept stating wellbeing is the combination of career, physical, community, financial, and social wellness.

Concepts of social support (Cohen & Wills, 1985), self-efficacy, and the social cognitive theory (Bandura, 1997) were integral to this study. Social support is primarily received and/or given through three main avenues: informational support, instrumental support, and emotional support (Cohen & Hoberman, 1983). This support can be further broken into two subcategories: employment sources, such as administrators, community, and other educators (Knobloch & Whittington, 2002) and personal sources, such as family and friends (Cornu, 2013). The perceptions of social support, true or untrue to the reality of their availability, can impact an instructor's self-efficacy level (Tschannen-Moran & Woolfolk Hoy, 2001). Self-efficacy is the cognitive process through which the perception of one's skills and abilities as they pertain to

their chosen career field are created. These perceptions are heavily influenced by self-reflection, coping mechanisms, an individual's effort and commitment level, and their resiliency levels (Bandura, 1977). Prior research indicated a strong correlation exists between perceived social support availability, an instructor's self-efficacy, and their commitment level to their career (Struyven & Vanthournout, 2014). Curry and O'Brien (2012) asserted helping teachers understand and improve their wellness may be crucial in keeping successful teachers in the profession. A review of literature revealed little research regarding SBAE teachers' perceptions regarding their holistic wellness, as defined by Rath and Harter (2010).

Purpose

The purpose of the study was to explore factors describing the self-perceived wellness of SBAE teachers in Oklahoma.

Methods

Q methodology was ideal for the study as it allowed for the exploration of self-referent viewpoints. This method presents participants with a set of statements derived from opinions on a subject of interest that are ranked according to their own views (McKeown & Thomas, 1988). These rankings are then factor analyzed leading to standard scores of the statements in the factors to be interpreted (McKeown & Thomas, 1988).

Participants

In Q methodology, the group of persons participating in the study are known as a *P set*. For this study, the P set included a purposive sample of SBAE teachers in Oklahoma representative of the geographical locations, experience levels, sex, certification pathways, and school size classifications of the population. Twenty-four SBAE teachers participated in the study. This number is consistent with Watts' and Stenner's (2012) recommendation that the number of participants in an P set be at least one-half of the number of total items to be sorted.

Instrument Development

A crucial step in a study using Q methodology is the development of the *concourse*, which is a list of subjective opinions about a particular topic that cannot be supported or rejected on a scientific basis (Brown et al., 1999). The concourse for this study was developed through a hybrid method, or combination of informal opinons heard by the researcher and information found in the formal literature. The concourse was then sampled to eliminate redundancy, ensure opinion-based statements, and adapt wording for the vernacular common to the P set. This process resulted in 40 statements, called a *Q set*, which represented the breadth and depth of the concourse.

Data Collection and Analysis

Following IRB protocol, we collected data in person and via the Zoom virtual meeting platform. A detailed description of the sorting process can be found in Brown (1993). We also

administered a questionnaire to collect data about selected relevant demographic characteristics of the participants.

Participants were provided the Q set as well as the record sheet and demographic questionnaire. Participants were asked to conduct an initial sort of the statements into three piles: most like their viewpoint, most unlike their viewpoint, and neutral. Participants then sorted the statements along a forced choice continuum record sheet.

Data were analyzed using PCQ software that generated a correlation matrix from which the relationship between sorts was determined. This correlation matrix was factor analyzed by centroid analysis followed by Varimax rotation. Two factors were identified as the best solution. Standard scores of statements within each factor were calculated, and the resulting composite arrays were used for interpretation along distinguishing statements, demographic information, field notes, and post-sort interviews.

Findings

Of the two factors identified in this study, nine of the 24 participants aligned with the first, and eight participants aligned with the second. The first factor was named the *Network Builders* for their value of interpersonal relationships and feelings of support in their community and careers. The second factor was named the *Confident Connectors* for the comfortable integration of their career, community, and family life.

Network Builders

Many of the most positively ranked statements for the Network Builders group reflected interpersonal relationships among instructors, students, and members of the community. For example, Statement 37, *I love making a positive difference in students' lives*, and Statement 38, *This job gives me purpose*, were the most positively ranked statements for the Network Builders. Statements concerning the personal and professional networks of the participants were also ranked among those most like this group, while statements relating to avoiding parental judgment and negative physical and mental stress were ranked most unlike this group. Data associated with these findings are displayed in Table 1.

Table 1

Statements Most Like and Most Unlike the Viewpoint for Network Builders

Item Number	Statement	Array Position
Most Like My Viewpoint		
37	I love making a positive difference in students' lives.	5
38	This job give me purpose.	5
13	Nothing feels better than creating aha moments for the student.	4

19	I have someone I can talk to when things get tough.	4
20	I have a ready-made network among other agricultural educators in my state.	4
Most Unlike My Viewpoint		
1	I'm tired and stressed and don't recognize myself in the mirror.	-4
10	I fear the negative connotations that may result from discussing my mental health.	-4
11	My family has grown closer through the traveling this job provides.	-4
3	I am uncomfortable administering medication to livestock because I'm afraid I'll hurt myself or the animal.	-5
21	I avoid social centers in town after competitions we didn't win to minimize the risk of running into parents.	-5

Confident Connectors

Participants in this group have found their footing as SBAE teachers – personally and in their communities. Many of the most highly ranked statements for this group reflected their involvement with production agriculture within the community, physical fitness, and time outdoors. The most positively ranked, or most like, statements for this group were Statement 11, *My family has grown closer through the traveling this job provides* and Statement 31, *Being an Agricultural Education instructor comes as easily as breathing to me*. The statements most unlike this group reflected concerns about physical and mental health or limited social relationships. Data associated with these findings are displayed in Table 2.

Table 2

Statements Most Like and Most Unlike the Viewpoint for Confident Connectors

Item Number	Statement	Array Position
Most Like My Viewpoint		
31	Being an agricultural education instructor comes as easily to me as breathing to me.	5
11	My family has grown closer through the traveling this job provides.	5
13	Nothing feels better than creating aha moments for the student.	4
4	My job requires a level of physical fitness above the average teacher.	4
22	I am comfortable with getting involved in production agriculture in my community.	4
Most Unlike My Viewpoint		
14	I am drowning in the demands of this career. It's way more than I signed up for.	-4

18	My family and friends rarely visit me because there is nothing to do in my town.	-4
6	I'm worried this job is taking an irreversible toll on my immune system.	-4
10	I fear the negative connotations that may result from discussing my mental health.	-5
3	I am uncomfortable administering medication to livestock because I'm afraid I'll hurt myself or the animal.	-5

Conclusions, Recommendations, and Discussion

This study explored two perspectives regarding SBAE teacher wellness named the Network Builders and the Confident Connectors. Network Builders feel plugged in and included by their fellow instructors and people in their lives outside their work environment. Sorting of wellness statements in the Q set indicate Network Builders place an emphasis on the relationship aspect of their careers. They perceive themselves as having an abundance of social support, primarily through emotional support. When asked about developing relationships with students, one participant said, "This year was a challenge in that aspect but those relationships I had made last year made my students more open with me through the transition to distance learning."

Confident Connectors are excited about their profession. Finding ways to encourage students to use the SBAE program is a creative outlet that contributes to their wellness. They focus on family time and developing relationships in their community.

The findings and conclusions of this study provide insight regarding what causes and helps alleviate stress for SBAE teachers in Oklahoma. Cultivating positive and supportive relationships is important to the wellness of Network Builders and Confident Connectors teachers. Agricultural education leaders and local school administrators should be cognizant of the social needs of SBAE teachers and offer in-service education focused on social networking and other factors impacting career reliance. Due to the relationship between stress and teacher burnout (Curry & O'Brien, 2012), there is a need to provide professional development programs on stress awareness, healthy living habits, occupational safety, life-balance, and fitness.

This study provides a foundation for further research on the topic of wellness for SBAE teachers. The specific issues identified in this study can guide researchers as they seek to expand assessment of wellness beyond the 24 teachers who participated in this study. Doing so will lead to development of targeted wellness programs and evaluations of the impact of those programs on personal wellness and its relationship to career resilience.

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A Systematic Metaphor Analysis of Gene-Editing in Agriculture in Online U.S. News

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Introduction

Although genetic engineering dates back to the 1980s, recent advancements in the field have caused a boom of discourse among the scientific community and the public (Metje-Sprink et al., 2019; Doxzen & Halpern, 2020). Modern news coverage largely focuses on Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) biotechnology, a relatively simple and inexpensive method to remove, add, or alter precise, user-selected sections of DNA (Doudna & Charpentier, 2014). Communicating effectively about the complex science of gene-editing often relies on a wide variety of metaphors to help the public understand the technology (Taylor & Dewsbury, 2018). Lay citizens and decision makers alike receive science information, sometimes exclusively, from news media (Schäfer, 2017). Metaphors are a bridge scientists and news media use to connect the science community with the public by relating the known with the unknown, particularly when discussing often complex topics within science (Lakoff & Johnson, 1980; Taylor & Dewsbury, 2018; Raz et al., 2019; Witschge & Nygren, 2009).

Metaphorical communication directs the attention and cognitive processes of the audience to connect two seemly dissimilar ideas by transferring the characteristics of a source domain to a target domain (Lakoff & Johnson, 1980). Andriessen and Gubbin (2009) gave the example of "the sensorimotor experience of affection as warmth (the warm body of our affectionate mother or father in our childhood) as the source domain when we conceptualize the subjective experience of a relationship (the target domain) as a 'warm' relationship" (p. 848). The development of CRISPR-based technologies has been metaphorically compared to the development of HTML webpage markup language. This comparison indicates a widely applicable, technological advance can change the world (O'Keefe et. al., 2015). Metaphors hold great promise, but also peril if not used carefully, in helping the public gain an understanding of science (Taylor & Dewsbury, 2018). O'Keefe et al. (2015) conducted a systematic metaphor analysis of coverage of CRISPR technology in large-circulation newspapers and popular science publications. The most prevalent metaphors used were describing the genome as "text" for editing and the use of "targeting" as a means of describing how CRIPR works. The researchers concluded the metaphors currently in use to describe CRISPR are wide-ranging and largely fall short of describing the technology in important ways. The literature does not reveal studies focused on how gene-editing applications specific to agriculture are discussed in the news media.

Framing formed the conceptual framework for this study. Framing is the selection of a portion of perceived reality and making it more salient or prominent in a communication in such a way the audience can receive it, relate to it, and interpret it. To accomplish this, the audience members draw on their own schemas to connect the issue with that they know (Entman, 2004; Goffman, 1974; Price & Tewksbury, 1997). News media professionals choose framing elements,

including words, visuals, and sources, to produce a frame used as a tool to convey information to an audience (Price & Tewksbury, 1997). Metaphors have been identified as framing tools to represent complex scientific concepts, including gene-editing (Gamson & Modigliani, 1989; Condit et al., 2002; O'Keefe et al., 2015; Kohl et al., 2020; Van Gorp & van der Goot, 2012). Metaphors are not neutral; they highlight or hide certain aspects of a topic (Semino, 2008). The metaphors used by news media influence the subsequent regulatory and ethical schemas used by the audience to interpret the information (O'Keefe et al., 2015). Experimental framing studies have found use of metaphors to influence audience perception of risk, uncertainty, and level of support for solutions to other policy-relevant issues, including climate change and natural disasters (Brugman & Burgers, 2019; Flusberg et al., 2017; Matlock et al., 2017). The metaphors news media choose shape public opinion on gene-editing in agriculture, necessitating an investigation of metaphors chosen by news media to describe the topic (Kövecses, 2018).

Purpose

This study sought to identify and examine how U.S. news outlets use metaphorical concepts to describe gene-editing applications in agriculture in stories published online so as to explore the information the public receives when building their opinion on the topic. The following research questions guided the study: (1) What metaphorical concepts do online U.S. news articles use to frame gene-editing applications in agriculture? (2) What are the most prominent metaphorical concepts used in those articles?

Methods

This study conducted a qualitative systematic metaphor analysis of U.S. news media articles published online concerning gene-editing in agriculture. Relevant articles published between January 2, 2015 and June 11, 2019 were collected using the Nexis Uni database. A data-driven coding process identified the metaphors in the news articles to develop a list of underlying metaphorical concepts for final analysis (Schmitt, 2005). Systematic metaphor analysis, detailed by Schmitt (2005) and adopted by Andriessen and Gubbins (2009), O'Keefe et al. (2015), and Broad (2020), identifies the primary metaphors already being used in text, revealing the metaphorical concepts authors utilize to describe a particular phenomenon. This qualitative approach consists of seven steps: (1) Identify the target topic for metaphor analysis; (2) Collect broad background knowledge and metaphors regarding the topic; (3) Sample a selection of text on the target topic; (4) Identify passages related to the target topic; (5) Identify metaphors within passages related to the target topic; (6) Group metaphors by underlying metaphorical concept; and (7) Determine the frequency of each metaphorical concept within the text.

To address the first step of systematic metaphor analysis, the target topic was gene-editing in agriculture. Regarding the second step, the lead author collected materials and information – academic journal articles, popular press articles, explanatory videos, and interviews with a scientist specializing in gene-editing in plants. To address the third step, this study examined U.S. news media coverage published online regarding gene-editing in agriculture between 2015 and 2019. Countries do not share a common regulatory definition of gene-editing and Americans most often receive science information via non-science, online news sources (Funk et al., 2017; Metje-Sprink et. al., 2019; Shearer, 2018). No articles within the

search terms were published before 2015. Collection ended in 2019 to acquire a manageable sample that still covered several years of gene-editing advancements. Newsbank and Nexi Uni Boolean search keywords were: “gene-editing” or "gene editing" or "genome editing" and livestock or crop* or animal* or plant* or food* and not baby and not babies. The asterisks indicate a wildcard search which returns content in an alternative form of the keyword. Articles returned based on the search criteria were included in systematic metaphor analysis if they primarily described gene-editing in agriculture. Based on the Nexi Uni search results, *The New York Times*, *Washington Post*, and *The Atlantic* were chosen to represent national news media as these U.S. news publications with national readership who published the most articles about gene-editing in agriculture during the time period of the study. *The Associated Press* was included as Newsbank search results indicated many state news outlets across the country picked up stories from this wire service. Based upon this criteria, 26 unique articles pertaining to the study were identified. The *New York Times* published 13 articles; *The Associated Press* published seven articles; the *Washington Post* published four articles; and *The Atlantic* published three articles. The number of texts for analysis is consistent with similar studies (Andriessen & Gubbins, 2009; Broad, 2020; O’Keefe et al., 2015).

To address the fourth step of the process, the body text within the selected articles was read for passages that described gene-editing in agriculture in terms of process or product. These passages were highlighted, then further analyzed in step five, identification of metaphors within the passages related to the target topic. Schmitt (2005) provided the three-part identification formula used to assess the passages for metaphors:

> a. a word or phrase, strictly speaking, can be understood beyond the literal meaning in the context; b. the literal meaning stems from an area of sensoric or cultural experience (source area); and c. which, however, is transferred to a second, often abstract, area (target area). (p. 371)

To satisfy step six of the process, this study utilized a creative, synthesizing approach to sort metaphors by those “belonging to the same image source and describing the same target area are grouped into metaphorical concepts” (Schmitt, 2005, p. 373). All identified metaphors were grouped by metaphorical concept in this fashion. The process of systematic metaphor analysis concludes with determining the frequency of each metaphorical concept within the text. This is an important step even in a qualitative study because the number of instances is an indication of how prolific the concept is in the discourse of the topic (Schmitt, 2005). To enhance dependability, the lead author kept an audit trail with details regarding decisions made about the study (Lincoln & Guba, 1985; Schmitt, 2005). A rigorous three-phase peer review process was established to support the dependability, consistency, and quality in the identification of metaphors and the construction of underlying metaphorical concepts (Creswell, 2007; Lincoln & Guba, 1985; Merriam & Tisdell, 2015; Schmitt, 2005). Peer reviewers included a master’s student studying agricultural communications, three researchers in agricultural communications, and one plant science researcher. To enhance credibility, the lead researcher journaled about the methodological process to bracket personal bias, and the peer review process established consensus of interpretation at the beginning, middle, and end of metaphor identification and conceptual grouping analysis. Referential adequacy further supported the credibility of the study by utilizing low-inference descriptors (i.e., the exact terms used within the selected news articles)

to create the underlying metaphorical concepts. All interpretations of the text always reference the source material (Ary et al., 2010; Schmitt, 2005).

Results

RQ1: Systematic metaphor analysis of 26 online U.S. news articles from four sources revealed seven metaphorical concepts used to describe gene-editing application in agriculture. These seven concepts are the product of grouping individual metaphors in the text into metaphorical concepts, identified by source domain keywords, as presented in Table 1.

Table 1

Metaphorical Concepts Describing Gene-Editing Applications in Agriculture

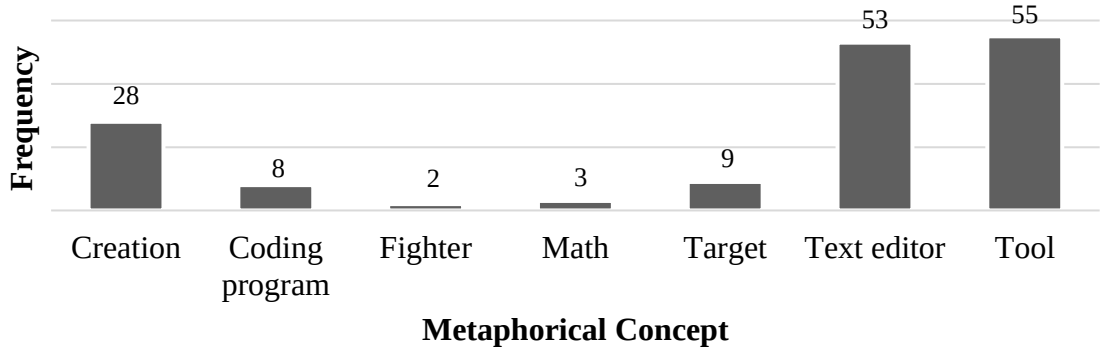
Metaphorical Concept	Source Domain	Presence in U.S. News Media Sources
Creation	Design, reshape, seeds of change, revolution, playing God, precision breeding, rewilding, stream, playing, franken-, science fiction, menagerie, flood	NYT, WP, AP
Coding program	Software, agile programming, big data, styles, pre-coded, on demand	NYT, WP
Fighter	Knocked out, fight	NYT
Math	Add, subtract	AP, NYT
Target	Target, off-target	NYT, WP, AT, AP
Text editor	Edit, copy, cut, paste, find-replace function, delete, template, search and replace function, rewrite, alphabet, word processor	NYT, WP, AT, AP
Tool	Surgically, swap, meld, repair machinery, cut, tool, work, build, snip, tweak, switch, on/off, slice, fix, scissors, tinker, glitch, toolkit, prop up	NYT, WP, AT, AP

Note. U.S. news media sources are abbreviated as follows: *The New York Times*, NYT; *The Washington Post*, WP; *Associated Press*, AP; *The Atlantic*, AT

RQ2: The final step of Schmitt's (2005) systematic metaphor analysis is determining the frequency of each metaphorical concept within the news articles (Figure 1).

Figure 1

Prominence of Each Gene-Editing Metaphorical Concept



Discussion, Conclusions & Recommendations

Previous literature has described gene-editing and CRISPR as code to be translated, blueprints for building organisms, and battles to be won, among other metaphors (Condit et al., 2002; O'Keefe et al., 2015). This study, which looked exclusively at gene-editing in agriculture in online U.S. news, identified some of these same metaphorical concepts as well as new ones. Results indicated seven metaphorical concepts proliferated the articles analyzed, conceptualizing gene-editing in agriculture as creation, a coding program, a fighter, math, targeting, a text editor, and a tool. Practitioners in agricultural communications may choose to use these metaphors in messaging about gene-editing as audiences have already been exposed to these frames and may have previously drawn the connections from what they know to the unknown of gene-editing.

The most frequently used metaphorical concept found in this study was that of gene-editing as a tool. O'Keefe et al. (2015) identified this concept using the term "mechanism", but it was not the most frequently used in their analysis. The tool metaphor is used to convey the action of how gene-editing works, while also signaling the many ways to alter genetic code. For example, "With the ability to cut DNA at a specific site, they can let the cell's DNA repair machinery paste in new sequences, usually a gene of interest, in the process of annealing the two cut ends of the DNA molecule" (Wade, 2015, para. 20). The third most common metaphorical concept in this study, gene-editing as creation, has not been introduced in previous literature. This may be due to the agricultural nature of this study. The duality of the creation concept as positive progress or a moral challenge allows for the exploration of the complexity of gene-editing in agriculture. For example, Chang (2017) quoted her source, "'This is not Frankenfood,' said André Choulika, chief executive of Cellectis, one of the companies developing gene-edited crops" (para. 6). Even each metaphorical concept offers different perspectives on gene-editing, they were also sometimes found together in the articles analyzed. For example, Harmon (2015) wrote "a menagerie of gene-edited animals is already being raised on farms and in laboratories around the world – some designed for food, some to fight disease, some, perhaps, as pets" (para. 5). Here the concepts of creation and fighting are mixed, which requires two different connections between what the audience knows and the unfamiliar concept of gene-editing.

Additional research is needed to explore differences in audience understanding or elaboration depending on use of singular or mixed metaphors to explain complex topics, like gene-editing.

Future research should investigate the effectiveness of each metaphorical concept in terms of causing consideration regarding the topic. O'Keefe et al. (2015) called for metaphors that lead the audience to engage in "thoughtful deliberation" (p. 8). The results of this study identified common metaphorical concepts being used in the popular press, so future research should test these concepts to identify the most effective in causing elaboration regarding the topic of gene-editing in agriculture, thus better informing practitioners. Inherent to systematic metaphor analysis, inferences of the metaphors may be interpreted further or differently by another researcher (Schmitt, 2005). The news articles included in this study represented only online news from four outlets that are all national publications, but all are based on the east coast of the U.S. Further research should investigate if other news outlets, particularly across regions and specialty, which may utilize different metaphors when reporting on gene-editing in agriculture. Longitudinal research should investigate how the metaphors used by mass media change over time as the technology develops and public understanding and opinion evolves.

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A Case Study: Communications Strategies Used To Establish a School Of Veterinary Medicine

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Introduction

In December 2015, the Texas Tech University System first announced their intention to establish a school of veterinary medicine, which would create the second veterinary school in Texas and the thirty-third veterinary school in the United States (Today's Veterinary Business, 2020). While many critical events occurred in the three and half years following the initial announcement, it was not until the final days of the 86th Texas Legislature in 2019 the Texas Tech University School of Veterinary Medicine was formally established. This pursuit to establish a new school of veterinary medicine required a complex communications strategy that sought support from key audiences including the state legislature, philanthropic donors, and the agriculture industry.

Fewer veterinary graduates are going into large animal practices, especially in rural areas (Brusk et al., 2010; Chieffo et al., 2008), creating a growing shortage of veterinarians in rural America. This shortage, especially in the southwest which is home to the nation's highest concentration of livestock (USDA, 2019), was at the core of Texas Tech's drive for establishing a new veterinary school (Texas Tech University, 2018b). A lack of retention in rural areas, especially among experienced veterinarians, has contributed to the shortage (Andrus et al., 2006; Villarroel et al., 2010b). Veterinary students are graduating with more debt than ever before, creating unsustainable conditions for new graduates (Chieffo et al., 2008). Having exposure to rural practices during veterinary school has been identified as a factor in students' interest in pursuing careers in rural areas following graduation (Villarroel et al., 2010a). The veterinary school model pursued by Texas Tech sought to reduce the amount of financial burden commonly associated with the traditional veterinary school path, while focusing on placing large animal veterinarians into rural areas. Texas is the ninth most populous state in the nation in terms of animals per veterinarian (Texas Tech University, 2018a). In addition to the often-understaffed rural practices in Texas, veterinarians are also aging. According to Texas Tech University (2018b), in the rural counties that represent 74% of Texas' counties, 46% of veterinarians are over age 60 compared to just 25% in urban counties. Despite a growing need for veterinarians in rural Texas, veterinary education in the state was not meeting the demand. As a result, Texas has relied on other states to help meet its needs for rural veterinarians.

To establish a new veterinary school in the state, Texas Tech had to secure funding and approval through the Texas Legislature and the state's higher education coordinating board. Embarking on such a campaign effort with a state governing body can be "a long and arduous process involving multiple stakeholders and negotiation between the parties involved" (Dollins et al., 2013, p. 87). The 86th Texas Legislature, which meets biannually, met for regular session between January and May 2019. In June 2019, the Texas Legislature earmarked more than $17 million for the TTU System to establish a school of veterinary medicine. Texas Tech's request for a Doctor of Veterinary Medicine degree program ultimately received approval from the

Texas Higher Education Coordinating Board in December 2019, the final step in formally establishing the Texas Tech veterinary school. Prior to receiving the state funding earmarks, a communications campaign was needed by the TTU System to garner the support necessary to be successful in getting funding from the state. Gaining support from the livestock industry, civic organizations, alumni, and other stakeholders was important to communicate the importance of the effort to state legislators. Campaigns of all types implement carefully chosen strategies to disseminate informational and persuasive messages through multiple channels, including mass media, digital technologies, and interpersonal networks, to targeted audiences (Atkin & Rice, 2012). Selection of succinct and strategic messages is critical. "The campaign must ensure the total dominance of basic messages in the information field to be supported at the level of public opinion" (Oleshchuk, 2020, p. 49). Targeting campaign efforts towards a secondary audience, the stakeholders listed, can lead to a powerful interpersonal influence on the primary audience, legislators (Atkin & Rice, 2012). Stakeholder endorsements through media and fundraising provide evidence to legislators of social movement and support of the campaign (Oleshchuk, 2020). Message sources have been found to influence attitude change (Ruth & Rumble, 2016).

State funding has long been a prominent and debated issue confronting higher education in the United States. Certain attributes of state political systems and institutions affect government spending on higher education in significant ways (McClendon et al., 2009). As such, Texas Tech embarked on a strategic communications campaign to work toward the successful establishment of the state's second veterinary school. Grunig (1992) suggests an organization's ability to identify key stakeholders and develop and maintain a mutually beneficial relationship with these stakeholders is critical to the effectiveness of an organization's efforts. Further, organizations and their stakeholders can affect each other's ability to achieve their goals (Grunig et al., 2002). Such communal relationships between organizations and stakeholders can build trust and support while reducing undesirable behaviors from stakeholders, such as negative publicity (Hon & Grunig, 1999). Examining successful agricultural communications campaigns can provide insight for how other groups can best reach the public and persuade them to support legislation benefiting the industry (Thompson & Rhoades-Buck, 2013).

Purpose/ Objectives

The purpose of this case study was to document and describe the communications strategies used by the TTU System to establish a school of veterinary medicine. The following objectives guided the collection and analysis of data: 1) Identify key audiences of the communications campaign; 2) Describe the communications strategy used during the campaign to establish a school of veterinary medicine; and 3) Describe internal collaborative efforts within the TTU System.

Methods

Case study and focus group methodology were used to understand the planning, development, and implementation of communications strategy of the TTU System when working to establish a school of veterinary medicine. Six individuals, each representing specific roles within the TTU System's efforts to obtain a school of veterinary medicine, were purposively selected to participate in a focus group. These individuals ranged from positions of

administrative leadership to specific staff roles focused on communications. These focus group participants were selected based on their involvement and execution of the veterinary school's communications campaign and because they had certain characteristics in common that relate to the purpose of the study (Krueger & Casey, 2014). The group interview format capitalized on the sharing and creation of new ideas that sometimes would not occur if the participants were interviewed individually (Hancock & Algozzine 2017). Obtaining each interviewee's rendition of the process allowed their perceptions to become the material to be understood (Merton et al., 1990). All invited subjects agreed to participate in the focus group and signed a consent form before the group interview. The focus group lasted an hour and half and was digitally recorded using video and audio technology in an on-campus classroom. Prior to the focus group, three communications staff members who were involved with executing the campaign activities were initially interviewed to gain a baseline understanding of the timeline and process for developing and implementing the communications strategy. These semi-structured interviews (Berg, 2009) provided additional information on which individuals were involved with the process, directed development of the case studies research objectives, and helped in the development of the focus group moderator's guide (Mason, 2002). These initial interviews averaged one hour in length, and all were recorded and transcribed. The data was triangulated with the use of individual interviews, a focus group interview, and official documentation to ensure trustworthiness. The researchers also used member checks following the interviews and focus group, created an audit trail, and addressed bias to ensure transferability (Lincoln & Guba, 1985; Merriam, 1998). All participants were given pseudonyms.

Findings

The first research objective sought to identify the campaign's key audiences. Three audiences were identified: 1) *the Texas Legislature*, 2) *philanthropic support*, and 3) *agricultural industry members*. These key audiences were critical to implementation of the communications strategy because these audiences were stakeholders. Sam, who implemented the campaign's communications strategy from the staff level, said getting buy-in from the state, donors, and the agriculture industry were critical to the initiative's strategy. State legislators were needed to support the initiative, an ask bolstered by donor support to be utilized alongside state dollars. Donors were needed to provide such support and were courted by the idea of becoming a part of a larger vision. The agricultural community at large, and the veterinary community, specifically, were needed for constituent support of the initiative, motivated by transforming education with a brand-new approach to teaching veterinary medicine. The key audiences were stakeholders who were engaged for their interest in the veterinary school.

Research objective two described the communications strategy used during the campaign to establish a school of veterinary medicine. Three themes emerged: 1) *fact-based, tight messaging*; 2) *third-party validation*, and 3) *creating momentum*. Using a consistent, simple message throughout the life of the campaign was the key strategy for the veterinary school's communications efforts. Participants said the campaign focused on the veterinary school being "a good idea" with the facts to back it up. David, who ran communications for the TTU System, said, "The facts supported every message we had from the student and community sides. Financially, we wouldn't be burdening the legislature. For the veterinary community, it would be transforming the way education was delivered. With donors, it allowed them to be a part of a big

vision." Tate, a fundraising administrator, said the initiative had a tight message from day one, and he always felt prepared and confident in donor meetings. "Not only did we have the message, but we had the facts and the perfect answers to all the questions. That influenced all of the messaging." While the campaign experienced different phases, including multiple state legislative sessions, a "pause" phase, and a change in system leadership, the same tight message was used throughout. When the Texas Legislative Session was about to make a crucial vote on the state budget that would provide state funding for Texas Tech's initiative to establish a veterinary school, the communications strategy focused on using the voice of Texas Tech pre-vet students to drive home the need for another veterinary school in the state. Op-ed pieces written by pre-vet students were placed in newspapers located in each state representative's district. These coordinated and timely messaging efforts across the state were not a coincidence. Anne, a system administrator, said, "Nothing happened on accident." Participants said success was easy when a tight message was maintained and when the team is working well together.

The use of external individuals and organizations to carry messages of support for the veterinary school initiative was crucial to the success of the communications strategy. This *third-party validation* was founded through a combination of livestock industry organizations, reputable opinion leaders, donors, and grassroots stakeholders. Kate, a system employee with livestock industry experience, said it was important to build awareness about the effort to establish the veterinary school through those who had "skin in the game". David added it was much more impactful to have others carry that message forward. Getting endorsements from key industry organizations helped validate the effort during the early stages of the campaign. This support from leading state industry organizations was crucial in gaining credibility among the livestock and veterinarian communities, while setting the narrative for how the new veterinary school would be meeting a critical need in the industry. TTU System personnel made presentations about the proposed veterinary school at two key state livestock organizations and the state's largest agricultural advocacy organization's policy meetings. Following these efforts, all these organizations officially endorsed the Texas Tech veterinary school. Kate said industry groups carried the message forward when the TTU System couldn't. *Third-party validation* also came from public and private donors, which were instrumental in carrying the message of the initiative. The initial gift from a reputable beef packer in the Texas Panhandle essentially "broke the ice" and opened the door for other donors to follow. Each time a gift was made to the veterinary school's fundraising efforts, a press conference was held to capitalize on every "win." Additionally, backing from influential civic organizations in the city where the veterinary school would be located was important. Participants mentioned the importance of *creating momentum* by activating previous relationships and organizations affected by the result of a veterinary school, specifically through fundraising, which Sam said was "tied at the hip" with communication efforts. The driving force of combined fundraising and endorsements grew enough to overcome obstacles and challenges the initiative faced from both internal and external forces. Participants said building upon successes throughout the campaign was critical. Specific milestones were set in terms of fundraising, industry endorsements, and the legislative session, and momentum was built every time a milestone was reached. David said by the beginning of the legislative session, the effort had to hit several benchmarks, each with its own communications strategy. Sam said momentum from fundraising led to endorsements from key agricultural industry groups in the state. The team operated on the philosophy that with an increasing number of endorsements and effective fundraising, success during the legislative session would come.

Research objective three described internal collaborative efforts within the TTU System and how key personnel rated their effectiveness. Two themes emerged: 1) *constant internal coordination* and 2) *an expectation of excellence*. The core team working to secure the veterinary school was very intentional about maintaining high-quality internal collaboration. Anne said it was "easy to maintain a tight message when everyone was working toward a common goal." Participants said having a core team that was "always on the same page" was critical to overcoming some of the significant challenges endured during the campaign. Sam said being intentional in their internal communication was essential. "Internal communication was the unsung hero of all of this. There was a core team with an agenda, and everyone had an expectation that intentionality allowed us to go forward." Participants said while the effort was all-consuming across campus, the "all boats rise" benefit of the veterinary school became the internal message system-wide. Anne said, "The vet school was no one's full-time job, but you couldn't have an external team come in and do this. This was the first time Texas Tech thought they could do something like this, and there was a learning curve for internal audiences, too." The second theme was an *expectation of excellence* among those involved in the campaign. The immense buy-in by internal personnel fueled the entire team to rise to level of excellence needed to execute the strategy. In discussing the management information flow and workload internally, participants agreed there was always an expectation that everyone's efforts were for the greater good. They said it meant the team was moving forward, in sync, together each day. Tate said this expectation of excellence was a standard set by the core team that rippled throughout the "cast of 100s." David added, "Our intentions were pure, and we had good leadership."

Conclusions/ Recommendations/Implications

This case study examined the communications strategy behind the initiative to establish a school of veterinary medicine at Texas Tech and found important and effective communication strategies for influencing both public opinion and legislative action. The findings of this case study have implications in higher education as well as industry public relations and campaign initiatives. The impact of the state legislature was critical to Texas Tech's ability to successfully establish a school of veterinary medicine (McLendon et al., 2009). Gaining support from the legislature came from a coordinated effort that consistently communicated the veterinary school's potential value to rural Texas, students, and the animal agriculture industry. A critical component to the campaign's success was the ability to have stakeholders carry the message on behalf of Texas Tech, which supports Ruth and Rumble's (2016) recommendation that message sources influence attitude changes. As institutions seek to add new schools, regardless of their focus, these communication strategies can be useful in shaping campaign efforts. All participants noted the importance of maintaining tight messaging as well as a core team to execute the campaign. Because university systems are made up of many employees and levels of leadership, this is an important finding and recommendation to institutions when pursuing significant initiatives or additions to their system, especially if there are competing institutions in the state. The emphasis on building momentum and credibility through industry endorsements and fundraising efforts highlights the importance of possessing established relationships *prior* to a campaign effort (Atkin & Rice, 2012; Grunig et al., 2002; Oleshchuk, 2020). Higher education institutions should always work to maintain relationships with the private sector to not only establish credibility, but to harness the value of stakeholder support (Hon & Grunig, 1999). Future research should include a content analysis of news articles about the campaign's efforts to

gain a better understanding of the media coverage and its influence on key audiences. Additionally, survey research design could be utilized to explore roles and perceptions of the campaign from the "cast of 100s" involved with deploying the communication strategies. Interviewers with stakeholders and legislators who received campaign messages would help determine message factors most significant in impacting their support of the veterinary school initiative.

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Application of the Theory of Planned Behavior: Exploring Utah Stakeholders' Intentions to Implement Farm to School Programming

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Introduction/Theoretical Framework

The National Farm to School program (FTS) has grown to 42,587 schools nationwide (National Farm to School Network, 2019). This organization works to improve economic development and public health in communities by connecting local food producers with schools and early care and education sites to provide fresh, nutritious foods to students (National Farm to School Network, 2020). FTS programs include growing school gardens and teaching about food, agriculture, health, and nutrition. Nationwide FTS programs benefit students through positive impacts on public health: students' willingness to try new foods, lower incidents of obesity and diabetes, increased daily servings of fruits and vegetables, and meal preparation (Anupama et al., 2008, Birch & Ventura, 2009; National Farm to School Network, 2020). FTS also offers local economic benefits through job creation and local food sourcing; educational benefits related to experiential learning (National Farm to School Network, 2020). The most successful FTS programs obtained support from multiple sectors within a school (parents, food service directors, teachers, administrators) and the community (distributors, economic developers, health advocates, policymakers, farmers, farm agencies, banks, media) (Joshi et al., 2014). Approximately 84% of Utah's school districts completed the 2015 Farm to School Census, which inquires about their participation in FTS programming. Of those districts that responded to the census, 35% participated in FTS activities and 17% planned to start FTS activities in the future (Food and Nutrition Service, 2015). Additionally, 82% of farmers who participated in the quantitative research (n = 100) had not participated in FTS. For the benefits of increased fruit and vegetable consumption and support of local economies to occur, farmers, school principals and child nutrition professionals are essential roles. It's imperative to know what drives farmers and school principals to participate or not participate in the Utah FTS program.

This research was conducted through the lens of the theory of planned behavior (TPB) (Ajzen, 1991). This theory is effective at predicting individuals' intention to implement a behavior based on several factors, which include their attitude toward the behavior, the subjective norms for the behavior, and the perceived behavioral controls (Ajzen, 1991; Armitage & Conner, 2001). Montanaro et al. (2018) suggested interventions geared toward all TPB constructs will be more successful in changing behavior. As Utah FTS establishes opportunities to increase participation statewide, understanding the attitudes, norms, and perceived behavioral controls that will influence the intentions of principals and farmers to participate in FTS programming will be necessary to guide those opportunities.

Purpose/Objectives

This research is part of a larger 5-year study exploring FTS programming among K-12 principals, K-12 teachers, food service directors, farmers, and Extension agents. This manuscript focused on the role of school principals and Utah farmers. The objectives for this research are to:

1. Determine attitudes toward FTS programming

2. Explain subjective norms that influence participation in FTS programming
3. Discover perceived behavioral control and participation in FTS activities

Methods/Procedures

This research follows a multilevel, mixed methods, sequential design (Teddlie & Tashakkori, 2009). The qualitative interview data with K-12 principals was collected at one level of the analysis, and the quantitative survey data from farmers was collected at another level of analysis. This data from different levels were merged during interpretation (Creswell & Plano Clark, 2007). The interview guide and survey development process included a literature review, feedback from a 5-expert panel, and approval from the institutional review board. Purposive sampling identified principals who served one full year as an administrator at a Utah high school, junior high school, elementary school, or charter school, using the Utah State Board of Education directory. A purposive sample of principals who were involved in FTS programming during the school year and principals who were not involved in FTS programming during the school year were initially contacted. Data saturation was met after interviewing four principals whose schools participated in FTS and three principals whose schools did not participate. The Utah Farm Bureau was selected because it's the largest organization representing the state's farmers and ranchers "for the purposes of addressing problems and formulating action to achieve educational improvement, economic opportunity and social advancement and, thereby, to promote the national well-being" (Utah Farm Bureau, 2016, para. 3).

Qualitative data was collected from [State] K-12 principals through semi-structured telephone interviews. Each interview lasted 30 minutes and followed an interview guide. The interview guide began with demographic questions and school characteristic questions. Qualifying questions were asked about the school's participation in FTS during the school year, which guided the rest of the interview. Interviews were audio recorded and notes were taken by the interviewer, which assisted with verbatim transcription. Participants were protected by use of a study identifier. Establishing trustworthiness is important to qualitative research (Lincoln & Guba, 1985). The researcher notes and audio transcriptions were used to establish credibility of the data. Transferability was established through thick description, and confirmability was established through an audit trail. The qualitative data were analyzed using NVivo 9.0. Open coding formed initial, major categories based on TPB constructs. Then axial coding reanalyzed the categories to discover specific categories (Creswell & Poth, 2018).

In accordance with the Tailored Design Method, farmers were contacted three times to achieve a higher response rate with the online survey (Dillman et al., 2014). Utah Farm Bureau protects membership information, so the vice president of communication sent one introductory email and two reminder emails with a clickable link to the survey. To encourage participation, participants could voluntarily enter their name into a drawing for one of four Amazon Fire Tablets. A total of 143 online survey responses were complete. The researchers accounted for nonresponse error by using the chi-sqaure test to report no significant differences between early and late respondents (Lindner et al., 2001). Descriptive statistics were used to summarize quantitative data. Utah farmers' attitudes, subjective norms, perceived behavioral control, and FTS participation were compared with those of the principals from Utah school districts to discover any common themes among the two stakeholders.

Results/Findings

Determine Attitudes toward FTS Programming

Overall, six principals had positive attitudes about FTS even while two principals were unsure of everything FTS encompasses due to their lack of experience with the program. It's worth noting that much of the positive attitude was directed more at farming and its importance. Principals' positive attitude seemed more directed toward students making connections about where their food comes from. Principal 2 said "I have a very positive attitude about it… I think it's great we are supporting local farms by buying produce as schools and selling it to local kids. It's a connection." Principal 7 shared a similar attitude by saying: "I think students need to understand where their food comes [from] and how important farming is." Principal 5 said "I guess I am curious right now, but other than that I haven't had time to develop an attitude toward FTS. I am not [averse] to the program yet." For the Utah farmers, attitude toward FTS programming was measured with eight items using a 7-point bipolar attitudinal scale with the following anchors: good/bad, negative/positive, beneficial/harmful, useless/useful, valuable/worthless, difficult/easy, relaxing/tense, and uncertain/secure. Respondents also reported a slightly positive overall mean of 5.79 (n = 143, SD = 1.16) for their attitude toward FTS programming. Five of the eight dichotomous pairs had a mode of 7, the most positive response possible: good, positive, beneficial, useful, and valuable (Hawley, 2017).

Explain the Subjective Norms that Influence Participation in FTS Programming

Five principals mentioned that parents would support FTS programming, while four principals acknowledged their schools would need the support of their teachers to implement FTS programming. However, two principals said teachers might be resistant if they need to teach additional curriculum or use their own money for curriculum and materials. For example, Principal 3 mentioned:

> My second-grade teacher does a lot with that; he has a farm on the side. He does a lot with animals and trying to bring that into his students' lives. I would say that 75%-80% of my teachers would be interested depending on the level of support and information they were given. A lot of them have grow boxes and things that they show kids how to grow plants like that as a part of their science curriculum.

Principal 1 mentioned the support of the school board, school district, and parents:

> I think it would have to have some sort of support in the school board and district level… I believe that there would be a significant number of parents who might be interested in that. I don't know if it would be a majority or not. We don't have the good of PTAs anymore at high school level. We have more community councils, and I am thinking about who is my community council. There would be two or three members there with a rural enough background that they would probably be interested in a program like this.

Principal 5 said parents are a subjective norm that would influence FTS adoption: "I am certain there are parents that would support it, or they wouldn't be against it. I am not sure there would be parents that would be willing to volunteer time if that was necessary."

Only two principals mentioned the connection of local farmers needed. Principal 2 suggested how farmers could be involved by saying "We have an environmental science class we

teach; a botany class we teach. Both of those could have farmers come up." However, support from agricultural organizations, such as Wasatch Community Garden, Thanksgiving Point, and Utah Agriculture in the Classroom, influenced involvement in FTS programing at two schools.

Five subjective norms influencing Utah farmers to participate in FTS programming were measured using a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The subjective norms were agricultural professionals (Extension educators, agricultural educators), family members, farmers, school officials (principals, teachers, board members), and policy makers (city, county or state elected officials). Overall, respondents neither agreed nor disagreed that these individuals would want them to be involved in FTS programming (n = 120, M = 3.30, SD = 0.65). Seventy-three respondents were neutral about school officials wanting them to be involved in FTS programming (61.9%).

Discover Perceived Behavioral Control and Participation in FTS Activities

Two principals described how their school garden complemented classroom instruction or provided fruit in the cafeteria; however, one principal did not know that gardening is considered an FTS activity. Principal 6 described the school garden:

> We have [an] AmeriCorps volunteer coordinator who also provides some instruction to kids concerning growing seedlings, how to plant things, how to irrigate, weed, how to compost things in the garden, and also how to harvest things. So, they have salad parties or activities out there and science lessons that are either taught by volunteers or by Janet, our garden steward. Our teachers also use the garden as an outdoor classroom and take science instruction outdoors and actually provide it in the garden area.

Principal 7's school provided different grades opportunities to learn about agriculture:

> Our second grade will visit a pumpkin patch every year, and they bring home a pumpkin from the pumpkin patch that's grown by local farmers here in San Pete. Our third graders right after the fair is over, our county fair, they have these house-looking booths where students rotate through and learn about different types of farming and what comes from farms and what's grown whether its beef or whether its vegetable or fruit or milk. They call it farm day. I believe our pre-school students visit a farm.

Three principals were not confident about their schools' ability to implement FTS in the future, and lack of information about FTS activities was as a potential reason as to why they weren't sure. Principal 3 said "I don't know if in the near future, but there is always a possibility. Partly because we haven't received a lot of information about it or requests to participate in any programs to get in to." Budgetary restrictions, time constraints, and personnel for oversight are factors that would restrict FTS program implementation.

Twenty-one farmer respondents (17.4%) have participated in FTS programming. Fifteen respondents (12.5%) visited a classroom to discuss farming or other local food topics, and 13 (10.8%) hosted a guided farm tour. A majority of farmers had not participated in FTS programming (n = 100, 82.6%). Those who indicated no participation had not heard about FTS programming (n = 33, 36%) and did not think it was offered in their area (n = 9, 10%). Twenty-five respondents (28%) indicated other reasons for not participating, such as not raising food products, volume, liability, and seasonal production.

Conclusions/Recommendations/Implications

Principals recognize the benefits of FTS for their teachers and students and have a positive attitude toward participating in FTS. Farmers exhibited positive attitudes toward FTS although, like the principals in this study, the majority had not participated in FTS. More principals expressed that their teachers and parents would support FTS, yet few principals mentioned farmers, Extension agents, and agricultural educators as subjective norms that would influence FTS participation. Contrastingly, Hawley (2017) found that farmers' participation in FTS is influenced by other agriculturalists and suggested that communities could also influence them. While nearly half of the farmers felt confident, they could participate in FTS, the principals in this study were less confident. Three principals were unsure of their potential for participation, citing lack of information to make a decision. This finding suggests a disconnection between farmers' and principals' abilities to make decisions about participation in FTS. Principals stated reasons their perceived behavioral control was less, including the lack of information, curriculum requirements, school budget, and the need for resources. It is worth considering that farmers are capable of making the decision to participate in FTS programs; however, it is unclear who makes the final decision within a school. Is the principal able to make the decision to participate in FTS, or is it the decision of the teachers, district, or child nutrition professionals?

For Utah FTS to expand their reach across school districts and connect local farmers to potential outlets for their products, more information needs to be shared with those individuals who ultimately make the decision to participate. Disseminating information about FTS to school districts and farmers, inviting them to participate is key to recruiting more schools and farmers into FTS programming. Agricultural educators, Extension professionals, and Agriculture in the Classroom staff are subjective norms who could be the missing link between farmers and schools who wish to participate in FTS programs. Extension can offer mingles or workshops where farmers and school administrators can come together and discuss FTS and what they bring to the table. Agriculture in the Classroom, high school agriculture teachers, and Extension 4-H programs have gardening, physical supplies, and curriculum so that principals and their teachers are not as overwhelmed with implementing FTS activities.

Findings from this study suggest that some schools are participating in FTS activities but are unaware such activities fall into the realm of FTS. Research should also discover teachers' knowledge and interest in FTS programming, as well as other stakeholders such as parents or parent teacher organizations. Research must also focus on school district administration to determine what necessary steps must be taken to increase implementation of FTS programs in public elementary, middle and high schools, as well as charter schools. Research should include students and their experiences with FTS programing and curriculum. Studies comparing those communities that participate in FTS and those that do not should be conducted, discovering economic contributions of FTS and the impact on community public health, wellbeing, and agriculture literacy. Inquiry into county Extension's programs should be carried out to determine their influence and contributions to FTS participation. However, until there are more schools and farmers working together in this program, it is difficult to determine the overall impacts that FTS has in Utah.

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Tis the Season for the Warm Embrace of Kith and Kin: Organizational Culture in Western Region AAAE Programs

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Introduction

The demand for teachers is real. Amondson (2019) stated that "The need for teachers is universal, regardless of economic conditions and political climates" (p. 1). Statistics have shown an alarming decline in enrollment in educator preparation programs (Amondson, 2019). Developing educator preparation is necessary for meeting the supply and demand need in education. Not unlike education in general, the demand for qualified teachers in school-based agriculture education (SBAE) programs has increased (Lawver et al., 2018). This phenomenon is faced with a decreasing number of individuals pursuing agricultural education as a career choice (Thieman et al., 2016). In the 101 institutions offering a degree in agriculture education, only 92 graduated at least one qualified teacher (Lawver et al., 2018). According to the Status of U.S. Supply and Demand for Teachers of Agricultural Education, 2014-2016 report, some programs have produced as many as 128 license eligible completers within a four-year program while other programs produced very few (Lawver et al., 2018). Eck and Edwards (2020) reminded us that the SBAE teacher shortage is not a new phenomenon.

The American Association of Agricultural Education (AAAE) calls for research to determine the methods, models, and practices necessary to recruit and support teachers and extension agents in agriculture education (Stripling & Ricketts, 2016). In their call for continued research in agriculture education, Roberts and Dyer (2004) summed it up by stating, "Creating effective agriculture teachers is imperative for the long-term sustainability of agriculture education programs" (p. 94).

Culture is a product of the environment over a long period of time and develops in most cases without conscious (Deshpande & Webster, 1989). An organization's effectiveness can be determined by its culture (Cameron & Quinn, 2011; Saffold, 1988). Research has suggested that a positive correlation existed between the strength of an organization's culture and the consistency of an organization's performance outcomes in relatively stable environments (Sorensen, 2002). Smart and John (1996) found a distinct connection with the organizational culture and the effectiveness of the organization. According to Cameron and Quinn (2011), the effectiveness of an organization was influenced by organizational culture.

In most universities, academic programs are offered and managed by academic departments which are subsets of academic colleges, which are subsets of universities.

Organizational culture may be stable and pervasive within academic program areas. However, academic programs exist within a larger system and are likely affected by structural dynamics within the larger system. Thus, selective admissions criteria, lower student demand, rising costs, pressures to publish, and expectations by administrators to bring in external funding likely influences organizational culture over time.

Theoretical Framework

The theoretical framework used to guide this research is Cameron and Quinn's (2011) Competing Values Framework (CVF). Culture is manifested in the ways in which organizations conduct business, treats its stakeholders, the degree of autonomy it provides its members, information flow within the organization, power structures, and member commitment (Boyd & Strong, 2020). Cameron and Quinn proposed that culture falls within four quadrants on an *x* and *y* axis. Clan culture (top left quadrant) is a collaborative culture with a balance between flexibility/discretion and internal focus/interactions. Adhocracy culture (top right quadrant) is a balance between flexibility/discretion and external focus/differentiation. Market culture (lower right quadrant) is a balance of external focus/differentiation and stability/control. Lastly, hierarchy culture (lower left quadrant) is a balance of stability/control and internal focus/interactions (Cameron & Quinn, 2011). By recognizing the type and strength of the organizational culture, an organization can institute change that will allow for more efficient goal attainment (Cameron & Quinn, 2011). Boyd and Strong (2020) suggested that culture is a complex construct that many confuse with an organization's philosophy, climate, or values. Boyd and Strong (2020) stated that "culture underlies and largely determines these other variables" (p. 233). Cameron and Quinn (2011) asserted that the strength of an organization's culture can be determined by smaller differences between its present and preferred culture as determined by its members.

Purpose of Study

The purpose of our study was to describe the organizational culture of AEPPs in the United States. Our research objectives were to identify organizational culture by AAAE region and determine the strength of organizational culture by region.

Method

We used survey methodology with non-probability sampling to gather data for this study in Spring 2019. The Organizational Culture Assessment Instrument (OCAI), derived from the CVF, measures four types of culture which we referenced in the theoretical framework section (Cameron & Quinn, 2011). The OCAI is a widely used instrument in both the public and private sectors (Cameron & Quinn, 2011; Thakar, 2010; Yu & Wu, 2009). Using the AAAE online directory, we identified 102 universities that offered teacher education programs in agriculture. We cross-checked the faculty profiles on university websites to identify potential participants by the courses that they taught and their programmatic research. The target population was represented by 382 professors, instructors, and administrators who contribute to the instructional function of an educator preparation program. Of the 382 contacted by email address, 93 (24%)

confirmed their participation in an educator preparation program, voluntarily agreed to participate in the study and are considered the accepting sample.

The OCAI operationalizes culture in four domains (Clan, Adhocracy, Market, and Hierarchy). Participants used an equal-appearing interval scale to identify the items that were most like their organization (Quinn & Spreitzer, 1991). The strength of culture was determined by comparing the self-perceived ratings on the items with the participants' preferred ratings. The more closely related the ratings within a culture type, the greater the strength of the organizational culture (Berrio, 2003). Prior researchers established the psychometric values of the OCAI as being both valid and reliable, justifying the applications to this research (Cameron & Quinn, 2011; Helfrich et al., 2007; Lamond, 2003; Thakar, 2010; Yu & Wu, 2009). Our post-hoc reliability confirmed the internal consistency with the accepting sample.

Results

In terms of academic rank, most self-identified as professors (n = 32), followed closely by associate professors (n = 28), and assistant professors (n = 21). Most reported both instructional and research (n = 42) expectations. The participants averaged 14.54 years in higher education and 10.21 years of experience at their present university. Faculty in the North Central region reported the least longevity with 11.54 years of experience and 8.04 at their current institution (n = 24). The North Central region also reported the least number of professors and associate professors at three and eight respectively. Faculty in the Western region reported the highest average years of service at 18.64 and 14.08 at their present university. Of the 26 participants in the Western region, 13 were professors. The Southern region had the greatest number of participants at 43. Their longevity was 14.81 years and 9.33 years at their current university. Faculty in the Southern region reported the highest percentage of professors and associate professors at 77%.

Perceived scores reflect how the individual perceives the culture in their academic unit presently. Collectively, clan (M = 3.31, SD = 1.25) was the dominant perceived culture across AEPP faculty (n = 93) participating in this study (Table 1). Preferred scores reflect how the sample would prefer the culture to be in their academic unit. The preferred organizational culture of the collective was also clan (M = 4.37, SD = 0.92). The strength of organizational culture is measured by how closely the perceived and preferred cultures are rated. There was greater disparity in the clan culture than any other cultural domain (Σ = 1.16).

Table 1

Dominant Organizational Culture Types and Strengths in the Unites States (N = 93)

Cultural Type	Perceived		Preferred		Strength
	M	*SD*	*M*	*SD*	*Σ*
U.S. *(N = 93)*					
Clan	3.31[a]	1.25	4.37[b]	0.92	1.16[c]
Adhocracy	3.12	1.02	4.10	0.88	0.98
Market	3.30	1.04	3.98	0.85	0.68

Hierarchy	3.25	0.97	3.85	0.93	0.06
North Central (*n* = 24)					
Clan	3.29	1.07	4.45[b]	0.75	1.16[c]
Adhocracy	3.16	0.75	4.08	0.74	0.92
Market	3.39	0.87	3.90	0.65	0.51
Hierarchy	3.39[a]	0.73	3.81	0.88	0.42
Southern (*n* = 42)					
Clan	3.30	1.22	4.33[b]	0.90	1.03[c]
Adhocracy	3.21	1.06	4.15	0.89	0.94
Market	3.41[a]	1.08	4.03	0.88	0.62
Hierarchy	3.32	1.02	3.87	0.89	0.55
Western (*n* = 26)					
Clan*	3.67[a]	1.03	4.65[b]	0.35	0.98[c]
Adhocracy	3.48	0.77	4.26	0.49	0.78
Market	3.56	0.75	4.20	0.50	0.64
Hierarchy	3.44	0.64	4.10	0.53	0.66

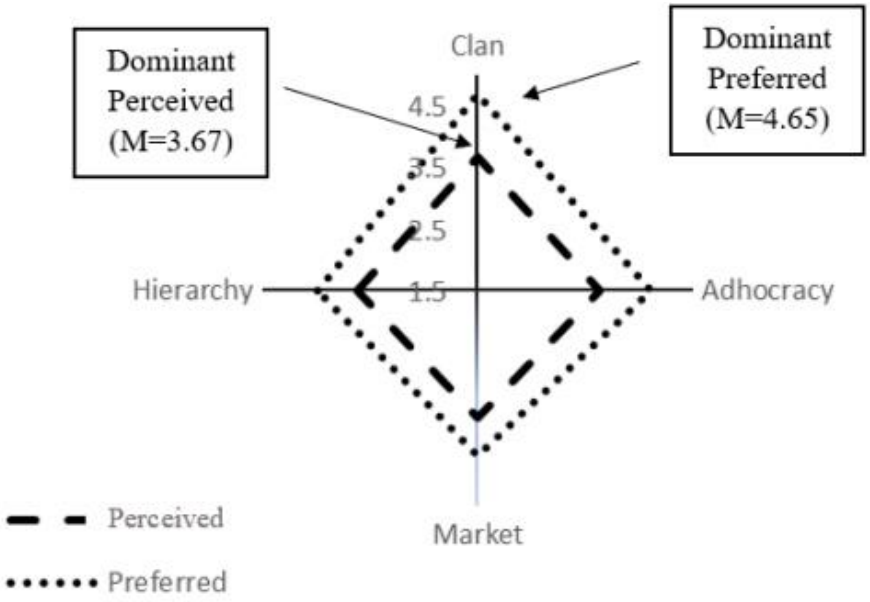
Note: [a] = Dominant perceived culture, [b] = Dominant preferred culture, [c] = Magnitude of culture (greater absolute values reflective of lesser cultural strength)

The data was disaggregated by AAAE region (North Central (n = 24), Southern (n = 42), Western (n = 26) and each regional culture is described below. In the North Central region, hierarchy was the dominant perceived culture (M = 3.29, SD = 0.87), while clan was the dominant preferred culture (M = 4.45, SD = 0.75). There was greater incongruity in the clan culture than any other cultural domain (Σ = 1.16). In the Southern region, market was the dominant perceived culture (M = 3.41, SD = 1.08), while clan was the dominant preferred culture (M = 4.33, SD = 0.90). Once again, there was greater divergency in the clan culture than any other cultural domain (Σ = 1.03). In the Western region, clan was both the dominant perceived culture (M = 3.67, SD = 1.03), as well as the dominant preferred culture (M = 4.65, SD = 0.35). There was a greater discrepancy in the clan culture than any other cultural domain (Σ = 0.98).

A visual display of the Western region data is contained in Figure 1. Although clan is the dominant culture in the region, the other three domains are minor, but important. Market is the strongest culture (Σ = 0.64) and was the second highest perceived culture by the participants. A market culture differs greatly than a clan culture. Market cultures are externally focused and competition is valued, whereas clan cultures are internally focused and collaboration is valued.

Figure 1

Perceived and preferred culture in Western Region AAAE (n=26)



Conclusions/Implications/Recommendations

This study revealed that clan culture was the more dominant culture dynamic across AAAE, which aligns with previous research in higher education (Berrio, 2003; Smart & Hamm, 1993; Smart & St. John, 1996). The strongest cultural domain across regions was the market culture. The clan culture domain is defined as seeming more like an extended family while the market culture domain is focused on conducting transactions, competitiveness, and productivity (Cameron & Quinn, 2011). This dynamic was true in the Western region where clan culture was perceived as the dominant culture and preferred as the dominant culture, however the strongest relative cultural domain was the market culture. The clan culture was not the perceived culture in the North Central and Southern regions.

Boyd and Strong (2020) reminded us that ethical leaders: (1) do not confuse culture with climate, values, or philosophy, (2) view culture more broadly than a function of human resources, (3) recognize that culture is not easily manipulated by a leader, (4) understand that culture is most closely related to strategic intent, and (5) realize that culture has a deep and pervasive influence on the efficacy of an organization. Thus, what are we to do with culture? Can culture be leveraged by a leader to achieve strategic outcomes like student enrollment, research output, or increasing extramural funding? We say likely not, at least not directly.

Culture likely has an indirect effect on these outcomes in that is a deep-seated situational variable that moderates leader behavior, the influence process, and follower attitudes and behaviors. Thus, it needs more rigorous correlational research over time. Comparisons of the role that culture plays with the players within academic programs over time within agricultural teacher education programs and between agricultural teacher education programs, and common agricultural leadership, and agricultural communications programs, followed by structural equation modeling might begin to explain the complex culture in which we operate. More

broadly, is our dominant culture in the agricultural sciences different from dominant cultures in business, architecture, or music?

Research on culture within career and technical programs at the school-based level might also shed light on how we better recruit students into our program and prepare them for success in our professional preparation programs in higher education. Finally, is our culture within higher education programs fundamentally shaped by our shared school-based experiences, particularly those in FFA and 4-H? Only by probing deeper in this fascinating concept of culture can we begin to understand how culture might mediate or moderate our professional practice of preparing the next generation of school-based teachers.

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Changes in Academic Rigor and Faculty Perception of Student Learning During Covid-19

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Introduction

The Covid-19 pandemic created unprecedented challenges for all sectors of society, especially post-secondary education. The environment created by Covid-19 did not allow for face-to-face instruction, forcing institutions to adopt online learning and adapt courses to fit an online model. To achieve continuity in education amidst this abrupt transition, faculty and institutions experimented with different technology, including software and social media platforms (Carrasco et al., 2021; Tasci et al., 2021), during the pandemic. The changes faculty made in response to Covid-19 likely impacted student's learning experience.

Online learning in post-secondary education existed before the Covid-19 pandemic. Online courses are often offered to relieve "non-traditional" students of the simultaneous burdens of working and raising children; to offer commuter students flexibility in attending classes; or for those who want more flexible class times (Dutton et al., 2002). Offering online courses has increasingly become an expectation of post-secondary institutions and faculty as society becomes more technologically dependent. A critical factor regarding the success of online learning is the ability to foster student engagement in a geographically dispersed classroom. Bernard et al. (2009) reported that consistent and strong interaction in online courses encourage more positive perceptions of online learning and improved outcomes of student learning. Existing literature documents mixed reviews of student perceptions to online learning. A study conducted by O'Malley & McCraw (1999) indicates that students felt an online environment made contributing to discussions more difficult and forced behavioral changes. These same researchers also reported that students did not want more online classes to be offered at their institution and ultimately suggested that online learning provides no advantage to students.

A key factor of student satisfaction with online learning is support. Providing students with instructional, peer, and technical support can optimize learning experiences, especially in an online context (Lee et al., 2011). Previous research evaluating student perceptions in an undergraduate online course indicates that overall satisfaction of the course was significantly related to support received (Lee et al., 2011), demonstrating that student support in an online environment is paramount to the learning experience. Online learning was on the rise before Covid-19 (Quezada et al., 2020) and we anticipate the pandemic accelerated institutional adoption of online learning. Since adopting online learning was necessary during Covid-19, it is imperative to understand the changes in academic rigor, perceived impacts on student learning, and how to ensure the continuity of education by maintaining the same level of learning as we move towards a new era of online education.

Theoretical Framework

The theoretical framework supporting our research is the Academic Communities of Engagement (ACE) model (Borup et al., 2020), which focuses on how educational institutions can provide guidance to faculty on best practices to provide students with instructional, peer, and technical support with the ultimate goal of maximizing student's academic success and engagement (Borup et al., 2020). Student engagement is associated with positive educational outcomes, such as academic achievement. The ACE model specifically focuses on academic engagement on a student level which involves student participation in activities within a course as opposed to participation in extracurricular activities. The ACE framework was especially relevant during Covid-19 as institutions and educators needed to provide students with multiple forms of support to ensure sustained engagement in courses, position students for academic success, and maintain academic rigor regardless of mode of instruction.

Purpose and objectives

The purpose of this study was to evaluate how Covid-19 impacted faculty-driven alterations in academic rigor and perceptions of student learning at the post-secondary level. To achieve this purpose, our objectives were to: 1) determine how and why faculty altered the level of academic rigor in courses in response to Covid-19; and 2) evaluate faculty perception of student learning in courses taught during the pandemic. These purpose and objectives align with the National Research Agenda of the American Association for Agricultural Education's focus on the use of technology in online learning environments (Roberts et al, 2016).

Methods

This study was part of a larger study that employed a mixed methods approach to data collection, facilitated through an electronic survey-based questionnaire. The questionnaire was designed to assess the impact of Covid-19 on teaching in agricultural-based disciplines in higher education. The Texas State University Institutional Review Board approved this research as exempt (#7380) and all participants were provided written informed consent prior to participation. The population was faculty and instructors who held a formal teaching appointment based in agricultural sciences during the Covid-19 pandemic (spring 2020, summer 2020, fall 2020) at colleges and universities across seven southern states. Our participants were identified by searching college and departmental websites in the target states, conducted in summer 2020. Using a total population of 1,795 faculty and instructors, a sample size of 317 with a 95% ± 5 confidence interval was calculated.

Data was collected using a researcher-developed instrument that contained five sections. Section 1 consisted of questions about personal and institutional demographics. Section 2 consisted of questions related to training in teaching. Section 3 consisted of questions related to the use of technology before and as a result of Covid-19. Section 4 consisted of questions related to teaching experiences during Covid-19, including questions related to course and career impacts. Finally, Section 5 consisted of questions about future training and professional development in relation to online teaching. The data presented here are from Sections 1 and 4.

Following recommendations of Gates et al. (2018) on establishing a face-validated instrument, we identified a panel of experts outside of the research team and participant group. The panel included ten Agricultural Education faculty with expertise in survey design and online teaching. The panel assessed the questionnaire for face, content, and construct validity. Based on initial panel recommendations, we revised the questionnaire and resubmitted it for further review until the final version was approved. To establish reliability, the questionnaire was piloted by agriculture faculty from multiple sub-disciplines who were not part of the research team, participant group, or expert panel. Out of 14 faculty identified for reliability, eight responded for a response rate of 57%. Data from the pilot study were coded and entered using the Statistical Package for the Social Sciences (SPSS) 25.0 software. We calculated a Cronbach's alpha reliability coefficient ($\alpha = 0.790$) which, based on interpretations provided by George & Mallery (2003), was *good*.

Our questionnaire was available to participants from early September to mid-October 2020. Dillman et al. (2014) recommends the use of a five-point contact data collection model, including a prenotice, the questionnaire, a reminder, a second reminder, and then the invocation of a special procedure during a five-week window. Using Qualtrics, we sent a prenotice to 317 participants. Three days later, we sent an email containing the link to access the questionnaire. Over the next three weeks, we sent three reminder emails to non-respondents. Two hundred and fifty-five participants provided usable data and eighteen participants did not teach in the spring of 2020; overall, our response rate was 86.1%. With a response rate exceeding 85%, no additional procedures were used to account for non-response error, following recommendations of Lindner et al. (2001). Data was analyzed with SPSS 25.0 using descriptive statistics and measures of central tendency to report how faculty changed academic rigor and faculty perceptions of student learning as a result of Covid-19 using SPSS 25.0. Descriptive statistics were also used to calculate the demographic characteristics of the both the participants and their institutions. Qualitative data were coded for themes and sub-themes by two independent judges with a third judge serving as a tiebreaker as needed.

Results

Most respondents identified as male (62.6%), were White or Caucasian (81.9%), and held a Doctoral degree (84.6%). Our respondents were primarily born were from 1981-1996 (23.1%), 1965-1980 (36.9%), or 1946-1964 (38.0%). Most respondents worked at an 1862 Land-Grant institution (52.2%) and were either Full (34.6%), Associate (25.2%), or Assistant Professors (26.4%). All respondents (100%) taught courses under the umbrella of agricultural sciences.

We asked respondents how they altered academic rigor during Covid-19 versus previous semesters: 33.1% reported they lessened academic rigor, 51.8% did not change academic rigor, 9.6% increased academic rigor, and 5.4% taught the course(s) for the first time. When asked an open-ended question about why the level of academic rigor was changed (Table 1), four themes emerged: concerns over academic dishonesty, difficulty converting practical concepts to an online format, student engagement or communication suffered, and lacking resources or time. An emerging theme was also identified: empathy for students. We also asked faculty how much they thought students learned in course(s) during Covid-19 relative to students in previous semesters

not affected by the pandemic. The majority of faculty (55.5%) felt students learned less during Covid-19 and 32.9% felt students learned the same amount. Only 4.3% of faculty felt students learned more during Covid-19.

Table 1.

Why faculty altered academic rigor during Covid-19 versus previous semesters

Theme	Sub-theme	Example statement(s)	#
#1. Concerns over academic dishonesty	#1A. Cheating	• "More opportunity for students to cheat online and cheating is more difficult to truly mitigate."	7
	#1B. Inability to proctor	• "Due to my inability to prevent collaboration between students and unwillingness to give proctored exams."	5
#2. Difficulty converting practical concepts to an online format	#2A. Difficulty conducting a laboratory online	• "Not being able to do traditional labs and hands-on training, no field trip are allowed or student travel during Pandemic."	6
	#2B. Difficulty transitioning courses to an online format	• "All assignments had to be accessible for students who were attending remotely, and this was quite a challenge. Some assignments, I could not do because they did not lend themselves to a format outside of the classroom."	8
#3. Student engagement or communication suffered	#3A. Students not engaging or participating	• "Inability or unwillingness of students to participate in discussion of topics at-a-distance."	9
	#3B. Difficulty communicating with students	• "Less interaction among students with zoom; less ability to "read" student responses with zoom; more time to devote to technical issues."	5
#4. Lacking resources or time	#4A. Uncertain how to teach online	• "Harder to teach and hold a higher standard with a drastic change in delivery method."	7
	#4B. Faculty and/or students lacked time	• "Greater time needed by students and faculty to create the course and participate in the course from a distance."	6

Discussion

Our respondents were concerned about academic dishonesty which, in turn, affected how they altered academic rigor. Previous data indicates that faculty and students perceive cheating to be more rampant in an online setting due to students being technologically savvy (Stuber-McEwen et al., 2009) and the greater distance between students and faculty (George & Carlson,

1999). Further, stress and anxiety are often used to justify cheating in online courses (Abdelrahim, 2021). Undoubtedly, the heightened emotions associated with Covid-19 contributed to the academic dishonesty our respondents were concerned about. Institutions can reduce stress and anxiety and, thus, cheating, by ensuring students have a sense of support and encouraging engagement in online courses. Proctoring exams is also a potential solution to cheating, but is limited because proctoring services present technological difficulties, require a quiet or empty place which is often not available to students, and can create anxiety, ultimately negatively impacting test performance (Kharbat & Daabes, 2021). Accordingly, academic dishonesty can potentially be addressed by using multiple versions of an exam, randomizing question order, and using multiple performance indicators (Dietz-Uhler & Hurn, 2011).

Faculty reported that transitioning concepts normally taught face-to-face to online platforms was challenging during Covid-19. Online classrooms deny hands-on experience that is necessary in certain courses (Gamage et al., 2020), especially those in an applied discipline such as agricultural sciences. To address this, faculty should adopt technology, such as simulation tools and virtual reality, which are effective in educational laboratories (Zhai et al., 2012) and provide students with instructional support under the ACE model. However, institutions must provide this resource to faculty to ensure students receive the support they require.

Faculty reported that student engagement and communication suffered during the pandemic. An approach to facilitate learning and engagement is through positive psychology which can maintain relationships that were undoubtedly affected by the Covid-19 pandemic (Chu, 2020). To implement positive psychology, faculty can emphasize class successes, show gratitude, empower students, encourage resilience, and set class goals (Chu, 2020), all of which can ultimately promote positive emotions and increase engagement.

Faculty lacking resources and time during Covid-19 contributed to uncertainty in teaching which then led to altered academic rigor. These data align with previous literature, in which faculty who converted their classes to an online format lacked the knowledge required for doing so (Petzold, 2020). To address uncertainties in teaching online, institutions should implement long-term theory-based training on how to best approach online teaching versus simply teaching faculty how to use the necessary hardware and software (Marek et al., 2021). Perhaps if faculty themselves received more institutional support, students would also feel more support and, thus, have more positive outcomes in academic performance.

Our data indicate faculty altered academic rigor in courses due to Covid-19. The themes that emerged from our analysis highlight challenges faced during the pandemic; these may persist after Covid-19 if online courses continue to be offered at a higher rate than before the pandemic. With these in mind, the ACE model should be considered to provide students the instructional, peer, and technical support they require for academic success.

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Determining the Impact of a College of Agriculture Living Learning Program: An Analysis of Archival Data

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Introduction/Theoretical Framework

In 2018, approximately 28% of first year students elected to terminate their education at four-year public institutions with traditional admission requirements (ACT, 2018). Of those students who did not return, 35% withdrew for academic reasons and the remaining students withdrew for non-academic reasons (Morrow & Ackermann, 2012). Retention has been a long-standing concern for higher education institutions (Webster & Showers, 2011). Hagedorn (2012) defined retention as, "staying in school until completion of a degree" (p. 87). Institutions of higher education have increased efforts regarding student retention "in an increasingly competitive and results-oriented higher education market" (Routledge, 2018 p. 4). Sokia (2020) described the retention relationship between students and universities as one bound together through a financial exchange. For this relationship to remain healthy, universities focus on providing programming and resources for students so they can continue their education resulting in a stable revenue stream for the institution and degree completion for students (Sokia, 2020).

One approach to university programming is Living Learning Programs (LLPs). These programs "are residential housing programs that incorporate academically based themes and build community through common learning" (Brower & Inkelas, 2010 p. 1). According to Brower and Inkelas (2010), academic themes vary based on the individual program. Some programs are based on the academic college, while others are based on student's specific major. These programs are designed to increase the interaction between faculty and students outside common classroom encounters and have potential to foster increased student success and persistence (Decarie, 2016). At Oklahoma State University (OSU) the Ferguson College of Agriculture has offered an LLP known as Freshmen in Transition (FIT) for the past 21 years.

Each academic year, approximately 100 students are selected for the FIT program (D. Vanoverbeke, personal communication, February 1, 2021). These students represent a variety of states and reflect diverse backgrounds and interests. The program is focused on providing a diverse set of experiences to encourage students to experience different backgrounds, cultures and opportunities. Selected freshmen are supported by eight student academic mentors (SAMs). The student academic mentors are former FIT students who have completed their freshmen year and have a desire to work with the next class of freshmen. In addition to SAMs, eight Faculty Associates (FAs) are assigned to provide mentorship to students in the program. Participants are required to complete experiences highlighting academic, and professional values, as well as community service. According to the Ferguson College of Agriculture website (https://agriculture.okstate.edu/students/undergraduate-students/freshmen-in-transition.html) the goal of these experiences is to promote academic success and professional growth while encouraging students to serve their communities and create a positive atmosphere designed to promote retention.

This study was framed by the work of Chickering (1969) and Tinto (2016). Chickering identified a unique developmental stage among 18 to 24-year-old American college students known as the *young adult*. He stated young adulthood should be examined separately as the developmental tasks were found to be different from those of adolescence and adulthood. Chickering and Reisser (1993) proposed seven developmental factors for the young adult: developing competence, managing emotions, moving through autonomy toward interdependence, developing mature interpersonal relationships, establishing identity, developing purpose, and developing identity. Tinto (2016) contributed to the framework via his assertion the motivation needed by students to continue their education is intrinsic in nature and bound to their self-efficacy and ability to create a sense of belonging and see value in the educational enterprise.

Purpose/Objectives

The purpose of this study was to determine the impact of the FIT program on participants retention, interpersonal relationships and academic purpose. The following objectives guided the study:

- Determine the retention rate of participants completing the Freshmen in Transition program for the 2019-2020 academic year.
- Describe participant perceptions regarding interpersonal relationships after participation in the Freshmen in Transition program.
- Describe participant perceptions regarding academic purpose after participation in the Freshmen in Transition program.

Methods/Procedures

This census study included participants of the FIT program conducted during academic year 2019-2020 (N = 90). The archival data used for this study was a product of a questionnaire retrieved from the university's Department of Housing and Residential Life.

Procedures related to Objective 1 relied on archived retention data from the Office of Institutional Research and Analytics (Oklahoma State University, 2020). The data included all freshmen students enrolled in the Ferguson College of Agriculture (n = 582). We were able to identify the 2019-2020 FIT participants (n = 90) for comparison because one of the researchers served as a GTA for the FIT program. Determining the retention rate of the FIT class was accomplished by comparing the FIT roster to each student's academic transcript. The team reviewed students' transcripts to determine if they continued their education at OSU beyond their first year. The number of students not continuing their education was divided by the number of students in the program. This number was then multiplied by 100 to determine the retention rate of freshmen enrolled in the FIT program.

Methods used to address Objectives 2 and 3 relied on archived data that included all students housed in Living Learning Programs during the 2019-2020 academic year and completed the Housing and Residential Life questionnaire. Students participating in the FIT program (n = 90) were disaggregated from the data for analysis. The questionnaire was designed to capture general data important to the Housing and Residential Life department and utilized

two demographic related questions and four open-ended questions focused on aspects of students' experiences. One question was selected to address Objectives 2 and 3, the statement, "Living in the living learning program has…" served as the stem for a drop down menu providing eight different response options: (a) *Gave me a sense of home/family*; (b) *Provided me with a close group of friends*; (c) *Helped me get more involved on campus*; (d) *Allowed me to connect within a faculty member in my major;* (e) *Provided me with academic support;* (f) *Aided me in becoming more passionate about my major;* (g) *Helped me decide a major;* and, (h) *None of the above.* Response choices a, b, and c were used to identify students' interpersonal relationships. Response choices d, e, f, and g were used to identify academic purpose. Thirty-two FIT participants answered this item yielding a 35.56% response rate. Descriptive statistics, specifically frequency and percentages, were used to report responses.

Results/Findings

The 2019-2020 FIT class was composed of 32 in-state students and 75 out-of-state students. Nineteen of those students were first generation college students. The program also featured 14 different majors from the Ferguson College of Agriculture and 8 undecided students (Oklahoma State University, 2020).

Objective 1 sought to determine retention rates for FIT participants. In academic year 2019-2020, 97.19% (87of 90) of FIT program participants continued their education at OSU. By comparison, the retention rate for all freshmen in the college was 88.65% (516 of 582). These data are displayed in Table 1.

Table 1
Retention Rates of Freshmen Enrolled in the Ferguson College of Agriculture and the Freshmen in Transition Program

Academic Year	All [College] Freshmen			FIT Participants		
	N	*n* Retained	% Retained	*N*	*n* Retained	% Retained
2019 - 2020	582	516	88.65	90	87	97.19

Objective 2 sought to describe perceptions of FIT participants regarding development of their interpersonal relationships after their involvement in the FIT program. More than 80% of the respondents cited *Gave me a sense of home/family* (84.38%; $f = 27$) and *Provided me with a close group of friends* (81.25%; $f = 26$) as outcomes of their living in a Living Learning Program. An additional response that aligned with interpersonal relationships included *Helped me get more involved on campus* (75%; $f = 24$). These data are displayed in Table 2.

Table 2
Participant Responses Related to Interpersonal Relationships (n = 32)

Response Choice	*f*	%
Gave me a sense of home/family	27	84.38
Provided me with a close group of friends	26	81.25
Helped me get more involved on campus	24	75.00
None of the above	1	3.13

Table 3 highlights data associated with Objective 3. This objective was crafted to identify perceptions regarding the development of academic purpose after participation in the Freshmen in Transition program. To that end, participants revealed after living in a Living Learning Program they were able to connect with a faculty member (71.87%; f = 23), were provided academic support (65.63%; f = 21) and became more passionate about their major (62.50%; f = 20). *Helped me in deciding a major* was cited less frequently (25.00%; f = 8) than other choices related to academic purpose.

Table 3
Participant Responses Related to Academic Purpose (n = 32)

Response Choice	*f*	%
Allowed me to connect with a faculty member within my major	23	71.87
Provided me with academic support	21	65.63
Aided me in becoming more passionate about my major	20	62.50
Helped me in deciding a major	8	25.00

Conclusions/Recommendations/Implications

Objective 1 was to determine retention rates of FIT participants for the 2019-2020 academic year. Retention of FIT participants is outstanding. The retention rate of 97.19% is 9% better than the retention rate for the overall freshmen class in the Ferguson College of Agriculture during the same time frame. It is almost 19% higher than the reported freshman retention rate reported by similar institutions in the U.S. (National Student Clearinghouse, 2020). A high retention rate is indicative of the healthy retention relationship described by Sokia (2020). According to Decarie (2016) programming provided by student living groups similar to FIT increased student success and persistence. The intent of this study was not to identify or determine participants' self-efficacy to continue their education; however, the data show the vast majority of students continued their educational pursuits implying the potential for development of a sense of belonging and value in the educational enterprise.

Objectives 2 and 3 were supported by Chickering and Reisser's (1993) proposed seven developmental factors for the young adult: *developing competence*, *managing emotions*, *moving through autonomy toward interdependence*, *developing mature interpersonal relationships*, *establishing identity*, *developing purpose*, and *developing identity*. The archival data did not address all seven developmental factors identified by Chickering and Reisser; however, the factors; *developing mature interpersonal relationships* and *developing purpose* were represented in the data. Specifically, *developing a sense of belonging in an academic setting*, *developing a peer network* and *engaging in campus activities* were connected to the developmental factors for the young adult. *Developing purpose* was another factor revealed in the data provided by participants of the FIT program.

The findings and conclusions of this study are similar to the findings of a 2003 quasi-experimental study that highlighted the FIT program early in its history in the Ferguson College of Agriculture. Specifically, the variables of persistence (Retention) and psychosocial development were investigated. Kelsey and Sexten (2003) reported a 90% retention rate for the 2000-2001 academic year, in comparison, retention of participants completing the FIT program

in 2019-2020 increased 7% highlighting the continued academic commitment of those students. However, unlike the participants in this study, participants in the 2000-2001 academic year did not report a positive effect on psychosocial development. It is possible program goals and objectives have evolved over the past 20 years to be more purposeful when considering those developmental factors for young adults.

The following recommendations are based on the findings and conclusions of this study and are presented as recommendations for research and practice. Additional quantitative research should be conducted to determine participants' perceptions regarding the value of the FIT program. In particular, survey research designed to inform program developers about the potential for the FIT program to enhance participants' self-efficacy associated with the academic enterprise should be considered. Additional quantitative, longitudinal research should begin with the 2021-2022 academic year to inform program leaders about trends in areas like retention and psychosocial development over time. Qualitative data should also be collected to determine aspects of the program that benefit retention and promote student persistence.

Regarding recommendations for practice, program developers should investigate the potential for integrating elements of competition into programming. Elements of competition have the potential to impact elements of development such as developing competence and managing emotions as described by Chickering and Reisser (1993). For instance, development of a competition between floors that includes a reward system designed to encourage students to complete assigned engagement experiences and promote participation in activities and meetings could result in higher completion rates of those opportunities. An additional recommendation for practice is the creation of a just-in-time professional development for SAMs in the context of teaching and learning. Providing orientation and training about the identification and implementation of selected teaching strategies would prepare SAMs to develop and implement a variety of instructional strategies to be used during the supplemental learning opportunities that take place outside of the college introductory course required for all incoming freshmen in the Ferguson College of Agriculture. A final recommendation for practice is to provide Mental Health First Aide training to all faculty associates assigned to the FIT program. Preparing faculty to engage students with mental health needs should be a high priority for program developers and leaders. These recommendations have the potential to improve the psychosocial development, persistence, and potential retention of participants of the Ferguson College of Agriculture Freshmen in Transition programs of the future.

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Pandemic Pedagogy: How Early Career Agriculture Teachers Reflect on Their Practice

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Abstract

This study leveraged qualitative methods to understand how early career agriculture teachers in California reflect on their teaching experience during the shift in teaching context from face-to-face instruction to emergency remote teaching due to the coronavirus pandemic. Through the lenses of Pedagogical Design Capacity and the Discovery Learning(R) Change Process Model, this research examined early career agriculture teacher reflections to understand their lived experience through the COVID-19 pandemic. Findings suggest that ECATs experienced the most drastic shifts in their teaching relative to reactions to mandates, negative emotions, adapting pedagogy, adapting to technology, and time management. Conclusions and recommendations are made within the theoretical framework.

Introduction/Theoretical Framework

On March 19, 2020, the California Governor ordered all residents to stay at home (Exec. Order No. N-33-20, 2020), which disrupted the mode of instruction used by early career agriculture teachers (ECATs). To reduce the impacts of the COVID-19 pandemic, the Executive Order mandated that all state residents were to "stay at home or at their place of residence except as needed to maintain continuity of operations of the federal critical infrastructure sectors..." (Exec. Order No. N-33-20, 2020, p. 1). As a result, agricultural education programs transitioned to online instruction (Easterly et al., 2021); causing an instantaneous ripple of change in the teaching modality for ECATs. According to Garcia and Weiss (2020), K-12 teachers had little preparation to address the challenges of the pandemic, and "teachers have had to come up with a variety of options on the fly, from assigning daily or weekly coursework that students turn in online to full classes conducted via Zoom and a range of approaches in between" (p.13). As new members of the teaching community, early career agriculture teachers (ECATs) are a subset of the population vulnerable to the impacts and changes experienced in the profession during their first few years (Lambert et al., 2011; Swan et al., 2011).

Given the immediate, variable, and drastic shift to emergency remote teaching, our prime objective was to explore how ECATs experienced these changes during the first few months of the pandemic. In the realm of research in agricultural education, the National Research Agenda (Roberts et al., 2016) supports this study. The National Research Agenda, Research Priority Six, alludes to the need to understand better vibrant and resilient communities (Graham et al., 2016) and guides our work with a greater focus on the impacts of a national tragedy (COVID-19) on the community of ECATs in California.

We framed this study to consider that agriculture teachers intuitively, regardless of circumstance, invest in their craft to be knowledgeable about their content, skilled in pedagogy, and constantly learning to remain relevant. To accomplish this, we enlisted the theoretical framing of Pedagogical Design Capacity (PDC)—advanced by Brown and Edelson (2003), and the additional lens of the Discovery Learning® Change Process Model (Musselwhite & Jones, 2010). Pedagogical Design Capacity posits that teachers have "an ability to perceive and mobilize existing resources to craft instructional contexts" (Brown & Edelson, 2003, p. 6). According to Brown and Edelson (2003), teachers leverage curricular and individualized teacher resources to either adapt, offload, or improvise a lesson. We leveraged this perspective with that of the Discovery Learning® Change Process Model (DLCPM). The DLCPM considers the process individuals undergo after the sudden onset of a traumatic event (similar to losing a loved one or drastic workplace environment shift). When combined, the two perspectives allowed us to calibrate an understanding of ECAT's pedagogical norms before and after the onset of the pandemic and helped us understand the lived experiences of ECATs during the process of change from face-to-face instruction to emergency remote teaching (Milman, 2020).

Research Question

The purpose of this study was to explore how ECATs reflected on a changing paradigm in education—from traditional delivery to almost entirely online instruction due to the coronavirus pandemic. We gauged ECATs' ability to cope through their reflection on teaching experiences during the onset of the pandemic. We sought to answer the following research question: 1) How do early career agriculture teachers in California reflect on their teaching experience during the shift in teaching context from face-to-face instruction to emergency remote teaching due to the coronavirus pandemic?

Methodology

This research study sought to understand how ECATs reflected on their experience transitioning pedagogy from full-time, face-to-face instruction to teach primarily in a remote setting. The participants for this study were ECATs, across geographic regions of California who were participating in a state-wide agriculture teacher induction (mentoring) program. The induction program provides an individualized mentoring experience through the first and second years of teaching after completing an initial teacher preparation program. According to data collected by the California Department of Education (Wieghat, personal communication, December 18, 2020), this group represents 45% of the state's first and second-year agriculture teachers. Following initial consent and cleaning of data, there were 156 usable data points among 52 different ECATs. Twenty-six of the individuals were in their first year teaching, and twenty-six were in their second year of teaching at the time of the submission. These data represented reflections of 74% of the ECAT population enrolled in the induction program at the time of submissions.

The data collected for this study were from written forms (a.k.a Weekly Conversation Logs) completed each month between the ECAT and their mentor. ECATs submitted documents as a part of regular induction programming. IRB approval for this project was given on April 17, 2020, and we obtained consent from the participants after their final submission on May 1, 2020.

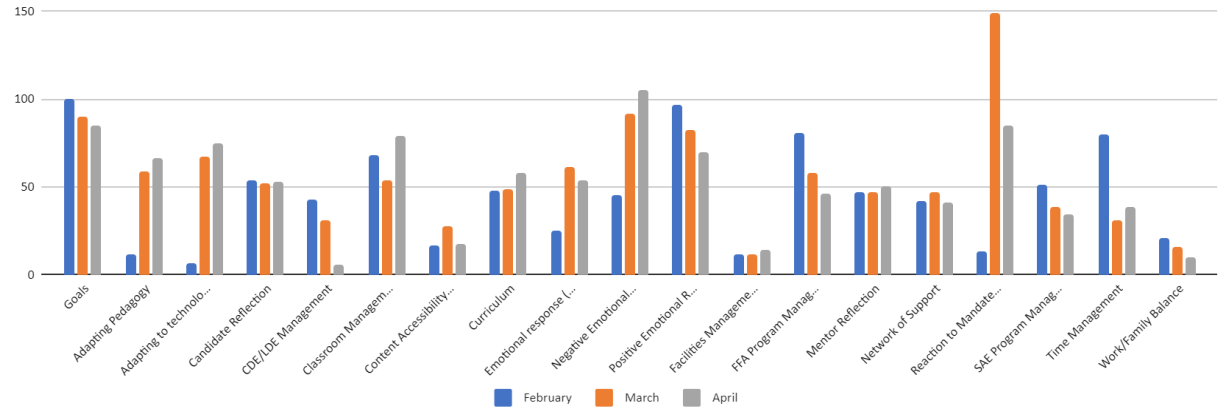
ECATs and mentors provided consent for using these documents via a consent survey distributed at the beginning of May 2020. We collected data for three different months in 2020—February, March, and April, and reflections were the primary focus of this study. We explicitly chose these months to understand how ECATs reflected on their lived experiences and related conversations with their mentors before school closures, at the moment of school closures, and during the initial month of emergency remote teaching (ERT). Reflections were then isolated from the rest of the submission and uploaded for analysis on the Dedoose® Social Science Analysis platform.

The review team analyzed data in two main phases espoused by Maxwell (2013): an initial phase of open coding for an organizational understanding of the data and a more substantive thematic analysis of the descriptive content within each code area. We began with a word frequency analysis to determine the top themes present in the data that related to our research question. The initial analysis yielded ten different codes that served as the basis for our review of the data. The reviewers applied the initial codebook to a dataset not included in the study to allow calibration of reviewers around code application and the evolution of the codebook. Two coders reviewed each data set to mitigate any inter-rater bias on code application, and we conducted one test of inter-rater reliability on the test dataset. Pooled Cohen's Kappas (de Vries et al., 2008) for each reviewer were between .53-.61, which expressed a "fair level of agreement" on coding application (Miles & Huberman, 1994). We collectively expanded our codebook to 17 parent and child codes that are available by request. After open coding, the research team focused more intensely on 5 of the code areas that showed the most notable shifts from February through April (Reaction to Mandates, Negative Emotional Response, Adapting to Technology, Time Management, and Adapting Pedagogy). In the second phase of substantive thematic analysis, each of the four reviewers was assigned one organizational code for analysis, with the lead author assigned two code areas. During this phase, reviewers met weekly to discuss thematic findings and calibrate perspective. Upon completion, each reviewer examined another reviewer's work for any discrepant findings. This phase yielded the primary inductive themes presented below.

Findings

The reflections of early career agriculture teacher (ECAT) participants in the California Agricultural Teachers' Induction Program (CATIP) yielded several findings. To lend perspective on the research question, fifty-two first- and second-year ECATs committed their monthly submissions—reflecting on weekly conversations with their mentors—to the data sample. Reflections gathered from ECATs all told a story about their goals and thoughts about how the pandemic impacted their teaching. We distilled their thoughts into several themes. Among them, *reaction to mandates*, *negative emotional response* (a subset of the parent code 'emotional sentiment'), *adapting pedagogy*, *adapting to technology*, and *time management* rose to the top with the most notable shifts during the three months (Figure 1). We found those trends to set the context for a richer understanding as we approached answering our research question, which is one of processes.

Figure 1
Code Application Frequency Identifying Trends



Note. This data visualization helped the research team to identify the prevalence of code application and notable trends.

The **reaction to mandates** theme addressed many feelings, actions, and approaches the ECATs exhibited in response to the Governor's stay-at-home orders. Teachers expressed negative emotions about their general uncertainty toward their teaching obligations. They mainly reflected on their responsibilities related to all three circles of the Agricultural Education Model and their enduring concern for their students' wellbeing. Additionally, ECAT reflections addressed frustrations, a period of mourning, and some form of renewal and appreciation. ECATs were frustrated with the extra work involved with transforming a hands-on program into a distance-delivery model and overly cautious administrators limiting access to campus and accountability for students. As they reflected throughout the rest of the transition to emergency remote teaching, ECATs mourned the loss of regular FFA activities and county fairs. Still, they quickly found a renewed appreciation for the value of social connection to colleagues and students.

The **negative emotional response** theme featured various sincere yet disagreeable emotions expressed by the ECATs during the study period. Despite the raw emotion, there were glimmers of resilience as teachers highlighted their successes to summon the necessary fortitude to continue. Most notably, the frequency of this code application increased by 15% over the study period, with themes of social connection, student learning, and engagement rising to the top of ECAT's reflections. Negative emotion was generally evident in thesis sentiments such as "THIS MONTH IS WILD!" or "This month has been extremely crazy," but went further to define the radical impact on the socio-physical connection to students. ECATS particularly expressed concern for the lack of social connection impacting their ability to hold students accountable.

The **adapting pedagogy** theme featured two prevalent mindsets among the teachers, one of struggle and the other challenge. The frequency of this code application increased by 450% between February and April reflections. The struggle mindset was fixed in nature and grew primarily from the lack of resources and relevant materials suitable for adapting their teaching appropriately for different student needs and access limitations. Conversely, the challenge

mindset was growth-oriented, and teachers in this space viewed adapting as an opportunity. Regardless of the degree to which teachers felt the struggle or the challenge in adapting their teaching, a common sentiment was present about reverting pedagogy to fundamentals that catered more to students' motivational, emotional, and physical needs.

Although teachers had been integrating technology into their practice for some time, the **adapting to technology** theme grew dramatically as the physical separation of teachers from students and facilities forced them into the virtual world of teaching full-time. As one might expect, the frequency rose over the study period by 971%. The distress eased as the ECATs discovered new resources, tapped into their networks, and began to make instructional decisions which sparked their creativity. While ECATs navigated the new educational landscape, they recognized a need to revert their communication tactics to personal phone calls, emails, and text messages. They found this tact the best way to connect with their students who needed regular and meaningful contact.

Given the increase in new responsibilities during the study period, **time management** was of concern. The boundaries between work and personal life were blurred, with many teachers working from home. Time management references decreased 51% over the study period. Time management presented challenges for ECATs related to prioritizing tasks, being efficient with their time, and being prepared for an ever-changing teaching landscape. ECATs felt that constant changes in scheduling and teacher expectations negatively affected their ability to manage their time.

Conclusions & Recommendations

This study provided a glimpse into ECATs' initial reactions to the California stay-at-home orders. However, the full impact of COVID-19 on this population of teachers will not be known for quite some time. From the perspective of Pedagogical Design Capacity (Brown & Edelson, 2003), data suggests that ECATs in this study navigated a shift from their initial mode of curriculum delivery to a mode entirely different at the behest of impacts from a pandemic. ECATs made this pedagogical shift partly because of the mandates imposed on their teaching but mainly because of their desire to best serve student wellbeing.

From the vantage point of The Discovery Learning® Change Process Model (DLCPM) by Musselwhite and Jones (2010), the pandemic required teachers to rethink their traditional approaches to their three-circle responsibilities, yet this was not the default reaction. As they entered Stage 1 (Acknowledging), teachers expressed uncertainty about the stay-at-home order and how it would impact them. When it became clear everyone would remain home, teachers dove into Stage 2 (Reacting) by spending considerable time and energy wrestling with the perceived barriers to supporting their students' needs in this new environment and confronting their emotional struggles. In Stage 3 (Investigating), teachers started to investigate new ways to teach and engage with learners by adapting their practice. Finally, as the final reflections suggested, teachers began to feel more confident and competent with their shift to distance learning, having tried and mastered new techniques and technology. Although reaching this stage was still plagued with concerns for their students, many ECATs felt empowered and energized by the creativity they exhibited.

Insights gained from reflections reveal that mandates impacted ECATs greatly in a time of crisis. However, the data also suggest that ECATs will persevere in the face of adversity—for the sake of their students. Like Easterly and colleagues (2021), we found that teachers were initially dissatisfied with the mandates placed on their teaching practice, and they expressed frustration with their new teaching environments. Yet, while they struggled with their wellbeing in light of time management and struggled with adapting pedagogical practices, ECATs had the networks and resources they needed. ECATs were able to tap into these networks and resources to overcome challenges and strive toward filling fundamental needs for their students.

We recommend that researchers further study ECATs' reflections to understand their perspectives and experiences through a full academic year of remote teaching. We also recommended that the state's professional development coordinators explore networks and well-curated resources that can serve ECATs regularly and support them in times of crisis. Furthermore, coordinators should work with state staff to examine the existing professional development continuum for opportunities to reach across experiential ranks and focus on enhancing the ECAT network. In light of learning from the COVID-19 pandemic and this study, we have found that ECATs have past experiences and perspectives to help themselves navigate challenging contexts. We also better understand that ECATs have emergent needs that the research community can support through future research and program development.

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The Impact of Course Changes on Preservice Teachers' SAE Self-efficacy

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Introduction and Theoretical Framework

The 2020-2021 school year brought innumerable changes to educational systems across primary, secondary, and post-secondary institutions (Zhao & Watterston, 2021). Teacher educators implemented mandated changes to their course components and delivery formats to accommodate state and institutional social distancing requirements as a result of the COVID-19 pandemic. Such changes led to questioning the readiness of preservice teachers to enter the profession (Choate et al., 2021). One important aspect of preservice teacher readiness is self-efficacy (Pajares, 1992). Therefore, this study sought to understand how preservice teacher self-efficacy changed in relation to modifications made to a school-based agricultural education (SBAE) teacher preparation course.

Bandura's (1978) theory of reciprocal determinism underpinned the study. This theory acknowledges the relationship between the environment, personal characteristics, and behavior and how each one influences the others (Williams & Williams, 2010). Theoretically, changing the environment would have implications on personal characteristics and behavior (Bandura, 1978). In this study, the environment was the course, the personal characteristic of interest was self-efficacy, and the behavior was the teacher behaviors as outlined by items on the instrument.

Oklahoma State University (OSU) SBAE preservice teachers typically complete AGED 3203/5323 Advising Agricultural Student Organizations and Supervising Experiential Learning during their junior year. The course focuses on SBAE informal instruction within Supervised Agricultural Experiences (SAE) and student leadership organizations (Academic Catalog, 2021). Due in part to the COVID pandemic, the Spring 2021 course differed from previous semesters in five important aspects, outlined in Table 1. First, OSU decreased the duration of class time by five minutes during the 2020-2021 school year to increase social distancing during class sessions on campus (OSU COVID Protocols, 2021). Two, course instructors were encouraged to offer a hybrid course format for in-person classes to accommodate students' needs during the pandemic (OSU COVID Protocols, 2021). Agricultural Experience Tracker (AET) and experiential learning through mock SAEs have been staples of AGED 3203/5323 (Toombs et al., 2021). AET self-efficacy was identified as an area of concern in OSU SBAE teachers (Toombs et al., 2020; Toombs et al., 2021). Three, additional emphasis was placed on AET in the 2021 course as recommended by Toombs et al. (2021). University protocols prohibited course instructors from requiring students to be present on campus during the 2020-2021 school year (OSU COVID Protocols, 2021). Therefore, the broiler experiential learning activity, which occurred in the OSU poultry facilities, could not be completed in 2021. Instead, a home hydroponics activity was designed to incorporate the agriscience fair component, SAE supervision opportunities, and mock AET records, which served as the fourth major change. Finally, the lead author served a teaching assistant for the 2020 class and as instructor of record for the 2021 class.

Table 1

Differences in 2020 and 2021 Course Formats

Component	2020 Course	2021 Course
Instructional time	100 minutes of lecture, 110 minutes of laboratory each week	90 minutes of lecture, 105 minutes of laboratory each week
Format	In-person then asynchronous	Hybrid synchronous instruction
AET Instruction	Self-paced AET assignments	Direct instruction and self-paced AET assignments
Experiential Learning Activities	Poultry (e.g., raising broilers)	Hydroponics
Instructors	Instructor of record and two graduate teaching assistants	Instructor of record and three graduate teaching assistants

Of the three foundational components of the SBAE model, SAE tends to be the weakest (Bird et al., 2013). Teacher motivation and student interest in SAEs have shown a downward trend in recent decades (Ramsey & Edwards, 2012), and inservice SBAE teachers have commonly requested professional development related to SAEs (Rubenstein et al., 2014). Early career teachers have reported anxiety in facilitating experiential learning activities, such as supervising SAE projects (Bolick et al., 2020). Yet, SAEs have the potential to positively impact the college and career readiness of SBAE students (Haddad & Marx, 2018; Thiel & Marx, 2019), as well as create financial benefits (Hanagriff et al., 2010) and other positive outcomes for them (Cheek et al., 1994; Ramsey & Edwards, 2012; Ricketts et al., 2006; Robinson & Haynes, 2011). However, teachers must feel self-efficacious in guiding students through meaningful experiential learning experiences (Pajares, 1992) related to SAEs. Therefore, SAE self-efficacy was chosen as the study's variable of interest.

Purpose and Research Objectives

The purpose of the study was to assess changes in preservice teachers' self-efficacy regarding SAE supervision over the course of a semester. The study aligns with The American Association for Agricultural Education's (AAAE) third research priority addressing a professional workforce in the 21st century (Roberts et al., 2016). Two research objectives guided the study:

1. Describe the self-perceived changes in SAE self-efficacy of SBAE preservice teachers in AGED 3203/5323 during 2021.
2. Compare self-perceived changes in SAE self-efficacy of SBAE preservice teachers in AGED 3203/5323 during 2020 and 2021.

Methodology

This study was a replication of the quantitative measures in Toombs et al. (2021) which explored changes in SAE self-efficacy of students enrolled in AGED 3203/5323 during Spring 2020 semester. As such, Rubenstein et al.'s (2014) preexisting instrument was used to measure SAE self-efficacy. The instrument was used to collect data through a then-now design (John &

Robins, 1994; Rockwell & Kohn, 1989) in which participants reflected on their perceived ability during Week 1 of the course (then) and reported their current perceived ability in Week 16 (now). The complete instrument consisted of 40 5-point Likert-type items and six demographic questions. Post-hoc reliability reported a Cronbach's alpha coefficient of 0.95, indicating the instrument was reliable (Taber, 2017). A panel of SBAE experts provided face and content validity.

Preservice teachers enrolled in AGED 3203/5323 during Spring 2021 (N = 43) were invited to complete the instrument during the final class session. Reminder emails and messages were sent in the following days. A total of 31 complete responses were collected for a 72% response rate. The demographic variables of sex and in-state or out-of-state residency were used to compare respondents to class population to control for non-response bias (Linder et al., 2001). Respondents were 22% male compared to the 25% of class members. Two-thirds of the respondents were Oklahoma natives, compared to roughly 70% of class members. It was determined survey participants were representative of preservice teachers enrolled in the 2021 AGED 3203/5323.

Other demographic questions revealed participants felt SAEs are somewhat important or very important in SBAE. All but one participant (97%) had at least two years of experience in SBAE as a secondary student and most (84%) rated their participation in SAEs during that time as average or above average. When asked about their intention to teach SBAE in the future, 24 (77%) replied yes, 4 (13%) replied maybe, 2 (6%) replied no. One (3%) preferred not to answer.

Findings

The first research objective of this study sought to describe the self-perceived changes in SAE self-efficacy of SBAE preservice teachers in AGED 3203/5323. The 2021 class reported a *Neutral* SAE self-efficacy (M = 3.18, SD = 0.83) at the beginning of the semester. During the final week, the average SAE self-efficacy was deemed to be *Moderately High* (M = 4.15, SD = 0.65). SBAE preservice teachers' self-efficacy increased almost one full point on the 5-point scale as a result of the experiential learning activities in AGED 3203/5323 (see Table 2).

Table 2

Comparison of SAE Self-Efficacy in Week 1 and Week 16 of 2021 Course (n = 31)

Item: My ability to…	Week 1		Week 16	
	M	*SD*	*M*	*SD*
Encourage students to improve their SAE	3.26	1.18	4.20	0.85
Build positive relationships with administrators	3.55	1.03	4.17	0.65
Clearly communicate the purpose of SAE programs with others	3.35	1.02	4.10	0.80
Assist students in selecting SAE programs that meet their individual abilities	3.32	0.96	4.17	0.81
Identify SAE programs that connect to the agriculture curriculum	3.32	1.01	4.20	0.76
Assist students in planning an agriculturally based SAE program	3.19	1.01	4.17	0.75

that meets their needs				
Encourage students to complete a record book for their SAE program	3.26	1.15	4.13	0.73
Assist students in developing SAE programs that meet their capabilities	3.13	1.15	4.13	0.82
Instruct students in how to complete SAE programs	3.13	0.92	4.17	0.75
Evaluate SAE programs	3.13	0.99	3.93	0.79
Coordinate communications between a student, parent, employer, and myself	3.48	0.77	4.20	0.66
Evaluate student knowledge and skill development within their SAE program	3.00	1.00	4.27	0.74
Provide students with meaningful supervision during their SAE program	3.16	1.13	4.20	0.76
Identify SAE programs that are beneficial for individual students	3.16	1.10	4.17	0.75
Inform administrators about the benefits of SAE programs	3.26	1.15	4.27	0.64
Identify SAE programs within a community	3.03	1.08	4.03	0.81
Provide individualized instruction related to a student's SAE program	2.97	1.08	4.13	0.78
Clearly communicate the procedures of SAE programs with others	3.03	0.98	4.07	0.91
Assist students in acquiring necessary resources to complete a SAE program	3.03	0.98	4.10	0.85
Assist students in completing a record of the financial transactions related to their SAE program	3.03	1.13	4.10	0.92
Total	3.18	0.83	4.15	0.65

Note. 5 = High, 4 = Moderately High, 3 = Neutral, 2 = Moderately Low, 1 = Low

SBAE preservice teachers in the 2021 class reported an average increase in their self-efficacy for each item on the instrument. Additionally, each item returned a lower standard deviation in Week 16. Of special note, the item, *evaluate student knowledge and skill development within their SAE program*, experienced the largest increase in average SAE self-efficacy with preservice teachers reporting scores 1.27 points higher in Week 16 than in Week 1. Conversely, *coordinate communications between a student, parent, employer, and myself* and *build positive relationship with administrators*, were the items that experienced the least amount of increase in SAE self-efficacy with average gains of 0.72 and 0.62, respectively.

Differences were noted in frequency counts of item responses between Week 1 and Week 16. At the beginning of the course, preservice teachers reported a wide variety of ability from low (1) to high (5). SAE self-efficacy in Week 16 experienced fewer moderately low (2) ratings and no low (1) rankings. The six items: *assist students in completing a record of the financial transitions related to their SAE program, clearly communicate the procedures of SAE programs with others, encourage students to improve their SAE, assist students in selecting SAE programs that meet their individual abilities, assist students in developing SAE programs that meet their capabilities, and assist students in acquiring necessary resources to complete a SAE program,* each received one moderately low (2) rating regarding preservice teachers' SAE self-efficacy.

The second research objective sought to compare changes in SAE self-efficacy between the 2020 and 2021 cohorts, especially in relation to the changes made in the instruction related to AET. Those completing the class in 2020 reported a *Neutral* mean SAE self-efficacy (M = 3.41, SD = 0.84) during Week 1 and a *Moderately High* mean SAE self-efficacy (M = 4.41, SD = 0.42) during Week 16, resulting in a full one-point increase in perceived ability, as published in Toombs et al. (2021). The data reported in Table 1 for the 2021 cohort are very similar to the mean SAE self-efficacy in the 2020 cohort. Mann-Whitney U tests detected no statistically significant differences between the years for mean SAE self-efficacy scores in Week 1 (U = 348.50, $p > .05$, r = 0.15) or Week 16 (U = 311.00, $p > .05$, r = 0.22) with small effect sizes.

As AET self-efficacy was a catalyst for changes made to course assignments and instructional topics, the items: *encourage students to complete a record book for their SAE program* and *assist students in completing a record of the financial transactions related to their SAE program*, were further compared between the two years. The Week 16 self-efficacy mean score for the item, *encourage students to complete a record book for their SAE program*, was lower for the 2021 cohort (M = 4.13, SD = 0.73) than it was for the 2020 cohort (M = 4.36, SD = 0.83). However, the Week 16 self-efficacy mean score for the item, *assist students in completing a record of the financial transactions related to their SAE program*, was lower for the 2020 cohort (M = 3.96, SD = 0.88) than it was for the 2021 cohort (M = 4.10, SD = 0.92).

Conclusions, Implications, and Recommendations

Despite decreased instruction time and social distancing regulations, preservice teachers who were enrolled in AGED 3203/5323 during the Spring 2021 increased their SAE self-efficacy. Additionally, standard deviations were smaller in Week 16, indicating a more uniform SAE self-efficacy, perhaps due to the share experiences of lecture and laboratory instruction, experiential learning activities, inservice SBAE teacher observations, and other course components. Items with the smallest increase in SAE self-efficacy: *coordinate communications between a student, parent, employer, and myself* and *build positive relationship with administrators*, serve as the bases for recommendations for this cohort of preservice teachers. Remedial instruction in communicating and relationship building with SAE stakeholders should be included before graduation. Discussing this topic with inservice SBAE teachers who are competent in these areas may bolster self-efficacy of preservice teachers (Bandura, 1997). Future iterations of the course should also consider emphasizing these topics.

Changes in the 2021 course appear to have made little influence on the growth of SAE self-efficacy of preservice teachers when compared to the 2020 cohort. In the theory of reciprocal determinism, Bandura (1978) proposed changes in the environment can influence personal characteristics, such as self-efficacy, and behavior. The changes induced to the course in 2021, some elected and others mandated, appeared not to change the environment enough to significantly impact preservice teacher SAE self-efficacy. Instructors were able to adapt to the loss of 225 minutes of instruction and accommodated a format of both in person and virtual audiences to maintain a positive influence on preservice teachers' perception of their ability to supervise SAE projects. Therefore, this cohort of SBAE preservice teachers is representative of others from OSU regarding SAE self-efficacy.

Peer institutions, who also made many changes to SBAE teacher preparation courses due to COVID protocols (Zhao & Watterston, 2021), are encouraged to consider replicating the study methods with their SBAE teacher preparation courses. Tracking preservice teachers' growth in perceived ability is an important metric to record (Pajares, 1992). This would provide additional data to traditional course evaluations and could be collected with similar procedures. OSU should continue to collect SAE self-efficacy data in AGED 3203/5323 to assess changes between student cohorts and inform future instruction.

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