NC-AAAE Innovative Idea Poster Session Proceedings

University of Missouri; Columbia, Missouri

October 6-8, 2022

For this conference, 14 posters were reviewed in the Innovative Idea category. Thirteen posters were accepted (93% acceptance rate).

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Reviewers:

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Solomonson, Jay	Illinois State University

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Sustaining Undergraduate Classroom and Career Excellence for STEM Students

Blake Colclasure, Kristopher Williams, Dane Bowder, Cale Stolle, Christopher Huber, and Tessa Durham Brooks
Doane University

Teaching Apple Preservation and Packaging with Integrated STEM Through AFNR

Sarah Thies, Jennifer Blackburn
Purdue University

Transport, Trailers and Cooperative Extension, Oh My!

Kyla Szemplinski MS, Karen Vines PhD, Sally Johnson PhD, Kelly Foltman DVM, James Hillaery MS, William Tait Golightly BS
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(Virtual) Stage Fright: Lessons Learned from Integrating Virtual Reality into a Public Speaking Course

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(Virtual) Stage Fright: Lessons Learned from Integrating Virtual Reality into a Public Speaking Course

The majority of the public experience some type of anxiety with public speaking and lack the opportunity to practice these skills in safe and constructive environments (Beidel & Turner, 2007; Leary & Kowalski,1995). Yet public speaking has been identified as a key skill college of agriculture students need to possess before entering the work environment (Easterly et al., 2017). A novel and innovative approach to help students refine their public speaking skills is through virtual reality (VR; Takac et al., 2019). VR provides immersive experiences for users, and while the technology has commonly been used for games, it can also be used for educational purposes and training (Takac et al., 2019). One of the potential advantages to using VR to practice presentations is that VR programs can provide feedback while students practice without the added anxiety of practicing in front of a peer or mentor, which could help build their confidence with public speaking.

How is Works

There are multiple applications on the market focused on simulating environments for presentations, including VIRTUALSPEECH (2022). This application provides full training courses to allow users to practice speeches in a variety of environments and receive real-time feedback while using a VR headset, like the Meta Quest 2. The VR scenarios include a job interview, charity dinner, lecture hall, business meeting, and a conference presentation – users can also upload copies of their slides into the scenarios. There is also training related to eye contact, working through distractions, and impromptu speaking. The VIRTUALSPEECH software will provide users feedback on their eye contact during the presentation, use of filler words, pace, volume, and listenability.

Results to Date

VIRTUALSPEECH was integrated into a public speaking class of 35 students in the College of Agricultural Sciences and Natural Resources at the University of Nebraska-Lincoln (UNL) in spring of 2022. The course instructor had one Meta Quest 2 VR headset to use for the class and a subscription for VIRTUALSPEECH. The VR program was first introduced during the class lab meetings (12 students per lab), and about 3 students from each lab participated in an impromptu speaking training using the VR headset. The visuals from the headset were streamed onto the class televisions to ensure all students could see what was happening in the virtual environment. After introducing and demonstrating the use of the VR software, students were invited to schedule a 15-minute one-on-one practice session using VR for extra credit on their two final presentations. These practice sessions were scheduled outside of normal class time.

Challenges & Advantages

Some challenges were experienced when initially setting up the VR headset with VIRTUALSPEECH. The main issue initially stemmed from trying to stream the VR content to the classroom monitors. Without streaming, students in the audience would not be able to see what was happening and it would be difficult to give students directions without being able to see the screen. The Meta Quest 2 can stream to a Chrome browser, but there must be a secure internet connection. Due to some of the security settings for UNL's Wi-Fi, we had to meet with IT to connect to the internet. Additionally, a Facebook account is needed to use the Meta Quest 2, and the same Facebook account needs to be logged into the web browser for streaming. While this is typically not an issue, it became cumbersome when the teaching assistant leading the labs

needed the instructor's Facebook login information to stream from the Meta Quest 2. Once this was correctly set-up, the device was able to stream without issue. Another challenge though was this is a "solo" activity, so it was challenging to find a way to offer it to students for practice when only one could use it at a time.

One of the biggest advantages to VIRTUALSPEECH is that it offered objective feedback for qualities like the listenability of speeches. Students received immediate feedback related to their speaking pace and eye contact to help improve their presentations.

Student Response

Despite demoing the VR program in class and offering two extra credit opportunities, only four of the 34 registered students participated in the VR activity outside of class. This was somewhat surprising given the initial positive reactions from students, so we asked for feedback at the end of the semester from students about why they did not participate. Their responses can be found in Table 1. For those who selected "Other," time was the biggest concern in their open-response answers. One student wrote "I just had an extremely busy semester, so any free time was spent doing homework or taking care of myself so extra credit just wasn't quite enough of an incentive to give up that time." Those who did participate in the practice appeared to enjoy the activity stating how cool it was to be in a virtual environment. Most elected to go through the eye-contact training and were able to identify which side of the room they tended to favor while presenting.

Table 1. *Why did you not participate in the VR practice this semester?*

Reason	*%*	*n*
Other	36.4	12
I did not need the extra credit	27.3	9
I did not want to take extra time coming to campus	27.3	9
It did not interest me	6.1	2
The extra credit was not a high enough incentive	3.0	1
I did not understand the purpose	0.0	0

Advice to Others

While using VR to practice presentations can be an engaging activity, instructors should consider if they have the time and technology capabilities needed to implement this in their classes before investing in this type of program. Students appeared to understand the role of the VR practice and many expressed interest during class, but they did not feel like it was worth their time to practice with it *outside* of normal class times. For those interested in using this type of program in their class, they should consider finding ways to integrate the program into normal class meeting times to increase participation without adding stress to students. While VR can be streamed to the class TV's, instructors should consider ways to still engage the audience through reflections or feedback if not engaging in one-on-one practice sessions. Instructors should also give themselves plenty of time to setup their VR system and practice using the program prior to the semester to ensure they are comfortable leading the VR class activities.

Costs/Resources Needed

Beyond typical classroom technology, a VR headset, like the Meta Quest 2 ($299), and the VIRTUALSPEECH program ($250/year) is needed.

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Airtable: A Resource for Research

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Airtable: A Resource for Research

Introduction

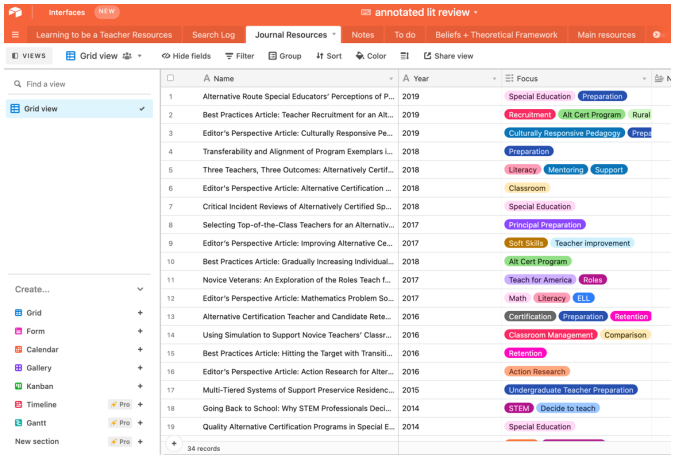
Working on a new research project is exciting but can quickly overwhelm with all the possibilities and available literature. As you begin exploring the existing literature, you might find it difficult to keep track without organization (Shaw, 2014). At the beginning of a research project, researchers should establish a plan that includes provisions for organizing materials and data. One example of keeping organized, specifically when focused on the literature review, is an annotated bibliography, a list of sources with notes (*Annotated Bibliography*, n.d.). As you conduct a literature review, it is essential to be efficient and not to repeat searches, track your progress, and explain how you found your information (Sullivan, 2021). Finding an excellent way to organize and manage literature can be difficult. While reference managers like Zotero and Mendeley allow you to keep track of papers and assist with citations, these tools do not allow researchers to keep track of important information from the content of the literature. To stay organized and easily access information, Airtable, a web-based database, was used by two researchers to create an innovative annotated bibliography.

How it Works

Airtable is an original web-based database that users can use for many different purposes by creating a database relevant to their work (*Airtable | Create Apps That Perfectly Fit Your Team's Needs*, n.d.). Over 250,000 companies use Airtable for inventory tracking, event planning, and human resources (*Airtable | Create Apps That Perfectly Fit Your Team's Needs*, n.d.). The first step to starting with Airtable is creating a base, a hub where all the data is stored. Users can share each base with multiple collaborators. After the base is created, you can customize your base with multiple tables, which function like a spreadsheet (see Figure 1). Within the table, you will need to identify the type of information you want to collect and create a field for each item. For conducting a literature review, we included fields such as the title of article/document, year published, author(s), journal/source, theoretical/conceptual framework, purpose, population, method, notes, and an attachment to upload the original file. We used the form function for each piece of literature to enter relevant information for each field.

Figure 1

An example table within an Airtable base.



Once we entered the information for the literature we had previously identified, we could customize the base using different views to adjust how and what information was displayed in the table. By adjusting the views, we were able to make sense of trends (e.g., publication dates), easily identify similarities (e.g., number of quantitative studies), or focus on a subset of papers (e.g., a particular type of population). We utilized three views: a grid view, a basic spreadsheet table; the gallery view, large cards on a grid; and a Kanban view, with cards stacked on a board. We also used customizations such as filtering or hiding fields, sorting to arrange a field alphabetically or numerically, or grouping records to visually create a separation. Users can save each view to easily re-access it.

Results and Implications

There are many benefits to using Airtable. Once a base is created, it is easy and quick to go back and reference both the annotations and the file of the uploaded paper. The adjustable views allow different ways to browse and present literature throughout the research process. New information can be added and bases can easily shared with other researchers. In the long run, using Airtable saves time. It is easy to use when studying trends or quantifying areas of work. However, you may only find Airtable useful for certain stages in your research. Airtable would be best to use when there will be continuous work on the area of study.

Future Plans

We plan on continuing to use Airtable to organize research for literature reviews. We will also use Airtable for new projects and journal articles and plan to reference bases we have already created. We also plan to explore additional opportunities for using Airtable in academia.

Cost and Resources Needed

Airtable can be free or low-cost depending on the plan selected. The researchers for this innovative poster used the free plan. The free plan is advertised as best for individuals or small teams learning how to use Airtable. The free plan includes unlimited bases, up to five users, one app per base, one sync integration, 1,200 records per base, and 2GB of attachments per base. Other plans include the plus plan for $10 a month. This plan includes three apps per base, three sync integrations, 5,000 records per base, 5GB of attachments per base, custom branded forms, six months of revision history, and automatic table syncing. The pro plan is $20 per month and is best for teams or companies to create workflow and apps. This plan includes ten apps per base, seven sync integrations, 50,000 records per base, 20GB of attachments per base, Gantt and timeline views, one year of revision history, personal lock views, and field and table editing permissions. The final plan is enterprise for advanced custom needs and is priced after contacting the sales team. This plan includes unlimited workspaces per organization, unlimited apps, salesforce and Jira on-prem sync integrations, 100,000 records per base, 1,000GB of attachments per base, three-year revision history, SAML-based single sign-on, enterprise-wide admin panel, an ongoing success plan, professional services, and add-on professional services. Anyone using Airtable would need a device with internet access. Airtable can be accessed via the web or app available for mobile and desktop on iOS, Android, Mac, and Windows.

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An Educational Game to Help Youth Explore Careers in Agriculture, Food, and Natural Resources

Introduction & Need for Innovation

Educational games can engage middle school students to explore careers in agriculture, food, and natural resources (AFNR). Incorporating games into education is not new; agricultural education researchers reported positive results using gaming to teach statistics and experimental design 40 years ago (Pollock et al., 1979). Secondary AFNR education teachers hold positive perceptions of games (McKendree et al., 2019; McKim et al., 2020) and feel confident about their abilities to utilize games in their curriculum (McKendree et al.). Research suggests gaming can be an appropriate method for learning among K-12 and post-secondary students (Bunch et al., 2015). In AFNR classrooms, games have been used to educate learners about experimental design and statistics (Pollock et al.), business management (Knobloch, 2005), plant care and environmental awareness (Tangworakitthaworn et al., 2020), hydroponics (Ali et al., 2017), watershed and land use (Anderson et al., 2020), animal health and management (Bunch et al.), animal neonatal care (Klit et al., 2018), and pest control (Chou et al., 2021). However, games are most commonly used to review AFNR content before exams (A. Talbert, personal communication, June 27, 2022).

Games have the potential to enrich learning in many contexts (Knobloch). The lead author's career journey inspired this innovative idea to feature AFNR career exploration within a game. The authors' primary objective was to help middle school students in 4-H connect their interests to AFNR-related career opportunities. Alternatively, if students were interested in a non-AFNR field, this innovative game helped them think strategically about career planning to support their AFNR interests. Contextualized teaching and learning (CTL) framed the authors' game design because it connects educational objectives with students' lives (Johnson, 2002).

Methods & How It Works

We designed an educational game, "*Steps and Slides,"* to help youth explore AFNR careers. Originally, the game was designed to support 4-H students in grades 6-8, but it could be modified to support other ages. Before starting the game, students were asked to fill out a Career Pathways test to identify three career codes using RIASEC based on their reported interests. During *Steps and Slides*, students used their RIASEC to help them make relevant connections between their codes and some game elements. The students could also use their career codes to help them connect the 16 career clusters to their test results.

Steps and Slides plays like *Chutes and Ladders*. In our game, two types of game pieces were laid out on the floor in a meandering pattern. Horizontal game pieces include career planning questions, while vertical pieces depict the U.S. Department of Education's 16 career clusters. Thirty horizontal pieces aim to encourage critical thinking, while 16 vertical pieces aim to inspire creative thinking about AFNR-related career opportunities. Realistically, the total number of game pieces could be adjusted to support classroom size or time constraints. We used colored painter's tape to create steps and slides on the floor. For gameplay, students were paired to support collaborative learning (Johnson, Laal & Ghodsi, 2012). Like the traditional game, student pairs rolled a dice to move through the game. Students can use traditional, oversized, or digital dice (available through online applications). If instructors want to use digital dice,

students without personal cellphones should be paired with those with personal cellphones. During gameplay, the instructor should "check in" with students.

Results to Date & Implications

We led *Steps and Slides* for three different groups of students (n = 20, n = 10, n = 12) during the summer of 2022. Before starting the game, students were asked about their plans after high school, and 27 of 42 (64%) reported already knowing what they wanted to do. Two groups were asked if they felt their career codes matched their interests, and 13 of 22 students (59%) reported that the RIASEC test accurately reflected their current interests. After playing the game, 23 of 30 (77%) reported that they were rethinking how they should plan for their careers. Interestingly, eight students (36%) reported that the game helped them feel more confident about the careers they had already decided on before playing the game.

Career exploration in AFNR classrooms has broadly focused on skill development, but more work is needed to understand how to keep students on AFNR career pathways (Barrick et al., 2018). To that end, *Steps and Slides* could increase students' awareness of wide-ranging AFNR-related opportunities to serve as the first step in keeping students in AFNR careers. Additionally, our game aligned with CTL because it incorporates the framework's eight components (Johnson) to connect students' interests and preferences with teachers' existing learning objectives and standards.

Future Plans & Advice to Others

Continued study of *Steps and Slides* could produce needed data about the effects of gamification in AFNR education. More research is needed on the game's capabilities, likability, or suitability for other age ranges. Additionally, the Career Pathways test distributed before playing the game could provide data about correlations between AFNR students and the DoE's career clusters, which could support career exploration learning objectives. The authors intend to continue utilizing *Steps and Slides* for K-12 outreach to enrich learning and hopefully collect valuable data for AFNR researchers.

Successful integration of *Steps and Slides* into curriculum would likely depend on supporting teachers' needs. Awareness of curricula tie-ins increases teachers' motivation to use games (McKendree et al.). Therefore, we recommend distributing *Steps & Slides* with relevant learning standards to help teachers understand its usefulness. We also recognize that teachers want professional development training before incorporating games (Bunch et al., McKendree et al.; McKim et al.).

Costs & Resources Needed

Costs remain a reported barrier for teachers wishing to enhance classroom learning. A 2019 study of game use among natural sciences educators found that cost is the perceived barrier to incorporating games into curricula. Thus, cost was considered in the development of this game. Teachers need to print 48 game pieces for *Steps and Slides* and a Career Pathways test for each student. The game pieces and the test are available online. Game pieces can be laminated to make them reusable. Colored tape is recommended for the steps and slides. Digital dice eliminate the need for purchasing physical dice. We estimate the cost of printing and lamination was $30. *Steps and Slides* needs a large classroom, and teachers would benefit from a helper to efficiently interact with students during gameplay.

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Brains and Braun: ***Pairing Turf Scientists with Turf Managers for a Turf Institute***

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Introduction

The study of turfgrass science holds importance due to the place it has in both our environment and economy. Twenty years ago, the global industry was worth over $90 billion (Chawla et al., 2019) and while the industry grows more and more each year, so too does the pressure it places on our natural resources. By definition, turfgrasses are plants that form a continuous ground cover despite mowing and traffic (Turgeon, 2011). Unlike those maintaining other crops however, turf offers a dynamic blend of recreation and management. There are opportunities for growth and there are challenges. A labor shortage currently exists in the turf industry (Klein, 2021) and numbers are declining in turf programs at the post-secondary level (Richman, 2014; Bigelow, 2016a). A study by Streich (2019) concluded that previous experience on golf courses or playing sports on turf fields may lead to a career in turf, but with so much variance in levels and impact of education and training, the challenge of filling jobs becomes difficult. One method proposed by Streich was to work through routes at the secondary level to expose students to the industry. These routes include coaches and science educators. Interventions like professional development for high school educators to be better prepare students to choose a career in the turf industry will not only reveal opportunities for recruitment but also provide formative feedback so that we can improve the programs (Rennekamp & Arnold, 2009) offered to high school teachers at future professional development institutes. An institute was hosted at Penn State in partnership between the Center for Professional Personnel Development (CPPD) and the Center for Turfgrass Science at Penn State to bring together local professionals who maintain turf for a living with scientists who study all aspects of turfgrass to holistically train secondary educators.

How it works

The goals for the institute were threefold: (a) increase the self-efficacy of educators delivering content related to turfgrass science, (b) increase the confidence of educators to communicate with local turf professionals to facilitate experiential learning opportunities, and (c) expose students to career opportunities in the turf industry. Participants progressed through two days of professional development in turfgrass science on campus at Penn State. The program included tours of: a golf course, a football stadium, a baseball stadium, and a turfgrass research center. The field managers from each site paired with a university faculty member to present a session where participants were able to engage in: discussions on management of the turf, conversations of career opportunities, and even run short form experiments that can be taken back to their institutions. Meetings between each team were held in the months leading up to the institute and during the week prior an on-site visit was conducted to finalize talking points, activities, and logistics for working within the operations that were taking place on the properties. Examples of the activities that were organized and guided by the scientists and managers included sponge absorption to demonstrate absorption and infiltration rates in different turf systems, divot mix preparation, and assembly and customization of a mobile water base with sprinkler head.

Results to Date

Participants (n=10) captured content from the scientific perspective as well as advice on the practical application of the content during the workshops that were led by tandem teams of scientists and managers. Participants also received a large tote of soil samples, equipment to run three different laboratory experiments, a binder with a semester's worth of curriculum and content resources as well as supplemental items like soil probes and fertilizer spreaders. Courtesy of the two title sponsors, participants were able to leave the institute with all of the physical items needed to deliver an effective unit of instruction. In addition to physical items, participants took both a pre and post survey to measure growth in the areas of self-efficacy and awareness in opportunities in turfgrass science. Participant confidence increased significantly as well as self-identified ability to reach out to local turf professionals.

Future Plans

Given the success of the first Institute, a smaller version will be run in Maryland for educators in the fields of applied STEM. Each of the scientists and managers identified tremendous benefit in speaking with and guiding educators through applications of the science behind the management of turf at each location and future work will expand to include extension educators in the teams to better represent diverse perspectives in the field. Challenges resided in articulating the need for hands on work at each location opposed to passive lectures that the educators struggled to engage in. Both future programming and future ideas similar to this type of programming should look at the differences between institutes led strictly by extension educators versus those lead by the teams of research faculty and turf managers, as well as the development of activities that can be completed by educators safely and constructively on-site at turf operations like golf courses and baseball fields. Given the limited scope of the pilot program, future programming will also consider investigation into involvement of students in a concurrently run program for training in turf and the sustainability of exposure to turf topics leading to careers in the turf industry.

Resources Needed

Items	Notes/Description	Unit Cost	Qty.	Total
Participant Toolkits	Honorarium for each of the 2 reviewers of the presentations and curriculum packages.	**$120**	**12**	**$1440**
Transportation	A complimentary digital registration to a future professional learning event	**$550**	**1**	**$550**
Food & Lodging	Appropriate Learning Management System for on-demand and live collaboration	**$175**	**12**	**$2100**
			Total	**$4090**

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Breaking Barriers to Effective Evaluation for Non-Formal Educational Programs with a Meta-Analytic Approach

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Introduction

Youth development programs. such as 4-H. help youth develop life skills (Allen & Lohman, 2016). However, in an age of reduced budgets and increased time demands, a more robust evaluation to demonstrate program value and justify costs is needed (Awan & Windon, 2022; Hachfeld & Bau, 2013; Interagency Working Group on Youth Programs, 2016; McClure & Fuhrman, 2012). Lack of time is an ongoing challenge to implement program evaluation for youth development educators (Lekies & Bennet, 2011). More recently, declining youth enrollments in 4-H Youth Development and all Extension programs have intensified challenges in effective evaluation, such as inability to develop strong data sets (Brown, 2009).

Both educators and employers note that better communication skills are needed in today's workforce (Jackson, et. al., 2016). Communications and media jobs are expected to increase by 14% in America by 2030 (USBLS, 2022). 4-H is a place where youth both can learn both communications skills and explore different careers (Allen & Lowman, 2016; Rice, et. al., 2015).

This project addresses these challenges and needs using the 4-H "Spread the News" workshop at 4-H Academy @ Purdue University as the context. First, we describe how to quickly implement an evaluation effort to set the stage for a more robust program evaluation in the future. We share a meta-analytic approach, which involves combining evaluation data sets from the same workshop over multiple years. Second, we share preliminary descriptive evaluation results. Finally, we discuss how meta-analytic methods can be used by others within 4-H and Extension.

How it works

Indiana youth participants enrolled in the workshop when they signed up for 4-H Academy at Purdue. 4-H Academy brings high school-aged youth to Purdue University to learn about career opportunities from faculty and professional staff through hands-on experiences. The Spread the News workshop accomplishes this goal by introducing 4-H'ers to the importance of journalism in the local community and the role of the First Amendment in American journalism. It incorporates media literacy concepts by addressing the definition of news and allowing students to create their own news stories. The workshop has the following learning objectives in three learning areas: Communications Knowledge, Career Exploration, and Civic Awareness. Youth applied communications theory, interviewed and took professional photos and footage for video news stories; created professional social media posts; and made an Adobe InDesign publication.

When preparing for the program, we could locate no appropriate evaluation instruments. To address this need, the lead researcher, a graduate student, conducted an independent study in the area of youth informal program evaluation to identify available resources and develop instrumentation.

The researcher began by reviewing available materials for the 2022 4-H Spread the News workshop: a lesson plan, a past program evaluation instrument, data from 2019, a supplementary Extension fact sheet, and the program agenda. Working with the workshop instructor, the researcher co-developed a list of formal program objectives. A series of 11 Likert scale items were developed by the researcher in the three workshop learning areas to measure participants' knowledge. A paper-pencil questionnaire including the Likert items and open-ended response questions was developed. Likert items were scaled 1 to 5, strongly disagree to strongly agree.

The instrument was piloted with n=7 participants, including six 4-H youth participants and one 4-H Extension educator who assisted with program delivery.

Next year, the instrument will be reviewed by additional Extension faculty and educators to establish face validity. Each year, we will collect data from workshop participants until we have at least 30 complete cases (youth participants). Data will be entered into SPSS 28 for analysis. Each data entry will have a data label indicating 1) program year and 2) instructor to help the researcher keep track of the year data were collected. Our data analysis will be informed by meta-analysis as a means to bring together the various data sets generated over several years in anticipation of slightly different program formats over time.

The use of meta-analytic techniques is innovative in its ability to address low youth participation rates in any given year of the study period. These methods help mitigate small sample size by developing a multi-year sample to enable additional quantitative analysis and external validity.

Results to date

Evaluation findings indicate moderate levels of youth satisfaction with workshop topics and activities. Preliminary quantitative analysis reveals moderate levels of agreement with statements indicating achievement of learning objectives in communication, career exploration and civic awareness (mean scores ranging from 4.11 to 4.38 for each learning area). Youth appeared to enjoy learning about communications careers (M=4.43, SD=0.53). However, it appeared that some youth may have need more instruction on the inverted pyramid (M=3.71, SD=0.95) and professionalism on social media (M=4.00, SD=1.00), as these were lower scoring items. Most youth participants (n=4) appreciated that the workshop covered lots of information. Half of participants (n=3) also shared that they planned to participate in job shadowing in the future.

Future plans

We plan to 1) work to recruit more participants to the 4-H Spread the News program at Purdue University 4-H Academy and 2) collect more evaluation data each year until we have a minimum sample size of n=30 participants.

Spread the News is a program unique to Purdue University. However, if other states offer comparable workshops in areas such as STEM or Agricultural Education, multi-state collaboration may allow the data set to become substantial more quickly. To do this, program partners would need to collaborate on a new IRB to include 1) research personnel at each partner institution, 2) a common evaluation instrument, and 3) provisions for data sharing and protection.

Costs

Due to limited funds and proven ability of graduate students to consult for Extension (McClure & Fuhrman, 2011), 4-H should continue to explore graduate evaluation partnerships to help mitigate the cost of hiring personnel to conduct program evaluations. Additional hard costs to be considered for the evaluation include printing and ink for the evaluations and pencils. These costs would be dependent on the number of participants. Because the evaluation was part of the workshop learning assessment for youth participants, no incentive to participate was provided.

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Building a Virtual Community:
Creation of an Agricultural Education PhD Program's Online Community of Practice

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Introduction

Online delivery of post-secondary education, including graduate degrees, is expanding worldwide. Lee (2020) suggests that a growing number of students choose online graduate programs for convenience and accessibility; to better fit lifestyles where careers and personal lives are already established. The doctorate in agricultural education program at the University of Missouri is delivered fully online to accommodate the needs of working students. Learners in the program reside across the country. Students engage with peers and faculty virtually by participating in interactive, online classes and by meeting virtually with professors to develop and carry out doctoral research. There are many agricultural master programs across the country which follow this same format, as well as undergraduate online classes.

Successful graduate students thrive through persistence, self-regulation, and motivation. These characteristics are even more essential for online learners. Hart (2012) identified several additional factors related to persistence for online degree success, including "a sense of belonging to the learning community" and "increased communication with the instructor" (p.19). Hart (2012) cited evidence showing positive relationships between social connections with peers, and persistence/retention in online degree programs. Social development theory stresses that competence, autonomy, and relatedness impact intrinsic motivation (Ryan & Deci, 2000). Relatedness refers to having a sense of belonging or closeness to people within a social group. A sense of belonging and connection to peers and faculty has been shown to contribute to PhD program retention and satisfaction in both face-to-face and online settings (Lewinski et al., 2017; Rooij et al., 2021).

Doctorate students in agricultural education at the University of Missouri connect with peers and professors through a variety of online platforms in class, including video conferencing, video and written discussion boards, and group projects. A doctoral student community of practice was conceived to strengthen the online learning community and increase the sense of belonging and relatedness for students in all stages of the program outside of the classroom.

How it Works

Community of practices allow individuals to achieve deeper understanding of common topics through regular interaction. The main objective for this community of practice is to increase positive, social interaction among peers and faculty outside of the classroom, while also connecting students with guest professors from across the country. Lewinski et al. (2017) found that positive interactions including "check-ins", advice, and just being present with peers and faculty aids in student personal and professional growth during graduate studies.

The community of practice is open to doctoral students from all stages in the program along with all program faculty. Monthly meetings began in June 2021 all held through Zoom. Emails are sent out by a PhD student facilitator through an updated list prior to each meeting. Monthly meeting reminders contain a flexible agenda that include topics to be covered, departmental news, shout-outs to peers and faculty or guest speaker biographies.

Students are encouraged to share topics of interests, pose questions to peers and faculty and to simply get to know one another outside of class. Faculty members share departmental news, timely information related to progression in the program, upcoming conferences, and events. Students have been able to share vital information and helpful hints on topics such as time-management, organization, research and comprehensive exams.

The community has evolved by members' contributing individual needs and ideas. Beginning in November 2021, the community of practice began hosting monthly "brown bags" with guest professors from a variety of universities. Guest professors share their backgrounds and perspectives on research and education, provide helpful advice and insights, while provoking thought and discussion.

Results to Date/Implications

The University of Missouri Agricultural Education PhD Community of Practice has virtually connected students and faculty every month from June 2021 through April 2022. The community will be on break for the summer semester, then will reassess needs in the fall, and reshape to meet those needs. Average attendance includes six students and three faculty. Overall, 15 different students have joined at least one virtual meeting. Six professors from outside the university have joined the group to provide valuable insights and assist in building students' professional networks. Student attendance and participation has increased as guest professors began to join, as well as when valuable department information was included on the agenda.

Student interaction has increased outside of the virtual classroom. Students from various stages of the program who have not interacted in class are connecting and consulting with each other through email and text. Several have even met in-person at regional conferences and other events after getting to know each other through the virtual community. Strong faculty involvement in the community of practice meetings has allowed students to feel connected and supported outside of class. The department has noted an increase in IRB applications and abstracts for conference presentations as compared to the year prior. It is not known to what extent this is due to the Community of Practice versus other factors.

Future Plans and Advice

A needs assessment will be conducted in the fall of 2022 to identify strengths, weaknesses, benefits, and challenges of the virtual community. Results will be used to make adjustments to the format as warranted. This idea can be easily replicated by secondary and post-secondary degree programs of all levels with students on virtual or hybrid learning platforms.

Costs and Resources Needed

The cost for this community is free! Resources such as zoom, email and web-based publishing needed for advertising and hosting the meetings are all virtual, which makes this idea easily replicated by any institution for any level of education program. Planning consists of only one to two hours per month, and includes contacting speakers, creating web-flyers, emailing members, and sending follow-up emails. This is a low-cost, using minimal time to plan idea!

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Building Relationships and Technical Skills for Student Teachers

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Need for Innovation

Teacher educators face the complex challenge of preparing student teachers to enter the classroom post-graduation. There is no set formula for how to incorporate pedagogy (Toombs et al., 2022; Tummons et al., 2020; Wooditch et al., 2018), content knowledge (Snider et al., 2021; Whitehair et al., 2021; Tummons et al., 2020; Wooditch et al., 2018), behavior management (Ingram et al., 2018), professionalism (Gates et al., 2020), work-life balance (Sorensen et al., 2018) and how to prevent early-career burnout (Sorensen et al., 2018; Ingram et al., 2018) into a preservice teacher preparation program. Preparing to address individual needs for a cohort of students is demanding year after year, especially with an educational environment that is constantly changing. Additionally, school-based agricultural education (SBAE) is confronted with a unique challenge of preparing preservice teachers with content knowledge and pedagogy to teach agriscience. The tension between preparing an applied science curriculum to meet the needs of modernized agricultural practices and the traditional production agricultural technical skills poses questions to teacher educators on how to best prepare preservice teachers (Tummons et al., 2020).

As recent graduates enter the classroom in August 2022 they face challenges previous cohorts have not experienced. To start, COVID fatigue impacted students differently (McKim & Sorensen, 2020) than any teacher preparation program could have predicted. The student teaching cohort of 2022 experienced university shutdowns, virtual early field placements, and methods classes online. Student teachers lacked opportunities to apply content knowledge through in-person interactions due to virtual learning opportunities. While the circumstances cannot be changed, it is important to address the lack of foundational skills these students are missing post-graduation.

Student teachers at The Ohio State University completed student teaching without practical pedagogical content knowledge (PCK) to enter the classroom in the fall. PCK can be defined as a unique blend of content knowledge and pedagogy for a specific discipline (Shulman, 1986). In a SBAE context, PCK needs to meet the evolving needs of science objectives and industry technical skills. How do we prepare SBAE preservice teachers to bridge the gap between science competencies and industry needed technical skills?

How It Works

To address the gap between science and technical skill content knowledge, a teacher educator and graduate student at The Ohio State University who were instructors for the spring 2022 student teaching seminar course sought to create an opportunity for preservice teachers to experience PCK outside of the classroom setting. After surveying local agriculture enterprises, Select Sires was selected as a potential business who applies technical skills with the foundation of applied agriscience content knowledge. Select Sires is a regional cattle semen cooperative, providing high quality bull semen for artificial insemination.

After reaching out to Select Sire's marketing coordinator who is in charge of scheduling school field trips, the instructors requested to work with geneticist to work through technical skills of evaluate bull semen. After proposing our idea to run a high school level laboratory at the Select Sires facility, the head geneticist worked closely with the course instructors to plan a purposeful experience evaluating bull semen for viability, morphology, and motility.

Two fifteen-seat passenger vans were used to transport students during the seminar week to the Select Sires facility. After learning about the background of the company and current state of the artificial insemination industry, students were assigned to groups to work to evaluate different samples of bull semen through inquiry-based strategies. Student groups needed to

determine if they would sell each specific straw to a client based on industry standards of viability, morphology, and motility. After the lab was completed, the head geneticist and his team described to the preservice teachers a day-to-day view of what they do to evaluate semen for their customers. In addition to reviewing the laboratory activity, students reflected on what they learned from the experience and how they can apply these strategies within their classroom.

Working with industry leaders who are applying science in an agricultural setting and hold technical skills is beneficial to preservice teachers. Using this opportunity to prepare preservice teachers for real-world PCK application is necessary to fill the gap that is being posed by science and industry technical skills.

Results to Date and Implications

Students submitted written reflections to the instructors at the end of each day of the student teaching seminar. The following are the biggest take-a-ways from the student teacher reflection submissions:

Modeling behavior: For some student teachers, this experience was the first time thinking about how to use laboratory equipment. Many students echoed, “I knew how to set up a microscope, but I had never made my own slide to look at. I would have failed at teaching this lab to my students if I didn't watch our instructor do it first.” Another student reflected, “I found it very useful to go to Select Sires because [the geneticists] organized the lab in a manner that I could see myself doing in my own classroom in the future.”

Content Connections: Both student teachers and Select Sires noted how impactful the time was to connect. Student teachers left with content knowledge resources, contacts at Select Sires, and ideas to incorporate a field trip like this into their own classroom come the fall. “I went an urban FFA program. I know nothing about production agriculture—this was out of my comfort zone. However, I left with a better understanding of how I can talk with my students about personal experiences without having to grow up on a farm,” stated a student in her reflection. May students reflected about how they have never learned about reproduction in animals outside of the classroom setting.

Future Plans and Advice to Others

This example was animal science focused, however, working with agricultural industry leaders can span across all context areas. For example, working with a local greenhouse to work understand real-world application of propagating or water techniques. Another example could be going to a local restaurant to learn about food safety practices. By continuing to incorporate this type of activity into future student teacher seminars we can continue to make other connections through the teacher education program.

Once important aspect of implementing an industry trip to teach PCK strategies is to allow ample time for students to reflect and ask questions. Feedback from students was positive and sought to have experiences like this prior to student teaching. It is also important for the instructors to help student teachers make connections between the activity, agricultural content, and pedagogical applications. The instructors for the course recognize the need to incorporate opportunities for SBAE preservice teachers to apply what they know about agriscience content to pedagogical strategies.

Costs and Resources Needed

Costs associated with this innovative idea include access and cost for transportation to an agricultural business. The instructor needs to allocate time to plan, collaborate with the business, implement the activity, and guide student teachers to reflect on the experience.

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Engaging Students with the Syllabus Through Social Annotation

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Engaging Students with the Syllabus Through Social Annotation

Need for Innovation

The syllabus is an important part of any college course. The syllabus serves as a place to share course information, requirements, and university policies (Field, 2022; Fuentes et al., 2021). The syllabus has several purposes, including as a communication tool to share contact information and when and where the class takes place (Center for Teaching Innovation, n.d.). Essential information for students about how the course connects with other classes and the learning objectives for the course should also be included in the syllabus (Center for Teaching Innovation, n.d.). Additionally, the syllabus should provide a guide to expectations about participation, grading policies, and an outline of course meetings and assignments (Center for Teaching Innovation, n.d.). The instructor also implicitly communicates their approach to teaching and learning through their language and course policies (Bain, 2004).

It is critical that students understand the content of the syllabus. Especially when grading structures, flexible delivery methods, and distinctive elements vary from course to course ("Annotate Your Syllabus 3.0," 2020; Blum & Kohn, 2020). The importance of the syllabus has taken on new meaning since the COVID-19 pandemic, as aspects of the course may change as life isn't yet normal ("Annotate Your Syllabus 3.0," 2020; Field, 2022). However, instructors often become frustrated when it seems that students do not read or understand the syllabus (Field, 2022).

One solution to the challenge of students understanding the syllabus is using a social annotation activity to increase student engagement with the syllabus. Social annotation allows students to add reactions, questions, and suggestions to the syllabus document in a shared environment. Completing social annotation with the course syllabus at the beginning of the term shows that the instructor cares about student input and welcomes feedback ("Annotate Your Syllabus 3.0," 2020). Furthermore, the activity can help make your class more inclusive by focusing on students (Brown & Croft, 2020) through building community and connectedness ("Annotate Your Syllabus 3.0," 2020).

How It Works

To facilitate the social annotation activity, the instructor shares a link with "commenter" level access to a shared Google Document or other platform. Students then add comments and reply to other students' comments to ask questions, provide reactions, and make suggestions on specific parts of the syllabus. The activity can be completed in different class formats, either during an in-person class, as a homework assignment, or via synchronous or asynchronous formats of online courses. The instructor answers questions, clarifies any confusion, responds to reactions, and emphasizes important parts of the syllabus by replying to students' comments within the document or in class.

Before beginning the activity, provide guidance on what type of annotations are acceptable by sharing examples, such as "what does this mean?" or "how will we present this project?" You can also encourage students to reply to other students' comments to show

agreement or offer alternative views. Share why you include this activity in the course and how you will respond to their comments (e.g., during class or a reply within the shared document).

Results to Date/Implications

Social annotation of the syllabus has been successfully implemented across a range of courses at the introductory undergraduate, advanced undergraduate, and graduate levels. The activity allows the instructor to highlight important parts of the syllabus, clarify statements, and attend to questions or comments. Instructors also gain insight into student interest and experience with the course. Students appreciate asking questions in a low-stakes environment and seeing what other students are asking, which may spark additional questions or help them not feel alone and build connections between students early in the class. Overall, student feedback was positive towards the inclusion of a social annotation activity, as demonstrated by the following quotes:

- "I thought it was nice to have a chance to ask questions and get clarification at the beginning of the semester"
- "I enjoyed being able to see what other people were typing, and I found it very helpful. I got a lot of clarity on things that I thought I understood."

We have also found that when the instructor uses the syllabus annotation as an out of class assignment it opens up more time on the first day of class for student engagement activities.

Future Plans/Advice to Others

We plan to continue using social annotation to introduce the course syllabus at the beginning of the term. From the instructor's standpoint, it is a beneficial activity to get a sense of the students through their questions and to indicate that you care about them. Instructors can use social annotation for the syllabus in any type of class (e.g., undergraduate/graduate, lecture/lab) and in any format (e.g., in-person, asynchronous). Another idea regarding the syllabus is to use the social annotation activity as a reflective activity at the midterm or the end of the class to collect feedback (*Annotate the Syllabus – OneHE*, n.d.). Additionally, instructors may use the idea of annotation to individually reflect and make their own notes throughout the course (Fuentes, et al., 2021; *Weekly Teaching Note | NYIT*, n.d.). Social annotation can also be applied to contexts beyond the syllabus to help students process and collaborate while reading (*Social Annotation | Center for Teaching Innovation*, n.d.).

Cost/Resources Needed

Syllabus annotation can be implemented with no financial cost. Personal Google accounts are free, and many educational institutions provide Google Workspace accounts or alternatives that allow commenting on shared files. Social interaction tools including Hypothesis, VoiceThread, and discussion boards can also be used. The amount of time required to set up a shared file for syllabus annotation is minimal, typically an hour or less to set up the document and respond to students' comments, and is typically offset by spending less time in and out of class answering student questions about information in the syllabus.

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Increasing Agricultural Literacy in Social Studies Teachers through Transformative Travel Experiences

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Introduction/Need for Innovation

A report from the Association for Career and Technical Education summarizes research on middle school students and pinpoints middle school as the stage at which young people can "benefit the most from career exploration" including developing self-awareness, gaining knowledge of careers, and forming plans to reach their career goals (2018, p.1). Unfortunately, in South Carolina, only 5% (13 of 248) public middle schools provide agricultural education (Teacher Directory, n.d.; 2019-20 Public School List, 2020), despite the fact that middle school agricultural education programs continue their substantial growth across the country (Odubanjo, 2018). One avenue to introduce careers in food and agricultural sciences (FAS) to middle school students is the state's middle school social studies curriculum which addresses agriculture in respect to the state's history. Furthermore, social studies is mandatory for the state's 8th graders; thus, engaging middle school social studies teachers has the potential to influence all students at a developmentally appropriate time for career planning.

To address the need to expose middle school students to FAS careers, Clemson University and NC State University researchers created a professional development program for middle school social studies teachers known as Studies in Occupations, Culture, and Innovations toward Agricultural Literacy (SOCIAL). Middle school teachers selected for the program, known as SOCIAL Studies Fellows, are engaged in a graduate course focused on the inquiry design method and coaching for integrating the food and agricultural sciences into their social studies curriculum. The focal point of the program is the SOCIAL Studies Academy, a summer tour of six Clemson University Research and Education Centers to observe contemporary agricultural production, research, and develop knowledge of FAS careers. The ultimate goal is to strengthen the agricultural workforce by exposing middle school students to diverse FAS careers.

Methodology

An invitation to apply to the SOCIAL Studies Fellows' program was sent to all middle school teachers and principals in South Carolina. The application asked teachers about their motivations, experiences, and plans relative to the inquiry design method, mentoring other teachers, and integrating FAS into their social studies curriculum. Of the 42 applicants, 13 SOCIAL Studies Fellows were selected in 2022, consistent with the program budget. The SOCIAL Studies Academy was designed to highlight FAS careers and issues inclusive of small farms; economics, markets, and trade; technologies; environmental and natural resource economics; and rural economic development. The SOCIAL Studies Academy involved a 6-day, 5-night tour. Each day included a tour of a different Clemson University Research and Education Center and presentations by agricultural faculty about their work, career experiences, and career requirements.

The SOCIAL Studies Academy evaluation focused on two questions: (1) To what extent, if at all, did the SOCIAL Studies Academy influence Fellows' perceptions of agricultural careers? (2) To what extent, if at all, did the SOCIAL Studies Academy influence Fellows' intentions for integrating agriculture into the middle school social studies curriculum? To address these research questions, Fellows completed two questionnaires. The first questionnaire was the

Perceptions of Agricultural Careers with 27 items measuring perceptions of agricultural careers and occupational requirements. This scale was originally designed for high school agriculture students (Talbert & Larke, 1995). The scale used was 1 (*Strongly Disagree*), 2 (*Disagree*), 3 (*Neither Agree nor Disagree*), 4 (*Agree*), 5 (*Strongly Agree*). A sample question is, "Most jobs in agriculture are minimum wage jobs." A second questionnaire, SOCIAL Studies Academy Evaluation, was designed by the researchers to measure intention to implement instructional practices for including agriculture into their social studies curriculum. This was a post-then-pre questionnaire, based on work by Willems (2010) wherein participants evaluated their practices after the program (post) and before the program (pre). The items used a 5-point scale: 1 (*Very Little*), 2 (*Little*), 3 (*Some*), 4 (*Much*), 5 (*Very Much*). The data was collected online using the Qualtrics Research Suite, and the questionnaires were administered using the Tailored Design Method (Dillman, et al., 2009). The population consisted of the 13 Fellows. The perceptions questionnaire was administered as a pretest before the SOCIAL Studies Academy and a post-test one week after the SOCIAL Studies Academy. Of the 13 Fellows, 13 completed the pre-test and 12 completed the post test for a 100% and 92% response rate respectively. The SOCIAL Studies Academy Evaluation was completed by the 13 Fellows (100% response rate). Data analysis used frequencies and percentages to compare pretest and posttest responses.

Results to Date/Implications

In regards to the fellows' perceptions of agricultural careers, the percentage who agreed or strongly agreed that: (a) "I am capable of getting a good job in agriculture" increased by 61.5% from pretest to posttest; (b) "Many agricultural leaders have college degrees" increased by 37.9% from pretest to posttest; and (c) "It takes special training to work in agriculture" increased by 30.8% from pretest to posttest. Fellows had an average 12.1% increase in agreement from pretest to posttest for the 27 items. From "before this program" to "now" the percentage of Fellows reporting "much" or "very much" in regards to FAS-related instructional practices increased an average of 74%. Specifically, the percentage of Fellows who intend to: (a) Encourage students to pursue FAS careers increased by 90.9%; and (b) Provide students with FAS career resources increased by 100%.

Future Plans

The evaluation demonstrates a clear increase in Fellows' understanding of agricultural topics and intent to implement specific FAS career development in their curricula. While this was a small study, results support transformative travel (see Soulard et al., 2020) as a viable option for teachers' professional development toward agricultural literacy. The results contribute to the literature on weeklong summer tours which have shown increased agricultural literacy among K-12 teachers (Balschweid et al., 1997). Additional research, namely interviews and observations, will be used to determine effectiveness of the SOCIAL Studies Academy and the extent to which Fellows work to amplify agricultural careers among their middle school students. We recommend offering the Fellows CEUs or graduate credit as a participation incentive.

Costs/Resources Needed

Funding is provided by the USDA National Institute of Food and Agriculture's Education and Workforce Development program, part of the Agriculture and Food Research Initiative (Award Number 2021-67037-34301). The SOCIAL Studies Academy utilizes $1,821 in funding per teacher for lodging, travel, food, and instructional materials.

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Planting Partnerships: Establishing a Community Collaboration between Warren County Cooperative Extension and the Youngsville Public Library to Increase Agricultural Literacy

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Planting Partnerships: Establishing a Community Collaboration between Warren County Cooperative Extension and the Youngsville Public Library to Increase Agricultural Literacy

Introduction

The need for partnerships in Extension education has increased over the past few decades because of budget decreases and staffing shortages (Lopez et al., 1999). However, Cooperative Extension and other organizations often offer similar educational programs to the same audiences without association or collaboration (Jones et al., 2020). Greater collaboration between Cooperative Extension and these other organizations could potentially help both partners increase programmatic impacts, decrease programmatic costs, and broaden their capacity to educate more people (Jones et al., 2020; Lopez et al., 1999). Thus, there has never been a better time than the present to encourage and forge stronger partnerships between libraries and Cooperative Extension, especially 4-H (Faiks, 2002). 4-H is the youth branch of Cooperative Extension that applies youth development research, through non-formal education, directly from land-grant universities to local youth, families, and communities (Fields & Rafferty, 2012). 4-H provides various research-based, learning opportunities in science, agricultural education, citizenship, and healthy-living (Fields & Rafferty, 2012). For years, public libraries have served people of all ages and backgrounds, provided free access to educational resources and materials, recognized the importance of science literacy, and created strong ties with other community-based organizations (Smith et al., 2012). Research indicates that public libraries have partnered and collaborated with community organizations to foster youth development (Fields & Rafferty, 2012). The parallel visions of public libraries and Cooperative Extension in providing lifelong learning experiences and communicating science to the public can illustrate how partnerships between organizations can enhance the vibrancy of education and opportunity (Peich & Fletcher, 2015).

How It Works

Warren County Cooperative Extension partnered with the Youngsville Public Library to develop a three-part summer program series. The summer program series was designed to introduce general scientific concepts and increase agricultural literacy among youth in the local community. Specifically, the summer series was titled “Plants & Pollinators,” and each program within the series aimed to help participants understand the links between plants, pollinators, and the foods we eat. The 4-H program assistant in Warren County and the director of the Youngsville Public Library worked in partnership to develop and facilitate three summer program sessions. Each session within the series was one hour long and included the following: 1) a team-building or physical activity, 2) a brief, interactive lesson derived from research-based curricula, 3) a craft aligned with the lesson, 4) a story aligned with the lesson, and 5) a small snack. The three-part summer program series focused on plant anatomy, seed structure, and pollinators, with hands on experiences throughout. All necessary materials and supplies were secured prior to the program and the cost of those materials was shared by both participating partners. Similarly, Warren County Cooperative Extension and the Youngsville Public Library shared the responsibilities of planning, preparing, designing, and delivering the three educational programs. The 4-H program assistant from the Warren County Extension Office was responsible

for designing and delivering each of the three interactive science lessons and crafts, and the director of the Youngsville Public Library was responsible for selecting an appropriate story to fit within each lesson and engaging participants in reading and literacy activities during each program. All other roles and responsibilities were shared in collaboration between partners.

Each session within the summer program series was held at a pavilion in a local park. This specific location is central to Warren County, is not tied to either program partner, and promotes outdoor exploration among youth. The target audience consisted of youth ages five through eighteen, but all children, youth, and their families were welcome to participate in the program. The program was free to all participants, and they were not required to register in advance for the program. The three-part summer program series was advertised on social media by both partners, and program flyers were posted at local businesses throughout the community to inform local citizens of the summer program. At the conclusion of each program, the partnership was promoted, and participating youth received further information about Warren County Cooperative Extension, Warren County 4-H, and the Youngsville Public Library to engage them in future events and activities.

Results to Date

The number of participants varied between four to fourteen when considering attendance at each of the three program sessions. The positive verbal feedback communicated by the majority of those youth participants indicated that the three-part summer program series was educational and enjoyable. Participants specifically enjoyed learning about plants and pollinators in an outdoor setting, rather than in a traditional classroom. Most of the youth participants, as well as their parents and guardians, who provided feedback stated that they would like the three-part summer program series to be offered again the next summer. Overall, the collaboration of Warren County Cooperative Extension and the Youngsville Public Library allowed program partners to involve a greater number of participants, decrease program costs, and employ the knowledge and experiences of both the 4-H program assistant and the library director.

Future Plans

The positive feedback and experiences of both the youth participants, their parents, and the program partners have led to the planning and preparation of a three-part summer program series for next summer. By continuing the collaboration between Warren County Cooperative Extension and the Youngsville Public Library, local youth will have the opportunity to participate in science and agriculturally-related educational activities that promote knowledge gain and improve literacy skills. Additionally, the continuation of this collaboration can help to promote the value of partnerships within the local community.

Costs/Resources Needed

The 4-H program assistant in Warren County and the director of the Youngsville Public Library invested a considerable amount of time and energy into the design and delivery of the three-part summer program series. However, all the lessons were derived and modified from the 4-H curriculum that is available for free with an online account. Expenses paid by Warren County Cooperative Extension and the Youngsville Public Library were the cost of the craft supplies and snacks, totaling approximately $130.

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Sustaining Undergraduate Classroom and Career Excellence for STEM Students

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Introduction

Improving diversity, equity, and inclusion in postsecondary STEM education is of paramount significance. Programs that are intentionally designed to provide underrepresented students access to relevant, equitable, and valuable STEM-based learning opportunities are critical to support the calling for a more diverse workforce in STEM careers and post-baccalaureate education (Daily & Eugene, 2013). Prior research has indicated that the formation of students' STEM-identity improves the retention of students pursuing STEM majors. Increasing STEM-identity requires purposefully designed approaches aligned to student characteristics. The intersection of gender, race/ethnicity, socioeconomic background, and academic preparation all affect STEM-identity to varying degrees (Collins, 2018; Martin-Hansen, 2018; Rosa, 2018). In addition to improving students' STEM-identity, improving career knowledge and preparation is another clear area of need for underserved students (Chemers et al., 2013; Gibbons & Borders, 2010). This poster describes the Sustaining Undergraduate Classroom and Career Excellence for STEM Students (SUCCESS) Project and its outcomes. The project was established at Doane University, a rural, residential, primarily undergraduate institution in Nebraska. The project was funded through the National Science Foundation (NSF) with a goal to increase the number of students, particularly low-income and underserved students, prepared to pursue graduate degrees in non-biomedical STEM programs, while also diversifying the pipeline of STEM majors in undergraduate degrees. The project utilized a multi-method approach in achieving this goal, including the formation of three student cohorts that were provided tailored support and learning.

How it Worked

The SUCCESS Program ran from 2015 to 2020 and established three cohorts of S-STEM scholars (scholars). Criteria to become a scholar were: a) apply and be admitted to the university; b) have a minimum high school GPA of 3.0; c) pursue a STEM major (with a STEM, non-biomedical, career intent); d) be Pell-Grant eligible (indication of low income/financial need); and, e) apply for the SUCCESS Program. The application included a short essay, recommendation letter from a high school teacher in STEM, the creation of an introduction video, and a face-to-face interview. The SUCCESS Program provided each chosen scholar 4 years of financial support through a scholarship (up to $10,000 per year, averaging $5,000 per year, minimum of $2,000 per year, as determined by each scholar's financial need). To maintain the yearly financial support, scholars were required to continue in the SUCCESS Program. The SUCCESS Program included components aimed to improve students' STEM-identify, support, and academic success. In the first year of the program scholars were required to live on-campus in a living-learning community – a specific residence hall designed for scholars. The intent of the living-learning community was to strengthen the cohort through shared experiences and interests. An upperclassman majoring in a STEM discipline was assigned to live in the same living-learning community and served as a SUCCESS Program liaison. First-year scholars completed the 3-credit course, *LAR 101: Science and Society*, designed specifically for each cohort. Additionally, throughout years one and two, scholars completed STEMinars – weekly workshops, discussions, and luncheons that explored cutting edge research on STEM topics. In years three and four, students were required to participate in SUCCESS program workshops that were tailored for career exploration in STEM and connected scholars with local and regional STEM employers. Furthermore, faculty from each targeted STEM major and key student support services administrators served on a management team and collaboratively implemented, monitored, and evaluated scholar support services designed to increase graduate rates and prepared scholars for STEM jobs and graduate programs. Support services included peer

tutoring, supplemental STEM instruction, academic counseling, writing center support, and retention support. Throughout the four years, scholars were required to maintain a minimum cumulative GPA of 3.0.

Results & Implications

The SUCCESS Project provided scholarships, educational programming, and support for 28 scholars (10 Cohort I scholars, 11 Cohort II scholars, and seven Cohort III scholars). The average scholarship awards per year were $4,650 (Cohort I), $5,410 (Cohort II), and $4,714 (Cohort III). Over the grant period, the number of majors in targeted STEM programs increased by 12.9%, while enrollment on the residential campus decreased by 5%. While the goal of the program was to increase enrollment in STEM programs by 17%, the increase of 12.9% in STEM enrollment was substantial for this small university. All scholars (10) in Cohort I graduated with a STEM degree in May 2019, 10 of 11 Cohort II scholars graduated with a STEM degree in May 2020, and 7 of 7 Cohort III scholars graduated with a STEM degree in May 2021. Evaluation surveys were used to provide data on scholars' experiences with SUCCESS Project initiatives. Scholars reported an increased interest in science and STEM careers. STEM employer visits were ranked highly among scholars as having an impact on their interest in STEM careers. Company visits included, but were not limited to, Celerion, Li-CoR, Cargill, and a local water treatment plant. Scholars also reported feeling well-prepared for careers and noted particular appreciated for the mock interviews and resume preparation as part of the program. Scholars had positive perceptions toward the *LAR 101: Science and Society* course and STEMinars. Of the 10 students who graduated from Cohort I, five are in STEM jobs and four are in STEM graduate school. Of the 11 students who graduated from Cohort II, four are in STEM jobs and four are in STEM graduate school, and of the seven students from Cohort III, two are in STEM careers and five are enrolled in graduate school.

Future Plans

Track I of the SUCCESS project ended and the authors have submitted and received a NSF S-STEM Track II grant. The grant will provide 120 unduplicated, annual scholarships to 30 low income students with academic ability, talent, or potential and demonstrated financial need who are pursuing STEM degrees. Although most features of the Track I SUCCESS program will continue (first-year living learning community, STEMinars, employer visits, etc.), Track II will include more robust recruiting initiatives. Strategic recruitment from five high schools that serve high numbers of underrepresentative groups is planned. Track II aims to increase retention rates of scholars by 13 points to 90% (baseline is 77%) and to increase the four-year STEM major graduation rate by 39 points to 80% (baseline is 41%). Track II will also improve evaluation measures of the program. One-on-one interviews/focus groups will be conducted with scholars before, during, and after completion of the program. Improved quantitative measures will be used to measure students' STEM-identify and career motivation.

Costs & Resources

Track I of the SUCCESS Project (completed) was supported by a $607,539.00 grant. Although many of the programs in the SUCCESS Project could be completed without grant assistance, we have identified the scholarship contribution ($521,664.00) as a foundational component to attract and retain scholars. The project was made possible by a collaborative effort between STEM faculty, university administration, student support services, and industry. The Track II award includes additional scholarships to support students and is a more robust program, funded by 1.5 million dollars from the NSF for program implementation.

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Teaching Apple Preservation and Packaging with Integrated STEM through AFNR

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Introduction

Every learner interacts with and depends on agriculture everyday (The National Council For Agricultural Education, 2015). The comprehensive topics within the Agriculture, Food and Natural Resources (AFNR) national standards offer a multitude of different contextualization opportunities. Knobloch et al. (2007) reported that teachers believed an authentic learning experience occurred through an agricultural context. Apples provide not only an agricultural context, but a local, cultural context for students in Lafayette, Indiana. Van Ingen et al. (2018) reported that culturally responsive teaching can support an integrated science, technology, engineering, and mathematics (iSTEM) approach and engage learners. Integrated STEM is "The approach to teaching the STEM content of two or more STEM domains, bound by STEM practices within an authentic context for the purpose of connecting these subjects to enhance student learning" (Kelley & Knowles, 2016, p. 3). Vasquez et al. (2013) identified three approaches to iSTEM: multidisciplinary, interdisciplinary, and transdisciplinary. The different approaches vary in the degree to which the learning experience weaves the subject domains together, provides real-world application, and gives ownership to the learners. The purpose of this unit was to create an opportunity for late elementary learners to explore apple preservation and packaging within a community context through iSTEM within an AFNR context. Learners explored the science and reasoning behind the choices food scientists and packaging engineers make in their careers to address real-world concerns such as food waste and overproduction.

How it Works

This unit was developed by Purdue graduate students enrolled in *Integrated STEM Through AFNR*. The unit was informed by Standards for Technology and Engineering Literacy, Indiana Science and Engineering Process Standards, and The AFNR Career Cluster Content Standards.

The unit began by activating prior knowledge of food science and technology. It then allowed students to explore and simulate the science behind apple browning, and through inquiry learning, design their own experiment to prevent apple browning. Continuing to apply inquiry learning, lesson 3 presented students with additional variables that food scientists and packaging engineers must consider and allowed them to explore packaging materials. Transitioning to a project-based learning approach through the engineering design process, lesson 4 and 5 assigned students the role of a packaging engineer. The lesson set the context for the problem within a local orchard. Students co-created constraints and criteria for their projects as well as tests to evaluate their criteria. Students designed their apple slice packages and after testing, made revisions based on their conducted tests. The unit was designed to be implemented over a week with additional time needed for completion of the summative assessment. The 45-minute lessons could also stand-alone but best support the learner as a unit.

Within the unit, students began by developing STEM skills and developed an understanding within a multidisciplinary approach (Vasquez et al.). As the unit progressed, it transitioned to an interdisciplinary approach that required students to use the skills they learned to solve problems in an authentic context. Multidisciplinary integration was present in lesson 1 and 2, advanced to interdisciplinary integration in lessons 3, 4, and 5, and through the summative assessment, reached transdisciplinary iSTEM. The concepts that were taught are distinguishable as science or technology/engineering with mathematics applied to collect evidence and justify decisions. The application of knowledge made this unit valuable as the students applied what they learned to make meaning and transfer it to an authentic problem. Multiple disciplines were consistently

used throughout the lessons to support students' problem solving and decision making. The instructor acted as a facilitator while also providing a fair amount of guidance to assist the learning process. Food production acted as the context for the learning experiences and challenged students to solve an authentic feasible problem within that field. Students built on their existing understandings surrounding the science of apples and used creative thinking to solve a real-world problem. Lessons 2-4, covering scientific inquiry and part of the engineering design process, were co-taught by two facilitators at a local after school program in a non-formal learning environment. "[Non-formal learning] shares the characteristic of being mediated with formal education, but the motivation for learning may be wholly intrinsic to the learner" (Eshach, 2006, p. 173). The lessons are adaptable to non-formal and formal learning environments.

Results to Date

Ten students at a local after school program designed their apple packaging to be airtight and to hold liquid, showing they understood the effect the oxygen in the air had on the apple slices and reflected the inquiry results that a liquid lemon water mixture worked best. Worksheets showed that learners were actively making and recording observations about the effects of the anti-browning agents. The worksheets also showed that learners were defending their conclusions by applying the observational data they recorded. The discussions within the engineering design prototype building time showed that students were thinking about the previous concepts; learners were building prototypes that would hold liquids and keep oxygen out.

Future Plans/Advice to Others

The unit is designed to be taught in sequence over a week. The lessons could also stand-alone but would require the facilitator to provide some context to the learners. In person delivery created opportunities for the facilitators to interact one-on-one with the groups and ask learners higher-order thinking questions to assess and foster their learning (Krathwohl, 2002). In-person lessons allowed for peer collaboration and richer discussions. Collaborative learning encourages students to self-regulate their learning and co-regulate their peers' learning (DiDonato, 2012). Encouraging students to work collaboratively in groups can have social, psychological, and academic benefits (Laal & Ghodsi, 2012). Inviting local apple producers to share and present the problem within the local context as well as field trips to a local orchard would enhance the problem and make it more meaningful to learners (Crompton, 2020). The context of the unit could be adjusted based on the local agricultural industry or learner interests.

Costs/Resources Needed

Each lesson plan in the unit includes a list of resources needed. The lessons were designed to be affordable, so most of the supporting and building materials are accessible household items (i.e. milk, salt, foil, wax paper). The lessons could be adapted to be taught online and the common household materials would support the online delivery. The inquiry and engineering design activities list a variety of suggested materials but do not require them all nor limit learners to only those materials. The approximate cost of all the suggested consumable materials for the unit is $50. Computer access is highly recommended to support the lessons with the respective videos and visuals. Each lesson includes complimentary worksheets that would incur printing expenses. The online implementation of this unit would be of less cost to the facilitator but may create a financial barrier for learners.

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Building Relationships Between an Equine Advocacy Group and Cooperative Extension to Facilitate Adult Education Programming: A Pilot Study

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Introduction/Need for Innovation

Transporting horses can be a hazardous endeavor. The activity requires proper planning and infrastructure to avoid accidents and maintain high standards of animal welfare (Miranda-de la Lama et al., 2009). Mishaps involving horse trailers can be a dangerous problem resulting in serious injury or death which could negatively impact the perception of the animal industry. Accidents can arise from mechanical failures and improper weight balance between the vehicle and the trailer (Braver et al., 1997).

Appropriate programs should be developed and contain educational topics which can help maximize loading and hauling safety procedures and potentially minimize accidents. These types of programs can be beneficial because of the valuable information and demonstrations taught by experts such as those within the Cooperative Extension industry and university agriculture research and extension centers (ARECs). When it comes to adult equine education programs in a non-formal setting, Cooperative Extension and ARECs should be one of the first resources/outreaches because of their time-tested, strong relationships in agricultural communities and experience providing non-formal education. Extension agents network with other community expertise to provide in-depth, experiential trailer safety programs that provide owners and haulers access to peer reviewed research, well-educated speakers and professional development opportunities. However, the MARE Center and VCE Loudoun needed assistance in promoting such events with organizations that have more presence/influence in the community. As such, the MARE Center and VCE Loudoun reached out to a more vocal equine organization, the Loudoun County Equine Alliance (LCEA). Having this partnership would be valuable on both ends because LCEA would assist in the Center's and VCE Loudoun's publicity efforts while the MARE Center and VCE Loudoun would be able to share our educational opportunities and research findings.

How it works/Methods/Steps

The goals of this program were to teach adult learners better trailer safety methods and for the MARE Center and VCE Loudoun to establish a professional alliance with LCEA. he need for this program was identified during a tour of the MARE Center with the LCEA. LCEA members and VCE Loudoun developed an educational program sponsored in part by the MARE Center, VCE Loudoun County and Blue Ridge Trailers. The outcomes of this program would be better trailer safety measurements, a professional, ongoing alliance between the MARE Center, VCE-Loudoun and LCEA and more awareness of the organizations and Center.

The planning committee prioritized offering meaningful educational experiences and opportunities. To increase the benefits and takeaways of this program and partnership for all parties involved, it is important to understand the motives behind why adult learners want to participate in agriculture education programs. Franz et al., (2010) found from their focus group members that farmers were motivated to learn more from agriculture educators if the educators helped with interpreting information, increased knowledge of established topics, helped with relationship building, local support for problem solving and opportunities to save time and money. Farmers also wanted to learn more about the latest research, engage in social aspects of agriculture and have hands-on learning methods during programs. Topics in the trailer safety program included lecture and hands-on trailer safety components, guest speakers that would

discuss the safest, most efficient trailering techniques, handouts that covered the latest trailer technology and social engagement with the agriculture educators that would build relationships. All these components were put together to help motivate participants to attend and share with others in the community so more people are aware of not just Cooperative Extension but also the MARE Center and LCEA. During the demonstrations, participants received informational packets, evaluated different types of trailers, inspected a hazardous trailer, changed a tire and interacted with the Extension and industry experts.

Results to date/implications

A pre-program trailer safety survey was distributed through QuestionPro to thirty registered participants. There were five questions consisting of yes/no responses and multiple-choice questions with pre-selected answers. Question content asked participants their knowledge about the program sponsors, how they heard about the event, program expectations, interest in trailer technology, if participants would share the program invitation and the level of interest in Extension education opportunities in equine nutrition and pasture management. Participants took on average two minutes to complete the survey and the completion rate was 100%. The survey results showed that most participants were aware of LCEA (~32%), heard about this event primarily through LCEA networking (40%) and wanted to learn more about trailer technology (~41%). Participants also stated they would share this event (89%) and were interested in learning more about trailer technology such as cameras and health monitors (90%). Participants were asked to fill out a post program survey of five short answer questions. Participants said everything was organized, enjoyed the guest speakers and trailer examples. They wished for loading demos, information on future events, more in depth discussion and demonstrations about technology other than handouts and trailer/vehicle weight calculations. Trailer safety actions they plan to incorporate into travel plans were updating trailer first aid kits, pre-drive checklist, reviewing weight ratings, tire pressure and gauge plus other trailer and vehicle maintenance inspections.

Future Plans/Advice to Others

This was a pilot study program to determine a partnership between the organizations. Based on the success of this program, future plans will include another opportunity to host another trailer program at the MARE Center that will feature more topics and hands-on learning opportunities. Additionally, the partnership between these three organizations will continue into other programs, outreaches and other educational programs so the public is more aware of the MARE Center's and VCE Loudoun's resources and opportunities for adult learning. We advise that other ARECs and Cooperative Extension services consider offering a similar program since it could be beneficial to the public in terms of adult learning programs.

Cost/resources needed

Program sponsorships were provided by CFC Farm and Home, VCE Loudoun County, LCEA, the MARE Center and Blue Ridge Trailers. CFC donated $250 which funded the speakers' and volunteers' lunches. All meetings were organized through Zoom and done during regular office hours. Guest speakers, agents, staff members and volunteers donated their time and equipment to organize and present the day of the program and coordination between all organizations was done as part of the study. The program cost participants $15 which covered lunch.

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