Adaptive Lessons Featuring Virtual Reality Experiences that Simulate On-the-Job Learning

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Introduction

The Food Safety Modernization Act (FSMA) of 2011 was the most significant food safety regulatory event in over 70 years. It provided new requirements for comprehensive and science-based preventive controls for the entire food manufacturing industry. As a result of the FSMA, all processors producing ready-to-eat products that are exposed to the environment after a kill step are required to implement an environmental monitoring program. According to the CDC National Outbreak Reporting System, dairy is the 5th leading cause of foodborne outbreaks and the second leading cause of foodborne deaths in the United States. The artisan dairy industry is a particularly high-risk group because they generally have fewer resources compared to larger facilities. Since environmental monitoring is a new requirement, training is needed to teach processors how to develop and implement an effective plan. The goal is to mitigate risk and support food safety behaviors by positively influencing attitudes, norms, personal agency, and intentions, thereby closing knowledge and skill gaps. Online learning meets the needs of this audience because it is often difficult or impossible for artisans to attend face-to-face training due to time and money constraints.

Current Food Safety Training

Of the food safety training for food handlers evaluated in the literature between 2006 and 2017 for knowledge, attitudes, and/or behaviors (n=17), two were media campaigns or other messaging, while the remainder were actual educational training courses. The studies that used media campaigns or other messaging included methods such as posting food safety infosheets (informational posters) around the processing facility, encouraging group discussion and providing food safety films for home viewing. The educational training courses included face-to-face classroom lectures with and without demonstrations, hands-on activities, and/or group discussion.

Reported Food Safety Training Design Considerations: Formative Research and Learning Theory
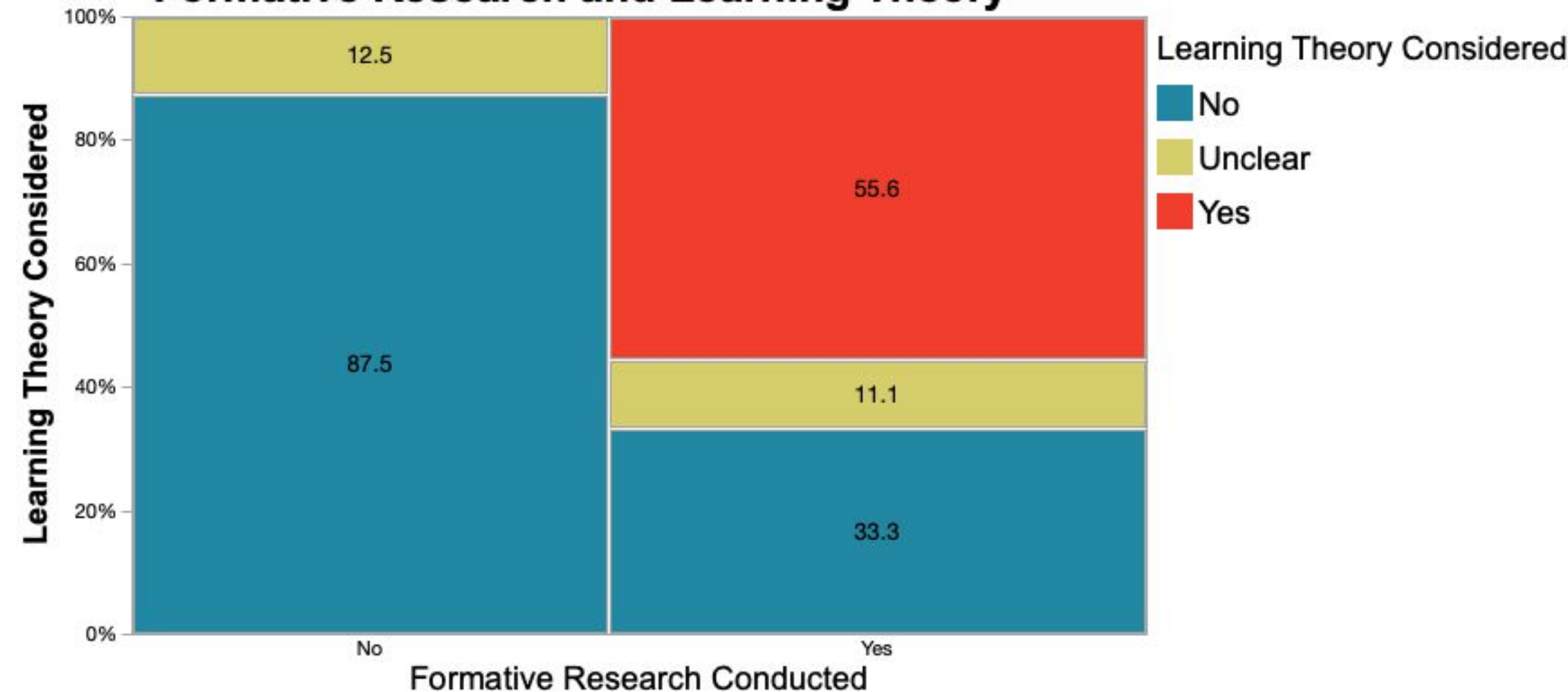
Instructional Design Process
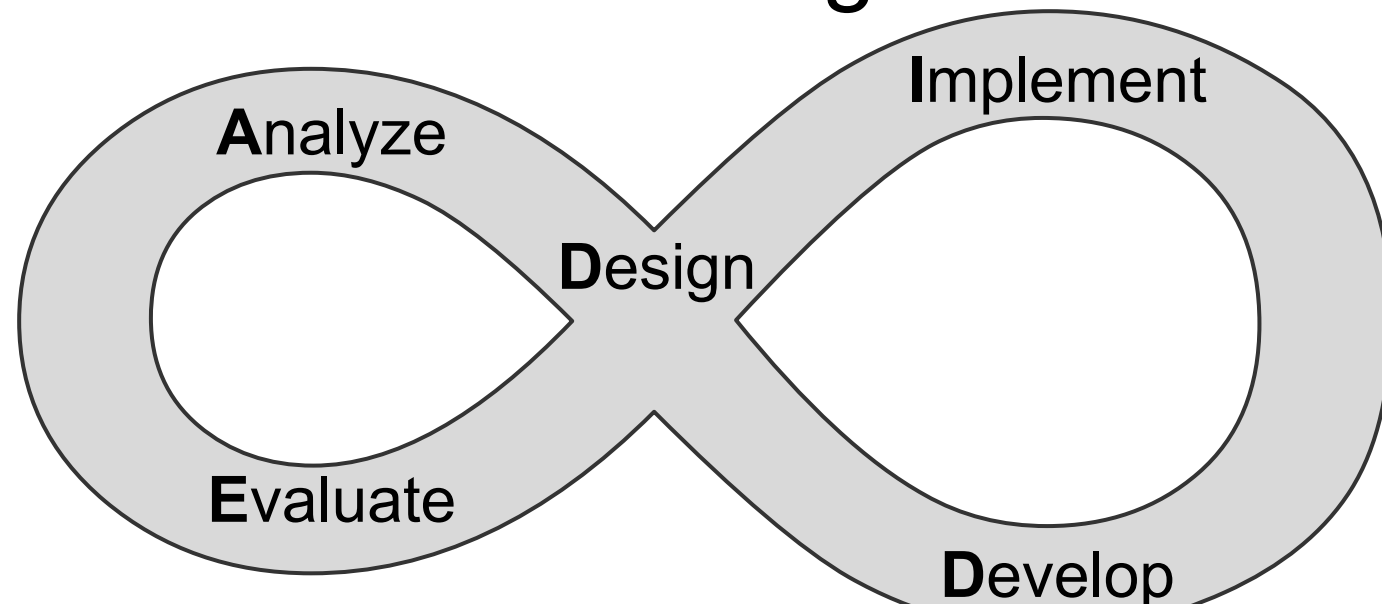
## Needs Analysis: Purpose & Methods

Purpose:
1. Identify the demographics of North Carolina Artisan Dairy Processors.
2. Use the Integrated Behavior Model (IBM) to assess which components of behavior predict the Artisan's decision to perform safe food handling behaviors.

Methods:

Identified Audience (*n*=49) Face-to-face Interviews (*n*=7) Online Survey (*n*=21)

Needs Analysis: Results

Method of Food Safety Training Received by Respondents

Respondent Education Level
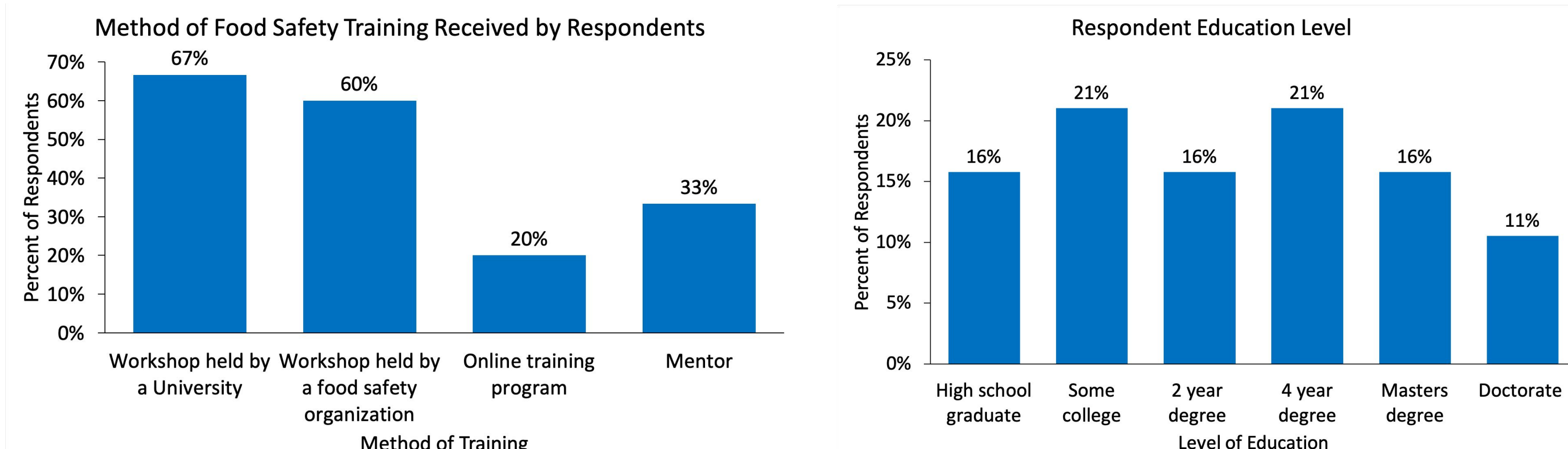
Integrated Behavior Model

Linear Regression predicting respondents average behavior component scores on intentions to perform safe food handling behaviors

$R^2 = 0.5734$
$(p=0.0683)$
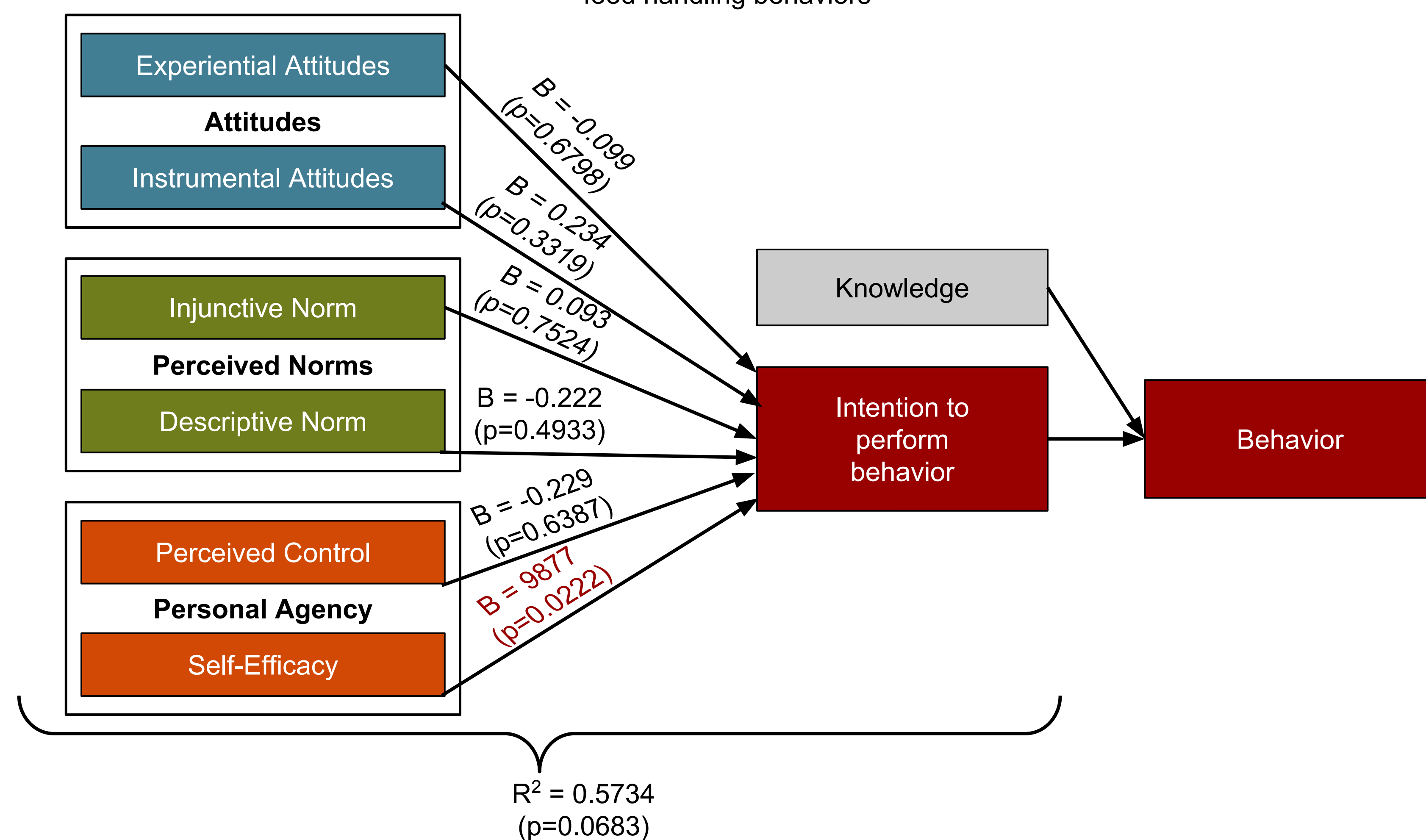
Needs Analysis: Key Findings

To best meet the needs of the target audience and have the greatest impact of behavior change, the training should:
- Be readable at an 8th-grade level.
- Provide opportunities for remedial learning.
- Feel socially engaging.
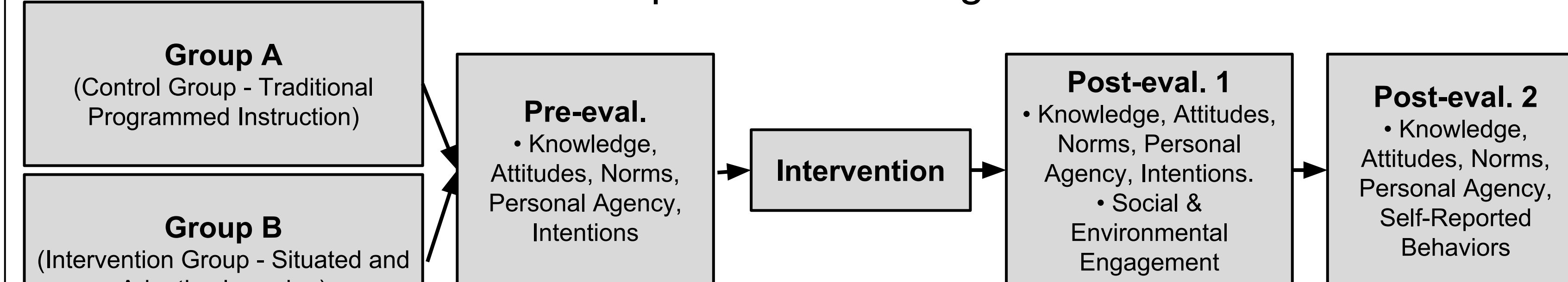- Provide the user with opportunities to apply knowledge.

Purpose of Study

The purpose of this study is to **determine if an online training designed using adaptive and situated learning strategies** (i.e. case study, simulation, and virtual reality) **has a significant impact on adult learners' knowledge, attitudes, norms, personal agency, intentions, and behaviors**. Specifically, do artisan dairy manufacturers successfully develop and implement an environmental monitoring program in their facilities after completing this course?

Research Questions

1. How **effective** is the online training course, designed using situated and adaptive learning strategies, in increasing adult learners in the workplaces' **knowledge** of training topics, specifically environmental monitoring in artisan dairy facilities?
2. Were the adult learners able to **effectively apply** the training content at the dairy facility in which they work?

Experimental Design

Adaptive Learning Strategies

1. Provide Remedial Pathways

2. Personalized Feedback

3. Choose A Pathway

4. Help Students Get to Correct Answer

- One chance: Either correct or incorrect result.
- Hope that students learn from their mistakes/misconceptions
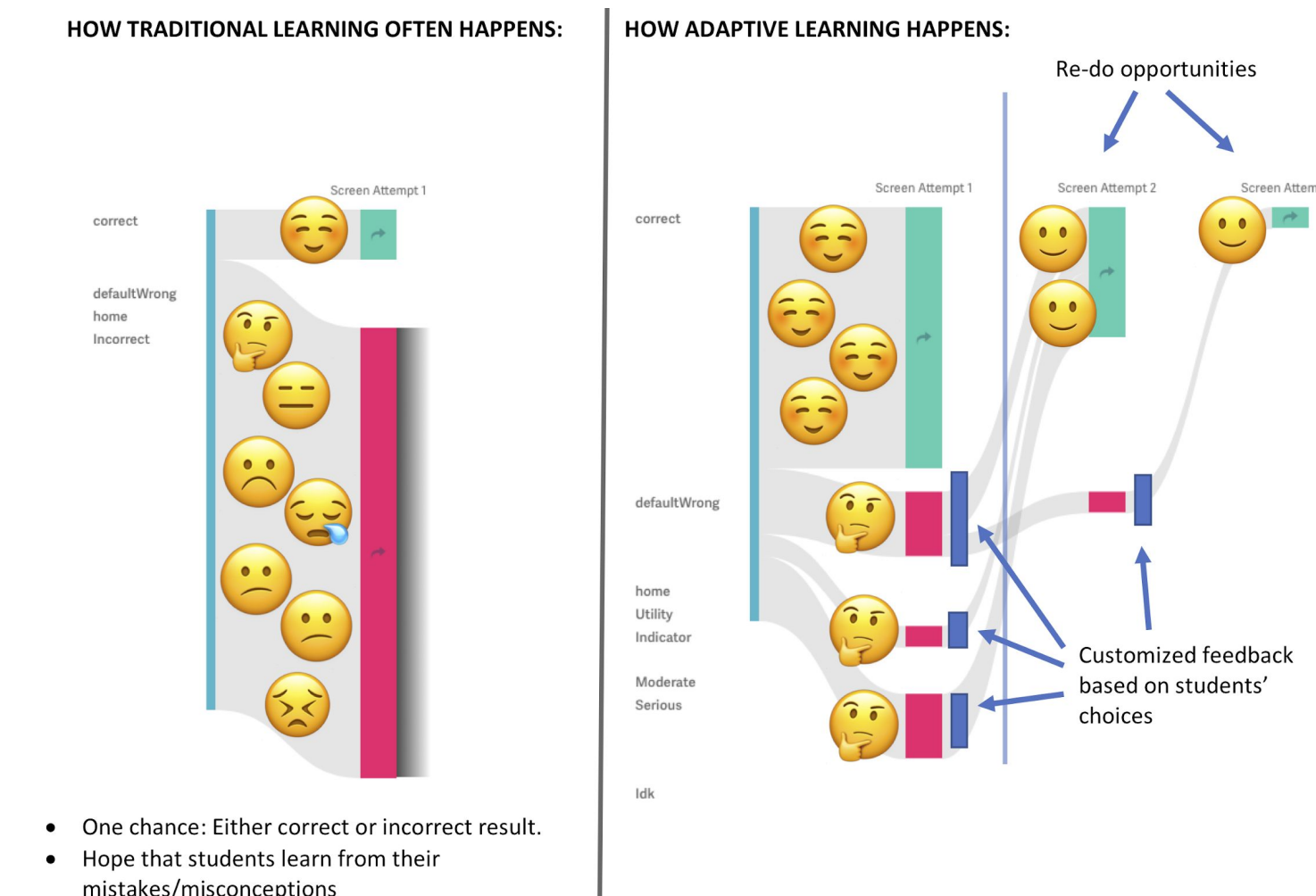
Virtual Situated Learning
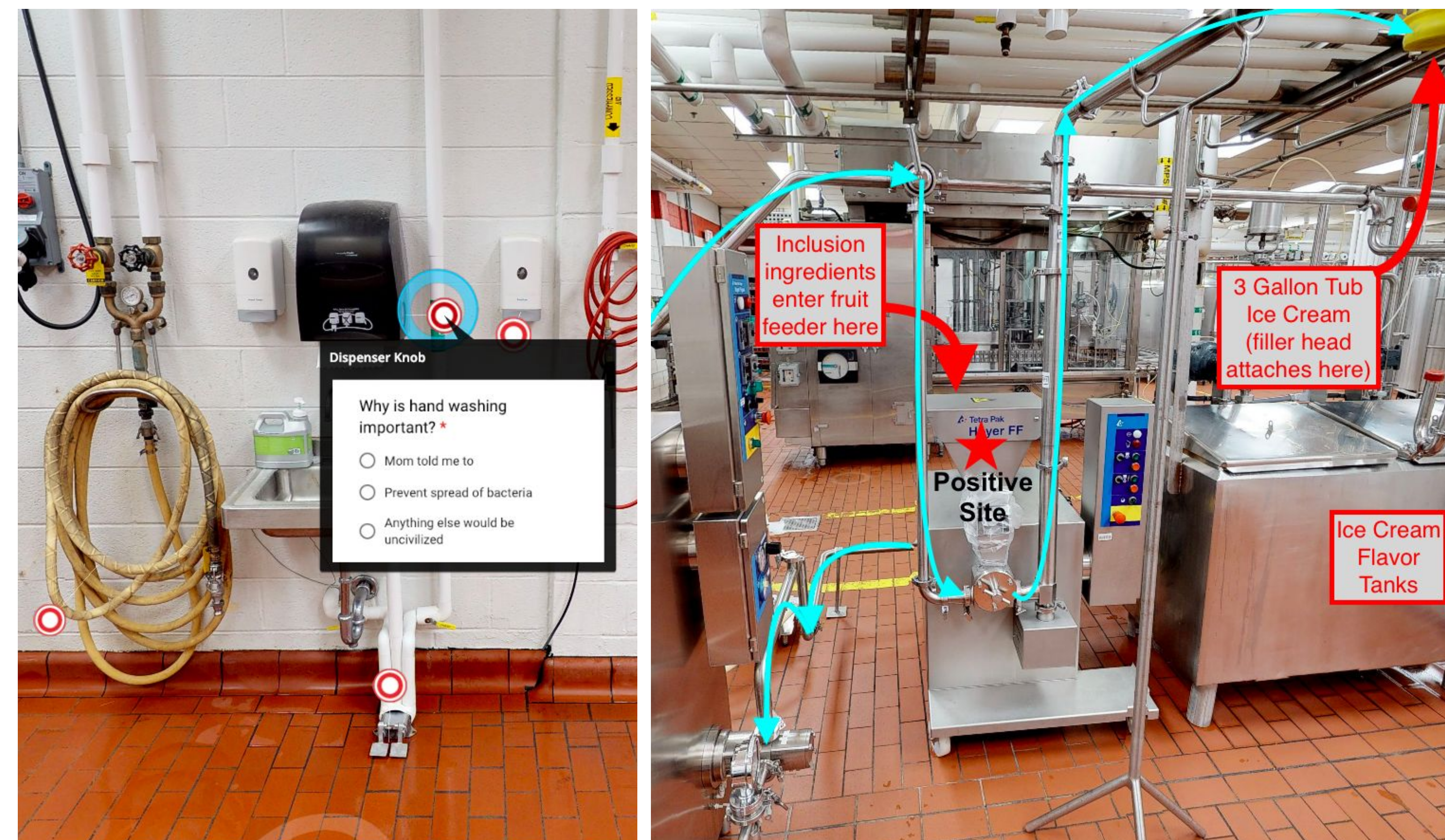
Significance

If it is successful, the approach used to design and develop the environmental monitoring training can serve as a model for trainers in *any* industry which requires students to learn complex material in the setting in which the material will be applied. This design approach has the ability to make training more accessible and (potentially more) effective, especially for small businesses, by reducing training costs, providing flexibility, and adapting to the unique needs of individual users. This approach to online training can help users by providing them with the knowledge and skills required to maintain regulatory compliance thereby helping keep our food system safe and helping small businesses stay in business.

Acknowledgements