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Teaching and Educational Method

Training Underrepresented Students via an Interdisciplinary Food Safety Outreach Program

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Abstract

Many higher education institutions strive to provide applied training to their students, such as by encouraging internships and including experiential learning activities in courses. This article summarizes students' participation in an outreach program as an alternative form of receiving applied training while attending college. Funded by a governmental grant and implemented by faculty and students, an interdisciplinary food safety outreach program provided a learn-by-doing opportunity to students. This article summarizes students' participation in the project under the leadership of faculty and concludes with a brief list of best practices for involving students in similar future projects.

1 Introduction

Food safety is an important issue for the agricultural and food industry, consumers, and policy makers. The U.S. Centers for Disease Control and Prevention estimates that each year, 3,000 people die and another 128,000 people are hospitalized due to foodborne illnesses in the United States (Centers for Disease Control and Prevention 2018). In addition to illnesses, hospitalizations, and lives lost, the economic burden of the pathogen contamination of food is substantial. Recently, the U.S. Department of Agriculture Economic Research Service updated its estimate of the economic burden caused by food safety recalls and outbreaks. As of 2018, the total cost is estimated at \$17.6 billion, a 13 percent increase from the previous estimate in 2013 (U.S. Department of Agriculture, Economic Research Service 2022). To address this important issue with the food supply, in addition to appropriate policies and new technologies, it is important for companies and government agencies to have access to motivated and experienced food safety professionals (Freedman 2021). The food system is complex and food contamination may occur at any stage of the supply chain (Centers for Disease Control and Prevention 2022). Contaminated food affects different segments of the population in different ways, often leading to more severe health outcomes in children, elderly, and the immuno-compromised (FoodSafety.gov 2022). Hence, professionals with a holistic understanding of food safety issues—from the technical and regulatory, to the health implications and economic risks—will be better positioned to improve the safety of our food throughout the supply chain, in future decades (Freedman 2021).

Food safety jobs and careers are plentiful and span across multiple disciplines. In an analysis of job opportunities for food safety professionals across various disciplines, Stevenson (2015) projected that the increase in the number of positions from 2010 to 2020 would be as high as 24 percent for certain professions. While pursuing higher education degrees, in most cases, students obtain a narrow view of food safety, based on the discipline that they have chosen to study. The technical aspects of food safety are addressed in food science, food technology, and animal science courses. The business and demand implications of food safety outbreaks are discussed in agribusiness and agricultural economics courses. The regulatory aspects of food safety are discussed in agricultural policy and law courses. The communication and public relations aspects of food safety are discussed in agricultural communication

courses. Other disciplines that also address food safety include microbiology, epidemiology, environmental sciences, plant sciences, soil sciences, and bioprocess engineering. It is rarely the case that students get a comprehensive, system-wide perspective on food safety during their college education. A deviation from this are the handful of food safety minors offered at universities in the United States, which usually require courses across several disciplines. However, according to our assessment, none of the food safety minors we have reviewed provide the social sciences perspective regarding food safety.¹

This article highlights how students of various disciplines were provided an opportunity to participate in an interdisciplinary Food Safety Outreach Program (FSOP). This program allowed student participants to both expand their knowledge of food safety issues from the point of view of other disciplines, as well as obtain hands-on experience with various aspects of providing food safety training to farmers. The objectives of this article are two-fold. First, the article outlines a recently completed interdisciplinary FSOP and students' involvement in this project. Second, the article outlines lessons learned and a list of best practices in involving students in outreach and extension projects, from the authors' perspective, as leaders of the project and as educators.

The article is organized as follows. The next section includes a brief discussion of the importance of hands-on and experiential learning activities to better train students for their professional careers. This section also provides information on the specific outreach project that was implemented utilizing students' assistance and/or including students' participation. The third section provides detailed information on each activity organized as part of the outreach project, and outlines students' participation. The fourth section provides a list of comments from student participants, highlighting the importance of participating in this project. The final section discusses lessons learned and contains a list of best practices in involving students in outreach and extension activities.

2 Background

The benefits of experiential learning activities are well documented in the literature (see for example Knobloch 2003 and Riley 2020). While there are many pedagogical methods of engaging students in hands-on activities during their higher education, recently a few studies have highlighted the importance of engaging students in extension and outreach projects (Cuffey et al. 2022; Liu and Zhang 2022; Marshall et al. 2022; Schmit, Stamm, and Severson 2022). While in some cases, the goal of involving students in extension-related projects is to better achieve the learning outcomes for a specific class, in other cases, the goal for this involvement (particularly at graduate-level programs) is to increase capacities in future extension professionals. This article highlights students' involvement with an interdisciplinary outreach project, where "outreach" is defined as a set of programs (trainings, workshops, etc.) to distill and communicate research-based information to industry stakeholder audiences. Students' participation in the project served the dual goal of providing faculty project leaders with assistance for project implementation, as well as providing students with a perspective into food safety that they had not been exposed to before.

While there are many articles summarizing successful interdisciplinary and cross-institutional extension and outreach projects, to our knowledge this is the first one that focuses on students' role, involvement, and training (Conner et al. 2022). The next section describes the outreach program in more detail, followed by a discussion about students' involvement and participation.

¹ The food safety minors offered at universities in the United States include: [The Food Science/Safety Interdisciplinary Minor at Colorado State University](#), [Food Safety Minor at Cal Poly Pomona](#), and [Interdepartmental Minor in Food Safety at Iowa State University](#).

2.1 The Food Safety Outreach Program

The FSOP is a National Institute of Food and Agriculture program that provides funding to various entities to implement food safety education and outreach programs. Most projects are focused primarily on small-scale farmers and food processors. With a maximum award of \$300,000, community outreach projects focus on the development of food safety outreach and education programs that address the needs of small, specialized, and underserved audiences (U.S. Department of Agriculture, National Institute of Food and Agriculture 2021).

In September 2019, our group of faculty representing four disciplines, from a large state university and a community college, was awarded a grant to provide interdisciplinary food safety training to small underserved farmers of leafy greens in the Central Coast of California.² The need for food safety training and regulation compliance among small-scale farmers is well-documented in the literature (Canales, Silva, and Anderson 2022). The FSOP included: (a) Produce Safety Alliance (PSA) Grower Training, (b) Agribusiness and Crisis Communication Food Safety workshops, (c) Grower Produce Safety workshop, and (d) field visits to growers to provide personalized food safety training based on the needs of their operations. While for some trainings, standard curriculum recognized by regulatory agencies was used (such as for the PSA Grower Training), for other trainings the faculty prepared and delivered the curriculum with assistance from students. A summary of the funded projects is publicly available (U.S. Department of Agriculture, National Institute of Food and Agriculture 2022).³

The target farmer audience for the outreach program included small-scale operators in the Central Coast region of California.⁴ Given recent food safety outbreaks in the leafy greens' industry, priority was given to small growers of leafy greens who would benefit from the training; however, we did not exclude other small-scale farmers who expressed interest. The primary language spoken by many of the target farmers was Spanish, hence Spanish translation was offered in most of the outreach events.

One of the stated objectives as part of a FSOP grant was to include students (associate, bachelor's, and master's) in the FSOP, as event assistants, as participants, or in some cases as both. Doing so would introduce students to the practice of food safety, and hopefully inspire them to pursue careers in this field, hence increasing food safety capacity across industries.

2.2 Impact of COVID-19

The global pandemic has had an impact on extension and outreach activities across the country (Boland et al. 2022). National stay-at-home orders in the spring of 2020 quickly prompted travel and other restrictions at university campuses and other institutions. California mandated the first state-wide stay-at-home order, on March 19, 2020 (Office of Governor Gavin Newsom 2020). This order came less than two months after we implemented the first group training—the PSA Grower Training—the first portion

² The four disciplines include agribusiness, food science, agricultural communication, and agricultural science. Note that the community college is a designated Hispanic-Serving Institution.

³ The proposed activities/objectives of the outreach program are listed below as written in the proposal.

- Provide Produce Safety Alliance (PSA) Grower Training to 40 small farm operators of Hispanic origin, and students.
- Complete in-person day-long field visits to 15 individual farms in the Santa Maria valley by personnel from the two institutions of higher education (including four professors and multiple students) to train and assist farmer participants with various aspects of food safety regulation compliance, record keeping, and crisis communication and stakeholder engagement plan.
- Students will be intensely involved with all aspects of the outreach project outlined above. By involving students, we seek to train the next generation of food safety specialists, much needed in the food and agriculture sector.

⁴ The target audience as defined on the project proposal includes: "Target group: Given the sizeable leafy greens' production in the Santa Maria valley, we will focus specifically on farm operators who grow leafy greens. Small and very small farmers of Hispanic origin are the primary demographic because this group of farmers is considered at a disadvantage in understanding and complying with food safety regulation, due to cultural norm differences and language barriers."

of activity 1 of the FSOP (refer to footnote 3). During the first outreach event, both local farmers and students completed the day-long training and were awarded certificates of completion. In the next section we describe in more detail students' involvement in planning and carrying out this and other outreach activities.

After the first outreach event, due to the various restrictions of the global COVID-19 pandemic, the activities could not continue in the same manner and the same timeline as outlined in the project proposal. While the target group of farmers would benefit from food safety training at any time, challenges with the global pandemic such as labor shortages and disruptions in the food supply chain, decreased the urgency of this particular training program. Implementation rules for the Food Safety Modernization Act (FSMA) already provided a longer compliance period for small-scale farming operations that made up the project target group (U.S. Food and Drug Administration, FSMA Compliance Dates). In addition, programmatic considerations, such as concurrent Spanish translation, involving students in project activities, and so on—led to the postponement of the implementation of most of the outreach events. Due to these challenges, a request for a Change in Scope for the project was submitted to and approved by the funding agency. As such, the project was modified to remove the second stated activity—field visits to farming operations (see footnote 3). Instead, additional online and in-person group trainings were added to the project—a format that resonated better with the preferences of the target audience, but also allowed for closer collaboration with the students.

3 Student Involvement in Outreach Efforts

The first objective of this article is to summarize students' involvement in the interdisciplinary FSOP described in the previous section. There are two ways in which students were involved in the project: (1) by assisting faculty in organizing and delivering the food safety trainings and workshops, and (2) by participating in the trainings and workshops, particularly those focused on disciplines other than the one they were majoring in (for example, food science students attended trainings organized by the agribusiness and agricultural communication faculty, and vice versa). We summarize both ways of student involvement in the sections below.

Student assistants were of diverse backgrounds, including Hispanic origin and first-generation students. Table 1 summarizes the profile of the *student assistants* involved with the project, specifically, the degree programs, fields of study, and their roles and responsibilities in the project. Student assistants were recruited by the faculty announcing the opportunities for involvement in their courses and were selected primarily based on their availability. While most of the student assistants were involved in the project for short periods or individual tasks (such as translating at a training event), four students (two students majoring in food science, one student majoring in agribusiness, and one student majoring in agriculture) were involved in the project for the duration of the project.

3.1 Summary of Outreach Activities and Specific Student Involvement and Training

Students were involved with all group training events for our project, including the PSA Grower Trainings, Agribusiness and Crisis Communication Food Safety Workshop, and Grower Produce Safety Workshop. All student assistants were paid an hourly rate equivalent to the rate of undergraduate teaching assistants (for associate and bachelor's students), and graduate teaching assistants (for Master's students). For each training and workshop event, below we summarize both students' involvement with organizing the specific event, as well as students' participation in the event as attendees.

3.1.1 PSA Grower Training

The FSMA Produce Safety Rule requires “at least one supervisor or responsible party for your farm must have successfully completed food safety training at least equivalent to that received under standardized

Table 1: Student Assistants Involved with Food Safety Outreach Program
Academic Institutions:
Allan Hancock College (a Hispanic-Serving Institution) (3 students) Cal Poly–San Luis Obispo (18 students)
Degree Programs:
Associate (3 students) Bachelor of Science (16 students) Master of Science (2 students)
Fields of Study:
Agribusiness (3 students) Agriculture (3 students) ¹ Agricultural Communication (9 students) Food Science (6 students)
Students’ Roles and Responsibilities:²
Developing and distributing promotional materials (21 students) Event set-up and logistics (16 students) Designing materials for and leading activity stations (6 students) English–Spanish and Spanish–English translation (16 students) Study and compilation of training materials (10 students) Completing the trainings offered (21 students) Distribution of certificates and post-event follow-ups (5 students) Social media, Zoom, and in-person interactions with participants (21 students)
¹ Represents the Allan Hancock College major.
² The number of students in this section adds up to more than 21 because most students assisted with several tasks. These statistics are also provided in the tables below, broken down for each training and workshop.

curriculum recognized as adequate by the FDA” (U.S. Food and Drug Administration–Code of Federal Regulations Title 21). One way to fulfill this requirement is to have individuals complete the PSA Grower Training course (Association of Food and Drug Officials 2023). This formal food safety training covers practical aspects of running a farming operation, such as worker health and hygiene, soil amendments, on-farm wildlife and domesticated animals, farm water, postharvest handling of produce, and the creation of a farm food safety plan (Association of Food and Drug Officials 2023). In order to provide this training to farmers and students, two faculty members completed the PSA train-the-trainer course and led both of the PSA trainings that were offered as part of the project. Table 2 offers a summary of the PSA Grower Trainings and student involvement. Out of the 40 attendees, 10 students successfully completed the PSA Grower Training, earning their certificates of completion. Importantly, half of the students were from social science fields and would not have learned the information covered in this training in their college courses. All ten student participants were also involved with assisting with various aspects of the two training sessions offered. Specifically, for the PSA Grower Training events, students were involved in multiple aspects, from event promotion to set-up and translation. Agricultural communication students assisting with the event had an opportunity to put their classroom skills into practice creating promotional communication materials.

Table 2: Produce Safety Alliance Grower Training

Trainings Offered:

Training 1: 17 Total Participants, January 2020

Training 2: 23 Total Participants, June 2021

Students Completed Training:

Agribusiness (1 student)

Agricultural Science (1 student)

Agricultural Communication (4 students)

Food Science (4 students)

Students Assisted With (10 Students Involved)¹:

Designing and Distributing Promotional Materials

Event Set-Up: Welcoming and Registering Attendees

Studying Training Materials in Advance

Translation: English-Spanish and Spanish-English

Interacting and Networking with Farmer Attendees

¹ The same students both assisted with the events and were participants who earned their PSA Grower Training Certificates.

For students assisting with translation during the event, the role required additional training and preparation beyond the classroom. Students from all fields and both institutions assisted with translation during the event. Multiple translators were used to provide the best quality translation possible, short of hiring cost-prohibitive professional translation services. Since the PSA training materials are available both in English and Spanish, student translators were asked to study the training manuals in advance of the training. Leading up to the event, students met weekly with faculty project leaders to ask questions and ensure appropriate understanding of the training materials. This was an important step for all student translators, because while all had the language skills necessary, they lacked the specific food safety knowledge, as well as the corresponding vocabulary in one or both languages. Students took turns in providing simultaneous translation, because attendees whose preferred language was Spanish wore headsets during the event. Importantly, students also translated questions from the audience (Spanish into English), allowing for an excellent flow for a bilingual event. The PSA Grower Training is designed to be delivered as a full-day course, but many trainers either provide the training in one single language or provide the training across multiple days in order to accommodate for translation services. In this case, we were able to provide the training simultaneously in two languages within the allocated time, hence saving busy farmers time while also reaching the target audience.

Finally, it is important to note that during the training events, students had opportunities to interact with farmers, listen to their questions, and observe their concerns about food safety regulation and assurance of food safety at the farm level. While some of the topics covered during the training may be discussed in college classes at the macro level, the practical aspects of the interaction between constraints, information, regulation compliance, and profitability were discussed in much more depth during these trainings, providing students real-world experience outside of their classroom environment.

3.1.2 Agribusiness and Crisis Communication Food Safety Workshop

Food safety outbreaks and recalls have critical implications for businesses and consumers. The vast agricultural economics literature outlines the implications of food safety outbreaks for various industries, including the leafy greens' industry (see for example, Arnade, Calvin, and Kuchler 2009). In agricultural communications literature, crisis and risk communication are an identified research theme (Williford et al. 2016) where scholars frequently explore food safety crisis communication (such as in Barr, Irlbeck, and Akers 2012; Irlbeck et al. 2014; Opat, Magness, and Irlbeck 2018; Calley, Myers, and Gibson 2019; and Gibson et al. 2019). However, while this literature and information may be more accessible to agribusiness and agricultural communication students, it is likely largely unknown to students in other fields, as well as among small-scale farmers. A goal of this project was to distill the current body of literature from these disciplines in a short workshop for farmers and students.

The training materials for the Agribusiness and Crisis Communications Food Safety Workshop were prepared by the agricultural economics and agricultural communication faculty, with assistance from students. The first workshop was held shortly after the stay-at-home order, in May 2020, and thus it was held remotely over Zoom.⁵ Participants included farmers, food industry representatives, and students. The second workshop was held in May 2022, and it was also held remotely over Zoom. Participants were primarily food science students.

On the agricultural communication side, the workshop included topics such as a brief history of major food safety outbreaks since the 1990s, do's and don'ts of food safety crisis communication, including understanding principles of good crisis communication such as lessons on uncertainty, risk, and threat perception. It also included information on pre-event preparation and planning, developing genuine and deep partnerships with stakeholders, and communicating effectively, early and often during crisis events. On the agricultural economics side, the workshop discussed the economic burden of food safety outbreaks, implications of recalls in agricultural commodities versus branded food products, consumers' demand response during food safety recalls, estimating costs of regulation compliance, industry strategies to reduce food safety outbreaks, and steps of recovering from food safety recalls for affected companies/brands. For farmers and students (particularly food science students), these topics were interesting and thought-provoking, and importantly, not covered elsewhere in the formal curriculum.

Since these were virtual events, five student assistants were primarily involved with event promotion, as well as with material preparation and compilation. Both sessions were held in English only. Student assistants managed the technical aspects of the Zoom sessions as well as kept track of attendance and issued certificates of completion, after the event. Table 3 summarizes key statistics about the trainings as well as students' assistance.

3.1.3 Grower Produce Safety Workshop

One of the objectives of the outreach project was to provide on-site individualized training to target farmers, covering topics such as the design of a food safety plan, keeping track of food safety compliance costs, the design of a crisis communication plan, among other topics. However, due to the global pandemic as well as small-scale farmers' limited time availability, we had difficulties providing the number of on-site trainings that was initially proposed. Via a change in scope, we requested to modify this part of the objective and instead offered an additional group workshop, which took place in June 2022.

⁵ The first training, titled "Food Safety Crisis Communication, Data Analytics, and Marketing Training," was sponsored by a separate small grant from California State University Extended Education.

Table 3: Agribusiness and Crisis Communication Food Safety Workshop

Trainings Offered:
Training 1: 70 Total Participants, May 2020
Training 2: 25 Total Participants, May 2022
Students Completed Training:
Food Science (25 students) ¹
Students Assisted With (5 Students Involved):
Designing and Distributing Promotional Materials
Preparing and Compiling Training Materials
Zoom Session Assistance
Digitally Distributing Certificates to Attendees
¹ Only includes participants from Training 2. Training 1 was sponsored via a different grant, and it was held remotely shortly after the start of the global COVID-19 pandemic. Due to allowing as much flexibility for participation as possible, this event was completely open to the public. As such, attendees were not asked to register beforehand, and we did not collect any information related to their background (such as whether they were students or industry representatives). Note, five student assistants involved with organizing the event were agricultural communication students; hence, they are not counted in the 25 student participants who were all food science students.

The Grower Produce Safety Workshop provided an opportunity for farmers and students to receive an update on the FSMA Proposed Rule on Agricultural Water, as well as discuss in more depth additional topics including sanitation and inspection compliance. The workshop included Activity Stations for participants to interact, learn, and ask questions, as well as a brief presentation by a food safety inspector to discuss inspection procedures and checklists. Compared to all other events, this event included a longer Q&A session and more active participation from the audience. Table 4 summarize the key statistics from this workshop.

3.2 Collaboration with a Community College

An important component of this project is the collaboration between a state university and a community college. While being certified as a Hispanic-serving institution, Allan Hancock College also serves many first-generation students and students with farming backgrounds. These backgrounds and experiences made Allan Hancock College students a great asset to the team because students helped identify and reach farmers in the target audience, as well as assisted with a successful delivery of the program given their language skills and cultural background. Researchers and extension workers alike recognize the importance of language and cultural sensitivity in delivering successful extension programs; hence, we strongly believe that this program greatly benefited from students’ involvement (Nabwiire et al. 2022).

However, an unplanned added benefit of this collaboration was the unique experience that it offered Allan Hancock College students, particularly those that either transferred to Cal Poly during the program or planned to do so, to earn a four-year college degree. In the case of the transfer students, participating in this program offered the benefit of getting to collaborate with professors in three departments at Cal Poly. Transferring from a small community college to a large state university, students may often encounter challenges in forming relationships with professors, which in turn may

Table 4: Grower Produce Safety Workshop**Trainings Offered:**

Training 1: 22 Total Participants, June 2022

Students Completed Training:

Agribusiness (2 students)

Agricultural Science (2 students)

Food Science (2 students)

Students Assisted With (6 students)¹:

Designing and Distributing Promotional Materials

Researching and Identifying Target Audience Participants

Preparing Materials for Activity Stations

Leading Activity Stations

Event Set-Up

Translation: English–Spanish and Spanish–English

Interacting and Networking with Farmer Attendees

¹ The same students both assisted with the event and were participants who earned their Grower Produce Safety Workshop certificates.

affect their internship and job prospects, graduate school recommendation letters, and so on. In a review of the literature, Ivins, Copenhaver, and Koclanes (2017) find that faculty collaborations are an important factor assuring transfer students' success at the new institution. In our program, we offered transfer students the opportunity to form relationships and collaborate with faculty as well as provided them with guidance on university resources and support. The relationship with students has the potential to be mutually beneficial—program leaders benefit from the unique background and experiences of the community college students, and students benefit from the connections with faculty. While there is literature on the factors that affect transfer students' success more generally, the impact of opportunities to collaborate with faculty in projects similar to ours, before students transfer, should be further investigated.

4 Feedback from Student Participants

Due to the scope of this outreach project, specific assessments of learning objectives for students were not included in the program. However, at the conclusion of the program, we contacted student participants and student assistants to ask for written feedback. Below we have included the responses of the students who responded to our inquiry.

- *“After making a career change and selecting the agriculture industry, establishing a strong foundation with my education in agriculture was an important step towards my future and career goals. By completing both the **Produce Safety Alliance Grower Training and Grower Produce Safety Workshop** that were offered at Allan Hancock College, I can enter the agriculture industry with a new set of skills that will make me more competitive when searching for a job and a strong addition to any company.”* (Agriculture Student, Allan Hancock College)

- *“I participated in the **Agribusiness and Crisis Communication Food Safety Workshop** and was introduced to many facets of food safety economics and communication. I was taking food safety at the time, and it was very helpful to review the case studies. In class, we would look at them from a microbiological and hazard prevention point of view, but in the workshop, we were able to look at the studies from a communication perspective. Understanding how crises are communicated can be just as important as solving the crises themselves.”* (Food Science Student, Cal Poly)
- *“As a college student who would soon be transitioning to a full-time role in the industry, I recognized the value of participating in projects that would help me develop a strong understanding of the current issues facing agriculture. My involvement with this project through the **Grower Produce Safety Workshop** helped me learn about current food safety regulations under the Food Safety Modernization Act. I am grateful to have had the opportunity to work alongside professors on this project and connect with local industry professionals in an effort to share the importance of keeping our food products safe.”* (Agribusiness Student, Cal Poly)
- *“The **PSA Grower Training** opened my eyes to a whole other form of agricultural communication—rather than informing the public of agricultural activities, this program set out to inform and enhance the lives of our own farmers. I was introduced to the world of USDA with their plethora of regulations, which has been immensely beneficial as I start my first post-graduate job and help farmers navigate USDA and California Department of Food and Agriculture (CDFA) programs and applications.”* (Agricultural Communication Student, Cal Poly)
- *“Participating in the **PSA Grower Training** was a great opportunity for me to apply tangible agricultural communication skills and acquire technical knowledge about food safety protocols under the Food Safety Modernization Act (FSMA). The program provided local growers with access to critical education that they would normally not receive, which is why the support of this training was so important.”* (Agricultural Communication Student, Cal Poly)
- *“Only looking at curriculum, food safety almost puts on blinders for students because we become fixated on this ‘battle’ between us, the product makers/producers, and them, the hazards of the environment. So much so, that we begin to lose sight of why we are doing this: To provide trusted, safe, wholesome food products. Participating in the **Agribusiness and Crisis Communication Food Safety Workshop** helped me to ‘refocus my perspective on food safety as not just this fight against microbes and other hazards, but to include, in that fight, the negative psychological impacts that occur when that fight that we were fixated on, is lost. This course was essential in my recognition that food safety requires setting aside our pride as a business, to refocus on those who are impacted most by our failure (the consumers).”* (Food Science Student, Cal Poly)
- *“I truly enjoyed being a part of this project. The trainings were beneficial for me personally, but also for the agribusiness leaders who participated. I now better understand the overlap between social science, policy, and food science when it comes to ensuring food safety. I think food safety trainings should be accessible to all in order to prevent any type of harm.”*
(Food Science Student, Cal Poly)

5 Involving Students in Outreach: Best Practices

While this was a short (2.5 years), relatively small budget (about \$200,000) project, which took place in the middle of a global pandemic—we believe the best practices outlined below are applicable to other types of interdisciplinary outreach projects and provide valuable insight for other academics seeking to involve students in outreach efforts. This list of best practices is based on our collective experience working with students on this project, and as such, it is not a conclusive list of best practices, but rather a starting point. Lessons learned from other project leaders outlined in future articles, as well as research articles that focus on measuring student learning outcomes by participating in such projects, will inevitably add to this list in the future.

a. *Include student assistants in outreach projects.*

Even if students are primarily engaged with administrative and event organization tasks, they learn about the subject matter in small ways: studying materials, interacting with attendees, proofreading training materials, and so on.

b. *Extend the opportunity to participate to all students.*

Announce the opportunity to be a part of the project to all students in your classes, emphasizing that a high GPA or academic performance of a certain level is not a requirement. For students who express interest, requiring a resume to apply may discourage some students who think they lack experience. Instead, meet with them one-on-one, if possible, to learn about their skill set and personal background. Meeting with students to explore their unique skill set may be a more effective way of involving a diverse set of students. Relevant skills may include technical skills, communication skills, language skills, and skills in event planning and social media promotions, among others. Relevant backgrounds may include farming or small business background and links to the project target audience (which may help with recruiting project participants, being aware of cultural sensitivities, and understanding language barriers, among others).

c. *Pay student assistants.*

While some students may be interested to participate for the experience, paying all students is a better approach because it attracts a diverse set of students. Particularly, first-generation as well as underrepresented and marginalized students may not have the luxury of engaging in a project without pay, even if it benefits them academically. In addition, for many grant-funded projects, including a budget line for undergraduate assistants will not overwhelm the budget constraints.

d. *If possible, hire a part-time administrative assistant.*

For larger, multidisciplinary, and/or cross-institutional grants, it is important to budget a part-time (or full-time) administrative assistant. Such an assistant would be in charge of helping students complete the paperwork and any required trainings, complete travel requests for students, process students' reimbursement requests, and so on. This is particularly important for a long-term project because many students might assist throughout the project, for a semester or for a single event.

e. *Meet with students one-on-one and as a group.*

Support and mentor student assistants throughout the project, particularly via brief one-on-one or group meetings. If graduate students are involved in the project, seek their assistance in mentoring undergraduate students. If your outreach efforts are in a specific area, such as food safety, this time with students serves to inspire and prepare them for careers in that area, and hence, increases professional capacities for the future.

- f. Provide students with the opportunity to assist in events across disciplines.* Agricultural economics and agribusiness students assisting with food and animal science events, bioengineering and agricultural communication students assisting with economics events, etc.—these opportunities allow students to study the same issues from the lens of a different discipline, in an applied setting. Such experiences are enriching and might just lead to a more well-rounded workforce for the food and agriculture industry.
- g. Include students of diverse backgrounds and degree levels.* If possible, collaborate with local community colleges and involve students from these institutions in the project. The project will be richer because of the diverse backgrounds, experiences, and skills the students bring. But also, it introduces community college students to the world of research and outreach in a less threatening way, potentially motivating them to seek undergraduate degrees and/or careers in fields related to food and agriculture.
- h. Measure the learning and career impact on students.* Design thoughtful methods to measure the impact on students. This may be done by including a set of learning objectives and assessing such objectives by utilizing pre- and post-tests. Other options include following up with student participants to understand what role, if any, the participation in the outreach/extension activity had on their choice of job after graduation. This is one of the major limitations of this article that we hope future literature will help fill.
- i. Do not be discouraged!* Most multiple-year projects do not go as planned, even for seasoned project leaders. Whether the target audience is defined too narrowly, or whether a global pandemic occurs in the middle of the project implementation, at times it is necessary to shift direction. The same applies for student involvement in the project. For example, you may plan to have the same five students assist with the project implementation for the duration of the project but end up having 25 students engaged in smaller parts instead. Many unforeseen circumstances may affect project implementation, but the solutions that emerge may in some cases work even better than the initial plan as proposed.

6 Conclusions

The food and agriculture industry stands to benefit from a well-trained workforce. Project leaders for extension and outreach projects stand to benefit from assistance from students in project implementation. In turn, by being involved in outreach projects, students learn new knowledge and skills, create new connections with faculty and industry, and earn a modest pay. As such, extension and outreach projects involving students are a unique public-private partnership to generate and distribute knowledge to the industry, while training a new workforce. As an added benefit, for cross-disciplinary projects, students may learn more about a specific issue from the lens of other disciplines.

In this article, we have summarized the first attempt at involving students in an interdisciplinary project related to food safety outreach. We have briefly highlighted the project and discussed students' involvement in all aspects of the project. A unique part of the project was that it included a collaboration between a state university and a Hispanic-serving community college. We concluded by listing the best practices of involving students in outreach projects. While the central part of this project was to provide training opportunities to the local farmers, future projects involving students should also explore in more depth the longer-term learning and career impact on student participants.

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