



Practice Makes Perfect: A Systematic Approach to Hybrid Sanitation Training Using the Tell, Show, Do Method

ABSTRACT

Sanitation is cited as one of the leading areas of non-conformance in food safety inspection reports. There is a strong need for sanitation training that builds confidence and job task competency. Educators at the University of Massachusetts Amherst, the University of Maine, and North Carolina State University developed a tiered training program to provide a holistic approach to sanitation training. This program offers six online, self-paced modules that break down the core components of a sanitation program (Tell), and in-person demonstrations of cleaning, verification of cleaning, and sanitation concepts (Show) with experts while allowing participants to practice what they have learned in a low-stakes environment (Do). The effectiveness of the learning model was assessed using focus groups and written evaluations. Focus groups were conducted after the in-person program concluded to evaluate its effectiveness and identify areas for improvement. Written evaluations (which were given pre- and post-in-person programs) had participants rank their change in preparedness in sanitation-related topics

from pre- to post-in-person program. Post-program focus group evaluations suggest that the “Tell, Show, Do” model effectively develops confidence in sanitation knowledge, attitudes, and behaviors. Written evaluations suggest an overall increase in preparedness across all sanitation-related categories from pre- to post-program.

INTRODUCTION

Sanitation is cited as one of the leading areas of non-conformances in recent food safety inspection reports (13). In a survey of over 200 U.S. food processors, Ferguson (2022) identified targeted training materials, program effectiveness, and pathogenic biofilms as the top sanitation concerns under the Food Safety Modernization Act (FSMA) (11). Another recent survey asked food safety communicators what additional training they thought small processors would benefit from, and 71% responded that there is a strong need for further training specific to sanitation (12); in a similar survey, 71% of food safety workers sampled reported that their primary food safety training was ServSafe manager training (38). While ServSafe training does provide

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relevant food safety information related to the Food Code, more targeted sanitation training is needed to better prepare for the more rigorous hands-on sanitation tasks relevant to wholesale food production (7, 11, 23). Historically, as learners progress through training, they increase the percentage of content they retain. However, as training ends, if training content is not reinforced by practice or repeated exposure, the mind will not prioritize memory space to that content, and the individual will begin to forget (26). This trend illustrates a forgetting curve and is considered a regular aspect of memory. Researchers who have investigated workplace learning have recommended a learning cycle, such as Kolb's learning and cyclical learning cycle, where students relearn the same material regularly, to enhance long-term procedural and declarative knowledge retention (15, 20).

The constructs that impact prolonged learned behaviors should also be considered. The Integrated Behavior Model (IBM) illustrates how knowledge, self-efficacy, attitudes, and learned behaviors impact an individual's intention to perform in a respective role (8). Situated, scenario-based, and adaptive learning strategies are recognized for their potential to increase learner engagement and facilitate the development of learners' self-efficacy (3, 17, 32, 44). Adaptive learning scenarios create a space for learners to see the outcome of their actions in a low-risk environment, which can begin to build their self-efficacy. Research indicates that adult learners exhibit improved knowledge retention when drawing on their past experiences (42).

Learning and behavior changes can be further improved if learners can apply their newly learned skills to reinforce the concepts and promote confidence. Shaw et al. conducted a holistic approach to food safety education intervention with small producers using a three-level sequential approach for an on-farm food safety program titled "Know," "Show," and "Go." The approach included classroom instruction on basic food safety concepts and field visits to show how some of these concepts are applied in practice on-farm. Then, it included learners visiting a farm that had recently passed a third-party audit. Results reported a positive change in their knowledge and opinions on fundamental food safety principles and regulations (39). There are other learning constructs commonly used in skill-based programming, such as the Tell, Show, Do model, which is like the Know, Show, Go model. The Tell, Show, Do model includes a "Do" section where participants can practice what they have learned in the program in a hands-on, low-risk setting. This is similar to the "Know, Show, Go" model used by Shaw et al., but instead of field visits to reinforce training concepts, the "Do" section allows participants to practice sanitation skills with experts in a low-stakes setting. While the "Know, Show, Go" model used by Shaw et al. incorporated long-term site visits to determine skill retention, the Tell, Show, Do model used in this work only required short-term reflections on skill confidence directly after an in-person, hands-on training. The Tell, Show,

Do model is recognized by ServSafe as a primary, effective way to conduct training for optimal learning outcomes, and has been called the "optimal learning blueprint," (38). An outline of the "Tell," "Show," "Do" model is included in *Figure 1*.

The "Tell" portion of the model enables learning by discussing a new concept or instructing the learner on how to perform a specific task. The Tell portion also provides context for the task to be performed later. This step typically involves an expert lecture or instruction.

The "Show" portion of the model entails demonstrating a task, thus displaying the correct method of performing a skill from an expert.

The "Do" technique of the process involves learners completing the task independently in the presence of experts who are available to guide them through practicing the task and answering questions. This work details a novel approach to food safety sanitation training using the tell, show, do method, and incorporates a self-paced series of online modules, and an in-person hands-on program to help build skill confidence.

This study investigates the effect of targeted sanitation training on employees' self-reported preparedness, confidence, and competency in performing sanitation-related job tasks. This work encompasses both online and in-person programs that aim to build confidence in sanitation job tasks. Building on previous competency-based models in food safety education, we hypothesized that a hybrid tell, show, do program would produce measurable gains in preparedness of sanitation skills.

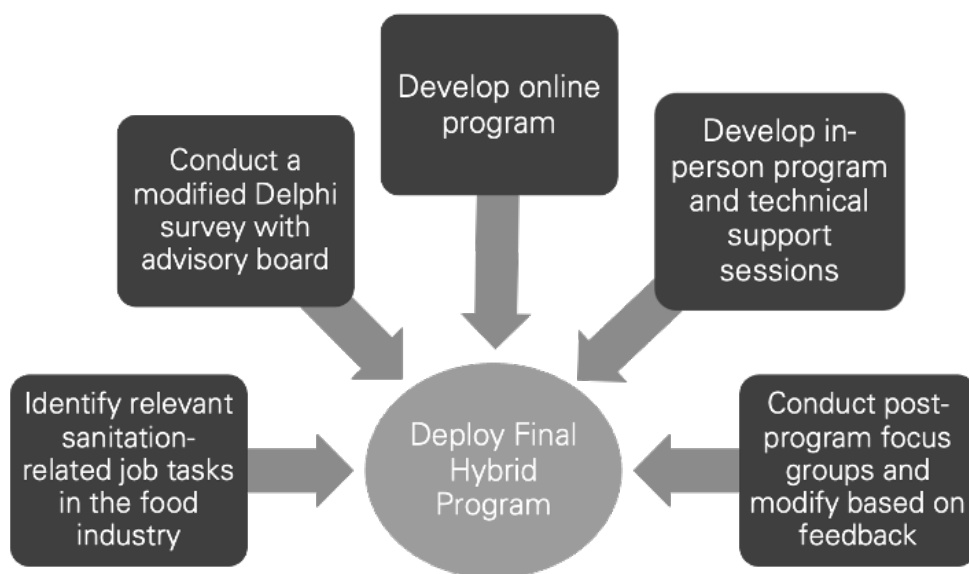
MATERIALS AND METHODS

Materials

Program Curriculum Design

A multidisciplinary Extension team from the University of Massachusetts Amherst, the University of Maine, and North Carolina State University created and administered the program, drawing on expertise in education, food safety, and sanitation. The program, entitled the Sanitation Controls Practitioners Program (SCPP), is a multi-level program designed to enhance learned sanitation behaviors and skills. The program was broken into categories: Tell, Show, and Do, which build on participants' prior sanitation skills and experiences to establish confidence in sanitation skills (all sections and their components are outlined below).

A modified Delphi method was employed to identify subsequent job responsibilities that food processors might encounter when hiring in their facilities, thereby building appropriate training that covers all major roles and responsibilities. This process gathered expert feedback to inform critical decision-making and subsequent curriculum development. This method included two cycles of expert input throughout the Job Task Analysis (JTA) defining process.



Appendix I. Sanitation Controls Practitioner Program course development structure.

Each level of the curriculum was developed with the expertise of an advisory board comprising representatives from the food safety regulatory, industry, and academic sectors. Experts and self-identifying experts can be defined as people who have a good understanding of a specific topic (in this case, food safety and sanitation) but varying experiences with that topic (they have varying accurate knowledge of a topic and can provide differing perspectives) (4).

The final Job Task list derived from the Modified Delphi approach was then used to inform the module content for the SCPP. The job tasks in the final list were separated into two categories: virtual module content (online programming) and in-person hands-on content (in-person programming). Focus groups with participants who completed the online and in-person programs were conducted to evaluate the program's impact on the components of hands-on activities immediately following the in-person program. Written evaluations were also administered to track changes in preparedness from the pre- to post-in-person program. The levels of the program are outlined below, and an outline of steps in the curriculum development are included in [Appendix I](#).

Level 1 - Tell: Online Modules

This tier allows instructors to “Tell” participants what they will learn or establish skills in the program. This step also provides context for core information needed to perform a physical task later. The online program, which is level I of the SCPP, contains six online, self-paced modules covering cleaning and sanitation basics. Each module contains check-understanding questions to test participants’ knowledge. The

online program is available through the Food Safety Resource Clearinghouse (37). Module content and learning objectives for Level 1: Tell are included in [Table 1](#).

Level 2 - Show: In-Person Cleaning and Sanitation Demonstrations

The purpose of Level 2: “Show”, is to demonstrate how to do a particular task to participants so they can see it in action. Seeing a task performed before practicing (“Do” section below) allows participants to build familiarity with the process and helps build initial confidence. The components contained in the “Show” portion of this program (Level 2 of the SCPP: In-person), are outlined in [Table 2](#) below.

Level 3 - Do: Practice hands-on sanitation activities

Level 3: “Do” requires participants to physically complete the task that they’ve been introduced to in Level 2: “Show”. This step requires participants to work in teams of no more than four people to clean three different surfaces, conduct ATP and protein testing, and conduct titrations for chemical sanitizers. An outline of the components contained in the “Do” section of this program are included in [Table 2](#) below.

Online Curriculum Development

The online program was created using the E-Learning software Articulate 360 Teams based on a storyboard design and curriculum script originally drafted in Microsoft PowerPoint, Storyline 360, and Review 360 (2016) (1, 31). The online program was distributed via a learning management system from NC State called Brickyard (a MyPack portal) (27, 30).

TABLE 1. A summary of each online content (Level 1) with the learning objectives for the "Tell" online program (Level I of the SCPP), including the learning objectives for each module

Module	Learning Objectives
Cleaning and Sanitation Basics	• Identify the benefits of maintaining a sanitation program. • Identify the difference between cleaning and sanitizing. • Identify the basic steps of cleaning and sanitizing. • Identify examples of manual, clean-in-place, and clean-out-of-place sanitation processes. • Distinguish between wet and dry sanitation programs.
Cleaning and Sanitation Tools and Supplies	• Distinguish between the cleanliness or hygiene standards for low, medium, and high hygiene areas. • Distinguish between a food-contact surface and a non-food-contact surface. • Identify the appropriate utensils and equipment for cleaning a food contact surface and non-food contact surface. • Explain and implement the concept of color-coding tools.
Water for Cleaning and Sanitation	• Identify regulatory standards for water used in food processing. • Identify how and when to test water for its suitability for use in food processing.
Chemicals for Cleaning and Sanitation	• Select appropriate cleaning and sanitation chemicals for food and non-food contact surfaces. • Identify types of soil or debris on surfaces. • Describe secure and safe storage of cleaning and sanitation chemicals. • Identify who is allowed to handle certain chemicals.
Sanitation Documentation	• Identify the components of a Sanitation Standard Operating Procedure. • Identify how often to perform sanitation procedures using a risk-based approach. • Identify the core components of a master sanitation schedule. • Identify which surfaces need an SSOP in each facility.
Sanitation Monitoring and Verification	• Identify best practices for cleaning and sanitizing monitoring activities. • Identify what is to be written or entered and kept in sanitation records. • Identify which environmental monitoring method to use in a given scenario. • Determine corrective actions when given test results of general sanitation monitoring. • Define verification. • Identify best practices for cleaning and sanitizing verification activities. • Review documentation and make observations to determine whether the cleaning and sanitation program is being implemented as designed.

TABLE 2. Demonstration and practice activities covered in Levels 2 and 3: “Show” and “Do” in the SCPP in-person program including the hands-on concepts practiced by participants

Practice Section	Concepts Demonstrated by Experts and Practiced by Participants	Learning Objectives
Cleaning	• Clean three different surface materials: wood, textured plastic, and stainless steel using provided cleaning chemicals (scrape, rinse, spray, scrub, rinse). • Clean two different organic materials on each surface: one carbohydrate-heavy load, and one fat-based organic material that contains protein, according to best practices for food contact surfaces with detergents. Visually inspect the surface for any visible contaminants after cleaning using UV and white lights.	• Identify and apply appropriate cleaning tools and chemicals based on soil type (e.g., fat-based, carbohydrate-based) and surface material (e.g., stainless steel, plastic, wood). • Demonstrate proper cleaning techniques using the six basic steps: scrape, rinse, apply detergent, scrub, rinse again, and inspect. • Visually inspect surfaces for cleanliness with naked eye or using flashlights and black lights to distinguish between food residues and mineral deposits. • Understand the importance of chemical concentration, heat, agitation, time and how each factor affects cleaning effectiveness. • Evaluate and improve SSOPs by identifying missing elements, vague instructions, or ineffective documentation based on USDA FSIS gold standards. • Differentiate between cleaning and sanitizing and understand why thorough cleaning a prerequisite for effective sanitization is.
Verification of Cleaning	• ATP swabbing for surfaces previously cleaned in the “cleaning” section above. • Protein swabbing for protein-rich surfaces and non-protein surfaces to see the difference in color results.	• Perform ATP and protein swab tests to assess surface cleanliness after cleaning and before sanitizing. • Interpret swabbing results using visual color changes (for protein swabs) and RLU readings (for ATP), and compare those across different surfaces and cleaning methods. • Apply swabbing techniques correctly in real-world scenarios, including hard-to-reach and high-risk areas (Zone 1 surfaces). • Protein swabbing: useful for allergen detection but not specific to one protein. • Develop critical thinking around how verification results can inform cleaning frequency, retraining needs, or equipment modifications. • Recognize when additional microbial testing (e.g., sponge swabs) is necessary beyond ATP/protein testing.

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TABLE 2. Demonstration and practice activities covered in Levels 2 and 3: “Show” and “Do” in the SCPP in-person program including the hands-on concepts practiced by participants (cont.)

Practice Section	Concepts Demonstrated by Experts and Practiced by Participants	Learning Objectives
Sanitization	• Conduct a titration for one of the following sanitizers to determine the concentration of a pre-made chemistry: peracetic acid (PAA), Quaternary ammonium (QUAT)-based sanitizer, or chlorine-based sanitizer. • Use a test strip to determine the concentration of sanitizers.	• Demonstrate how to verify sanitizer concentrations using both titration kits and test strips. • Use a test strip to determine the concentration of sanitizers. • Compare the accuracy and usability of different concentration verification methods and understand human error risks. • Identify critical variables affecting sanitizer effectiveness, including: • Concentration • pH • Organic load • Contact time and temperature • Understand regulatory standards from the EPA and FDA regarding sanitizers used on food-contact surfaces. • Interpret sanitizer labels to ensure compliance with concentration and use requirements. • Discuss appropriate corrective actions when sanitizer levels are found to be out of specification.

Evaluation of the program through participant feedback

A pre- and post-program evaluation tool was developed to assess participants’ experiences, knowledge, perceived course effectiveness, the usefulness of the in-person program components, and their interest in and preparedness for implementing key sanitation practices. In-person focus groups were conducted using semi-structured interview protocols tailored to the SCPP post-program experience. All evaluation instruments, including surveys and interview guides, were developed prior to program implementation. The study was reviewed and approved by the University of Massachusetts Amherst Institutional Review Board (IRB #3036) (33).

Methods

Recruitment

Beginning in September 2023, the SCPP development team—comprising seven academic experts from North Carolina State University, the University of Massachusetts Amherst, and the University of Maine—initiated participant recruitment for the online pilot program. Potential

participants from academic institutions and food processing facilities across the Northeastern U.S. were contacted directly via email or phone and the program events were posted through social media channels (Instagram, Facebook, and LinkedIn), with targeted networks. Interested individuals received detailed project information and a registration link to enroll in the online SCPP. Participants who were either enrolled in the online program or had completed the online SCPP were then invited to participate in one of three upcoming SCPP in-person programs on the East Coast United States. The first in-person program was held at a University GMP pilot plant (site 1), while the other two in-person programs took place in shared-use kitchen facilities (sites 2 and 3). The online program was self-paced, and participants were not required, but highly encouraged, to complete the online program prior to attending the in-person SCPP. Registration details and demographics (name of participant and business size) were collected, completed and tracked via Google Forms.



Figure 1. Outline of the complete SCPP multi-level approach to sanitation training.
Note: Level 3, group technical support, and “Lead a Sanitation System” are not analyzed in this work.

Program Delivery

The curriculum was delivered in a series of levels: a set of six online modules, followed by a four-part in-person program that incorporates expert demonstrations and hands-on practice to build sanitation skills. The online program represented the “tell” portion of the learning model, whereas the in-person program incorporated the “show” and “do” elements of the learning model. The in-person program was taught by a minimum of two instructors to diversify content delivery. A graphic representing the multi-level approach to the SCPP is included in [Figure 1](#). Each program level is outlined below.

Focus Groups

Focus group participants were recruited from those who attended the in-person tier of the SCPP. Participants were asked about their general experience with the hybrid program (positive and negative), and whether the program helped enhance skills in sanitation. Two sites (Sites 2 and 3) were divided into two groups to conduct focus groups. This was to ensure responses were collected from everyone, and that voices were not diminished in too large of a participant pool. To evaluate the success of the Tell, Show, Do model, responses from focus group participants were recorded, transcribed, and imported into NVivo 15 (2024) for coding and analysis to identify common themes (28). A summary of the semi-structured focus group questions is included in [Table 3](#) below.

Written Evaluations

Along with post-in-person program focus groups, the program was assessed through written participant evaluations. Identical pre- and post-program written evaluation tools were developed to assess the overall course effectiveness, the usefulness of the sections in the in-person program, and interest in and preparedness regarding implementation of key sanitation activities. Interest and preparedness were assessed before and at the completion of the in-person SCPP. A 5-point Likert scale was used to rank interest (1 = I am not at all interested, 2 = slightly interested, 3 = neutral, 4 = mostly interested, 5 = extremely interested), and preparedness (1 = I am not at all prepared, 2 = slightly prepared, 3 = neutral, 4 = mostly prepared, 5 = extremely prepared). [Table 4](#) includes a list of sanitation-related activities that participants were asked to rank based on their overall interest and preparedness. Additional question formats included Likert scales and open-ended text. A 5-point Likert scale was used to assess course effectiveness (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree), and a to assess course usefulness (1 = not useful, 2 = slightly useful, 3 = moderately useful, 4 = very useful, 5 = extremely useful).

TABLE 3. Summary of semi-structured SCPP post-in-person program focus group questions

Question Theme	Questions Asked
Reactions to the SCPP	• Please describe which parts of the program were most helpful to you. • What do you like most about this course or the instructor's teaching of it? • What about this course or does its teaching need change or improvement? • What suggestions can you offer that would have made this course a better learning experience for you?
Impacts of the SCPP	• What part of the curriculum in this program are you more confident with now than you were prior to taking the course? • What sanitation tasks can you perform now that you couldn't do before taking this program? • Can you tell me about whether the SCPP impacted your sanitation program? If so, how will it impact your sanitation program? • Is the curriculum in this program beneficial to your role in the food industry? Why or why not? • Would you recommend this course to a colleague? Why or why not?

TABLE 4. Sanitation-related activities that were ranked for interest and preparedness among written evaluation respondents

Activity
Understanding an SSOP
Following an SSOP
How to physically clean a surface
How to inspect a surface for visible cleanliness
The difference between wet and dry cleaning
How to read and understand an MSDS
Identify sanitizer versus disinfectant concentrations
How to prepare a sanitizer to the correct concentration
How to conduct a titration
How to use test strips to determine sanitizer concentration
How to swab for protein on a surface
How to swab for ATP on a surface
How to effectively fill out a record
How to identify which sanitizer to use for which surface

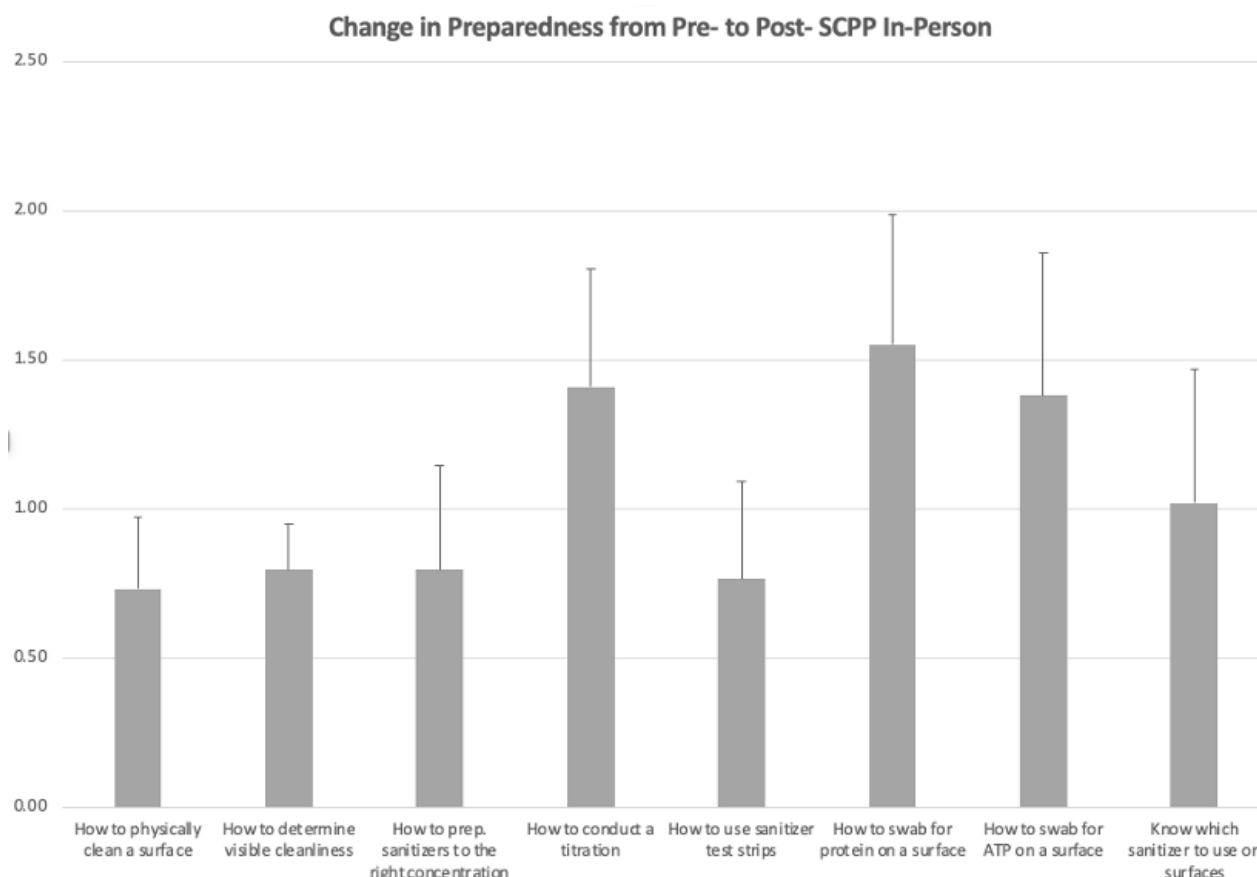


Figure 2. Average change in preparedness in various sanitation-related topics from pre- to post- in-person SCPP (pre-in-person SCPP: n = 40; post-in-person SCPP: n = 33). *Represents statistical significance.

Data analysis

Focus groups were recorded and transcribed via Zoom (version 5.16.5) (29) and imported into NVivo 15 (2024) (version 5.16.5) for coding and analysis (28). Analysis of qualitative data from focus groups was coded according to Saldaña's Coding Manual for Qualitative Researchers (36). Analysis of descriptive statistics for written evaluations (e.g., mean and standard deviation) and *t*-tests were performed to determine statistical significance between means (where the *P*-value for significance was set at $P < 0.05$) using Microsoft Excel (version 16) (10). Open-ended questions were optional, however, responses were categorized and coded as testimonials in NVivo along with the focus group transcripts for each site.

RESULTS

Participant Demographics

Participants were accepted on a rolling basis during the pilot period of the program (September 2023 (initial recruitment) through December 2024 (close of registration for the in-person programs). A total of 51 food processors completed or partially completed the online SCPP during the

recruitment period for the program. Of those 51 participants that engaged in the online program, 42 (82.35%) opted to take the in-person SCPP (12 at Site 1, 14 at Site 2, and 16 at Site 3). Of this cohort of 42, 18 worked at large food processing facilities, 23 worked at small or very small food processing facilities, and 1 worked in academia. Standard Food and Drug Administration (FDA) definitions of large and small food businesses were used to determine the standing of each participant's place of work. Out of the 42 participants who participated in the in-person SCPP, 38 completed anonymous written evaluations, and 28 participated in the focus groups evaluated below.

Written Evaluations

Pre- & Post Survey Responses

The survey assessed participants' overall interest and preparedness in sanitation-related topics. Figure 2 illustrates the change in preparedness of SCPP participants from the pre- to post-in-person program. On average, preparedness increased on average in all sampled categories. The increase in preparedness was statistically significant in the categories of "how to conduct a titration", "how to swab for protein on

a surface”, “how to swab for ATP on a surface”, and “know which sanitizer to use on which surfaces”. On average, processors that came from larger facilities indicated a lower change in preparedness from pre- to post- program than those that came from small or very small companies.

Open-Ended Responses

There were four open-ended responses in the written evaluations. The first asked participants to identify the most valuable part of the SCPP (online or in-person), while the second inquired about the least valuable section. Responses included that participants found the verification of cleaning (swabbing activities) and titration sections in the in-person program to be particularly valuable. However, some participants felt that the cleaning section of the in-person program was “too elementary,” and that topics such as dry cleaning and “specific detail on chemistry” were missing from the program. Some felt that a limitation of the program was that it was not “detailed enough” overall.

Participants were also asked to suggest topics for future iterations of the program. They identified topics such as “how to find an approved chemical supplier”, “how to keep and maintain sanitation records”, and more details on “clean-in-place versus clean-out-of-place” as areas that would help them advance further.

The final open-ended question asked participants to provide any additional suggestions or ideas for improving the program. While most respondents left this area blank, a few notable responses were provided to guide program future direction. One participant suggested that the in-person program would be enhanced by the use of actual production equipment for cleaning and sanitization demonstrations and practice. Another suggested adding “more hands-on activities”, and a team exercise on how to evaluate a master sanitation schedule. Several participants suggested that the program include more detail “like the Preventive Controls for Human Food course”, while others deemed the program too advanced for an operator.

Figure 2 represents the average overall change in preparedness of SCPP participants from the pre-in-person program to the post-in-person program. Interest went up on average in all categories except for “how to prepare sanitizer concentrations” and “how to use test strips to determine sanitizer concentration”. Change in interest from pre- to post-in-person SCPP did not increase significantly in any category.

Analysis of Focus Groups: Codebook Development

Results from coding the focus group responses indicate an overall positive experience with the program. Participants particularly responded positively to the demonstrations and practice of ATP swabbing and titrations. An excerpt of the codebook for is included in *Table 5*.

Focus Group Structure

Focus groups were conducted in three unique locations with participants who completed the SCPP in-person program. Focus group 1 had 12 participants, while focus groups 2 and 3 each had 8 participants. The focus group questions asked participants to describe their past sanitation experiences, solicit opinions on the online and in-person programs, curriculum structure, and any changes in confidence and knowledge of sanitation skills covered in the programs (both positive and negative). Participants were asked about their “takeaways,” whether they would recommend the course to a colleague, and how valuable the program was to their current or desired role in the food industry.

To evaluate the impact of targeted sanitation training on employees' preparedness, confidence, and competency in performing sanitation-related job tasks, focus group data was collected, collated, and analyzed for major topics or themes. These themes were then clustered into common sections and synthesized into major themes that identify critical limitations and opportunities within the SCPP program. The major theme findings are reported below.

Theme 1: Overall Experience with the Program

Participants across all three focus groups reported a positive overall experience with the full SCPP. Many participants described the online component as a useful refresher, while others—particularly those newer to sanitation—found it at times “overwhelming” due to the volume of information. However, the in-person, hands-on component was consistently described as the most impactful part of the program. Participants appreciated the opportunity to practice sanitation skills in a “low-stakes setting,” describing the in-person training as “real-life,” “practical,” and helpful in building confidence. They especially valued learning swabbing techniques and conducting titrations to verify chemical concentrations. The use of three different instructors during the in-person program helped keep sessions “engaging” and “exciting.” Several participants noted that the hybrid model worked well, with the online program providing context and the in-person component reinforcing and applying that knowledge.

Theme 2: Participants' Backgrounds and Reactions Based on Experience Level

Based on focus group responses, the three cohorts included a diverse range of participants in terms of job title and sanitation experience—such as operators, maintenance workers, compliance coordinators, supervisors, farmers, entrepreneurs, and market managers. These demographics were not asked about or recorded in written evaluations, but rather verbally discussed in the focus groups and qualitatively interpreted. Some participants mentioned that they had no prior formal sanitation training, while others had taken

TABLE 5. Excerpt participant quotes from focus group codebook (NVivo15) that depict overall opinions of the SCPP, confidence in sanitation skills, and post-program experiences with the demonstrations in the program

Code	Code Type	Definition	Example Quote
Opinion of SCPP: hybrid program approach	Attitude	Positive or negative reactions to the hybrid nature of the SCPP.	“I’ve taken the Preventive Controls course, the HACCP, and other training from chemical company providers. I really appreciate the hybrid model for sanitation. This is something that we need to take seriously. So, getting that classroom instruction kind of sets the tone. But then also, it’s something you get to practice in real life, and having both components is great.”
Sanitation confidence: post-program	Descriptive	Was overall confidence in sanitation-related topics increased by participating in this program.	“Like anything, practice makes perfect, like all these techniques get easier over time when you do them and practice with them. This program really reinforced some skills for me.”
Experience with demonstrations if positive	Descriptive	What demonstration was the most beneficial to the participant.	“I’ve never actually gone through the verification process before, like, actually being able to watch how it’s done by an expert. I haven’t taken high school chemistry. Being able to watch that and getting all the little details was helpful.”

basic courses such as Good Manufacturing Practices (GMP), Hazard Analysis of Critical Control Points (HACCP), or Preventive Controls for Human Foods (PCHF) training.

For participants reporting having “lots of experience” with sanitation, the online material felt “redundant” and could have been more advanced. For newer participants, the online material was sometimes overwhelming, but the in-person training helped clarify and solidify concepts. One participant described their prior sanitation knowledge as being entirely learned on the job, while another appreciated that the program allowed them to bring their prior knowledge and engage with others from different backgrounds and experiences. Participants that came from smaller companies showed a larger increase in self-reported preparedness from pre- to post- program.

Theme 3: Skill Building and Application to the Workplace

All groups shared that the program helped them become more confident and competent in sanitation practices—especially in swabbing, titration, and other verification

techniques. Participants reported that they felt more “aware” of best practices and were confident in implementing these skills at their home facilities. Supervisors and managers found the program useful for answering common staff questions, helping to correct bad habits, and explaining the “why” behind sanitation protocols. One participant noted that the program provided clarity on areas for improvement, while another mentioned that it made them feel more empowered and better equipped for their role.

Theme 4: Program Value for Workforce Development

Participants saw the SCPP as a career advancement opportunity, especially for those without traditional academic training. One person noted that participating in the full SCPP would help them “move up in the world,” while another said they would give special consideration to a candidate listing the program on their resume. The training model itself—particularly the “tell, show, do” approach—was frequently highlighted as one that could be adopted at participants’ own facilities to train new hires. Many expressed

Change in Interest from Pre- to Post- SCPP In-Person

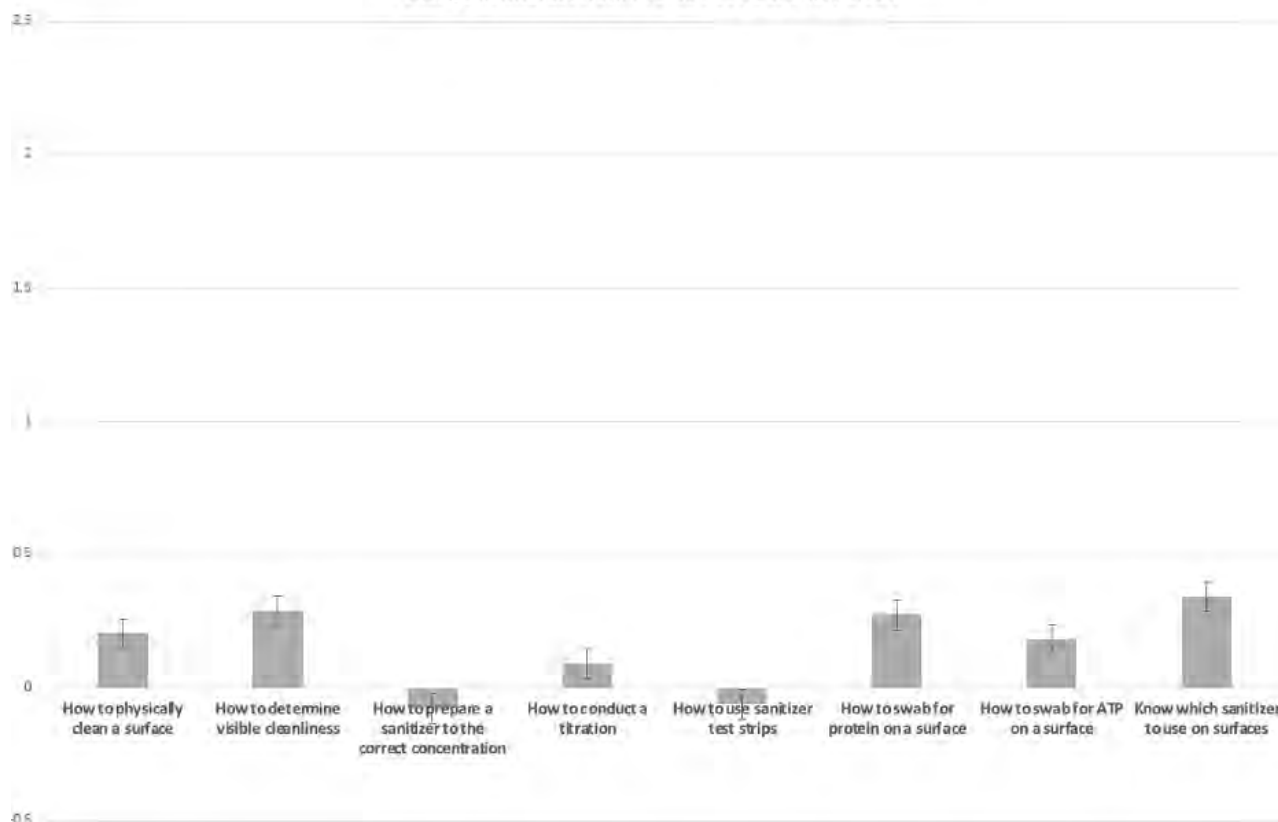


Figure 3. Average change in interest in various sanitation-related topics from pre- to post- in-person SCPP (pre-in-person SCPP: n = 40; post-in-person SCPP: n = 33).

interests in using the SCPP as a formal training tool for new employees and saw the program as contributing to a stronger foundation in sanitation that would benefit their whole team.

Theme 5: Networking and Community Building

Participants appreciated the community aspect of the program, which introduced them to peers across the food industry and provided opportunities to share insights and best practices. Several expressed that they valued being able to meet other processors who were also navigating food safety regulations. The presence of multiple instructors was also viewed positively, adding variety and keeping participants engaged throughout the program.

DISCUSSION

The following section will discuss overall findings from both the written and qualitative focus group evaluations. All data from the three sites was combined and averaged to assess and quantify overall themes.

Written Evaluations

Although not all were statistically significant, findings from the written evaluations indicated an overall increase

in self-reported preparedness from pre- to post in-person SCPP. When reflecting on new and emerging food safety credentialing programs that require competency-based evaluation metrics, it is positive to see participants' preparedness to perform sanitation-related tasks increase (5). Other current food safety programming that utilizes hands-on approaches to training have also seen an increase in confidence and self-reported learning, emphasizing the success of hands-on training approaches to training. Participants that came from small and very small companies ultimately reported a larger gain in preparedness from pre-to post- in-person program, which may be due to lack of onsite training resources at their facilities. This emphasizes a need for scale-relevant training materials for small processors, and effectively communicating which stakeholder group would benefit more readily from training programs.

Interest increased in most categories sampled, except "how to prepare a sanitizer to the correct concentration", and "how to use sanitizer test strips." Interest was in this program as a way for the ideation team to refine the curriculum after pilot feedback. Ranking interest would determine if the program was engaging to participants. Through open-ended responses, it was determined that there is an opportunity to

enhance terminology for the SCPP. One processor reflected on their experience with this part of the survey in their open-ended responses, saying that it was “difficult” to rank their interest on topics that were primarily functions of their job. The participant said that they “have little interest in the functions of their job” although they are trained on how to complete their daily tasks, and that they “just did whatever job task [they] were told to do”. This indicates the potential for improved analysis tools in future in-person SCPPs. Instead of ranking “interest”, future evaluation tools can rank usefulness of the modules or topics covered in the program. Past-published work by Richard et al. shows an effective use of ranking topic usefulness. Richard et al. found that using customized, targeted food safety training for small food businesses was deemed “useful” for participants in the study (35). Our preparedness gains align with meta analytic evidence that hands-on food safety training improves knowledge and practice, particularly when paired with refreshers (39).

Open-ended responses yielded feedback on areas of improvement for the program and provided insight to the overall perceptions of the program. Open-ended responses were coded like focus group responses and are assessed below in the Focus Group and Program Limitations and Opportunities sections of the discussion below.

Focus Groups

Overall, focus group participants generally expressed the positive impact that the program had on them. Almost all participants believed the in-person program allowed them to practice in a “low-stakes, informative setting”, while the online portion served as a “refresher on the basics of cleaning and sanitization”. They also believed that their participation in the program would “impact their sanitation performance” in their respective job roles.

Considering that the basics of performing cleaning and sanitization are cited as common non-conformances in inspection and audit reports, it is significant that this program was shown to increase preparedness in sanitation topics (13, 18). Competency-based training models are increasing in popularity among auditing agencies and regulatory officials, such as Safe Quality Foods (SQF), and Food and Drug Administration (FDA) regulators (41). An FDA vision document proposed in 2010 mapped out a “National Curriculum Standard” that included a skill-based model for testing regulatory officials on how to conduct an inspection effectively (21). Therefore, many emerging food safety training programs, such as the Certified ServSafe Instructor Training® encapsulate the principles of a tell, show, do model for assessing performance accuracy (3, 19, 38, 43). The Certified ServSafe Instructor training tools for instructor’s manual includes specific examples of how to “engage participants with curriculum using the tell, show, do model”. In the United States, ServSafe is often required for

at least one staff member at every food facility to complete successfully, underscoring the prevalence of the tell, show, do model in delivering successful food safety training.

Participants enjoyed the use of different instructors to teach the in-person program, as it “kept things exciting,” which suggests that the engagement with learners may improve knowledge and skills. This aligns with current literature indicating that the use of diverse instructors enhances student engagement and learning outcomes (22). This suggests that future iterations of this program should continue to involve multiple subject matter experts when teaching and demonstrating, when resources allow.

The participants across all three sites varied in sanitation experience and position titles. Initially, the program was advertised for small food entrepreneurs; however, enrollment was open to all food processors involved in sanitation activities. Among the participants were processors from both large and small food processing firms, emphasizing the wide variety of processors seeking sanitation skill development tools. The variety of positions and self-reported sanitation experience affected participants' opinions of the overall program. Participants with extensive sanitation experience believed that some material was too simple (“redundant”) and should have been advanced, while those with little experience thought some information was “overwhelming” to conceptualize. In other words, opinions of the SCPP program depended on past sanitation experience and respective roles in the food industry. Varying knowledge levels has been a notorious challenge in creating standardized curriculum and educating processors in the food industry (24, 40). Past published work and current data underscores the potential for more catered, customized training initiatives for specific sites and roles within a processing environment (2, 9, 14). Additionally, further analysis is necessary to fully understand the program's long-term impact and its effect on the various roles/positions that participated. Long-term post-program evaluations were not collected for participants in this program to determine whether they applied what they learned in practice. This data will support future initiatives and marketing efforts for the program, as administrators will be able to determine which target demographic the program is best suited for.

Program Limitations and Future Opportunities

Overall, the participants reported increased preparedness in conducting sanitation practices. Participants in all focus groups desired a more tailored program specific to their company, suggesting future offerings should be more commodity-focused, as they recommended creating programs based on a company's needs. There is an opportunity for the program to be tailored to specific equipment, processes, and products. Despite this, participants indicated interest in using the current program for new employees, highlighting its practicality for any

food production facility. There is an opportunity to create operator, supervisor, and sanitation lead tracks with core and role specific competency practice. Large facilities could opt in for optional hygienic design and environmental monitoring electives, while very small facilities could opt for the basic approaches to sanitation.

Past work has shown that high turnover rates and knowledge retention are critical challenges in food safety training (9, 12). Previous research and varied training needs expressed by participants in this study emphasize the importance of targeted approaches for different skill levels. While many programs, including the SCPP, are semi-standardized, future work should aim to tailor approaches to various skill levels within different food processing environments. Participants also recommended that the SCPP completion certificate be nationally recognized to enhance credibility within the industry. However, they found the training certificate valuable for professional development (e.g., listing on resumes and adding to LinkedIn profiles).

Because the program was based on wet cleaning procedures, there is an opportunity to develop future iterations of the program that focus on dry cleaning procedures and hands-on practice using the Tell, Show, Do method.

One limitation of this study is that the focus group format may introduce acquiescence and social desirability bias, as course creators and instructors moderated the sessions, potentially leading to bias (16, 25). Additionally, different instructors conducted focus groups at three sites, affecting consistency. To eliminate bias and ensure comparability, future focus groups should be conducted by the same person who is neither an instructor nor a creator of the program. To address this limitation, the team included anonymous course evaluations to solicit feedback.

Additional evaluation opportunities could be added to assess long-term implementation indicators: instances of ATP readings below threshold, titration out of specification events per month, corrective actions closed, etc.

This pilot carried no participant fees and did not measure monetary cost to sites. Findings therefore speak to educational effectiveness rather than budget impact. We also did not collect direct sanitation performance outcomes. Future cohorts will pair training with routine verification indicators and a brief manager survey on resources and perceived value.

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CONCLUSION

The Sanitation Controls Practitioner Program (SCPP), utilizing the Tell, Show, Do model, successfully enhanced participants' confidence and practical skills in sanitation across various roles and experience levels in the food industry. Participants consistently highlighted the value of combining online learning with hands-on practice, reinforcing the model's effectiveness as a comprehensive training approach. While feedback revealed areas for refinement, such as the need for company-specific customization and additional post-program follow-ups, the overwhelmingly positive participant experiences confirm the program's potential as a scalable solution for building sanitation competency in food processing environments. Future program development should prioritize expanding reach to a broader audience, offering tailored training options, and implementing follow-up assessments to evaluate long-term application and impact. Focus group results also suggest that the in-person SCPP is a potential vehicle for training industry managers or sanitation team leads to be instructors of the in-person activities for adoption within their own facilities. Through continued adaptation and evaluation, this model can serve as a valuable tool in improving sanitation practices and reducing food safety non-conformances across the industry.

ACKNOWLEDGMENTS

This material is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, the Center for Agriculture, Food and the Environment, the Food Science department at the University of Massachusetts Amherst, under project number MAS00567, Food Science department at the University of Maine, the Food Science department at the North Carolina State University, the USDA Food Safety Outreach Program, project number USDA FSOP, Project #2021-70020-35685, and the USDA National Institute of Food and Agriculture, AFRI project NIFA 2023-67011-40346 FELLOWSHIP. The contents are solely the responsibility of the authors and do not necessarily represent the official views of the USDA or NIFA.

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