NourishSmart: A Train-the-Trainer Approach to Food Waste Reduction Education – Implications for Extension Family and Consumer Sciences Programming

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Abstract

Food waste comprises nearly one third of the U.S. food supply, causing environmental harm, $384 billion in annual economic losses, and worsening food insecurity (13.5% of households in 2023). In Utah, where 1 in 6 children faces hunger, targeted education is critical. NourishSmart, a 2024 standards-aligned, four-lesson curriculum from Utah State University's Hunger Solutions Institute, employs a train-the-trainer model to empower K-12 and afterschool educators in food systems and waste-reduction education. Six trainings (October 2024–March 2025) reached 137 educators; retrospective surveys (n=131) showed significant gains in knowledge (+1.92), resource awareness (+2.08), and confidence (+1.88; all p<.0001). Qualitative feedback praised interactive, Utah-specific resources. National outreach engaged 75 more educators. NourishSmart offers a scalable model linking sustainability, waste prevention, and food security in schools.

Introduction

Food waste remains a pressing issue in the United States, with recent estimates indicating that 29% of the food supply became surplus in 2024, much of which was wasted (ReFED, 2025). This surplus equates to substantial economic costs (~$384 billion) and contributes significantly to greenhouse gas emissions, largely through methane from landfills (Food and Agriculture Organization, 2021; Environmental Protection Agency, 2021). Concurrently, food insecurity affects 13.5% of U.S. households, with higher rates among households with children (United States Department of Agriculture Economic Research Service, 2023). In Utah, approximately 1 in 6 children faces hunger, underscoring the need for interventions that reduce waste while supporting food access (Utah Food Bank, 2023).

The U.S. Environmental Protection Agency has set a goal to reduce food waste by 50% by 2030 (Environmental Protection Agency, 2021). Schools offer a key setting for fostering sustainable behaviors through hands-on learning, which has been shown to influence food waste reduction (Secondi et al., 2015). Adolescents are particularly receptive to environmental education incorporating waste strategies (Stevenson et al., 2018). However, Utah lacked dedicated resources for educators in this area. NourishSmart addresses this gap with a train-the-trainer model grounded in experiential and peer-to-peer learning to enhance waste-reduction behaviors (Schanes et al., 2018). The program supports national efforts to combat food waste while advancing food security and sustainability.

Objective

NourishSmart aims to:

1. Equip educators with resources and training to integrate food waste education into curricula, fostering student awareness of its environmental, economic, and social impacts.
2. Promote hands-on, experiential learning and support schools and after-school programs in implementing food waste reduction and recovery initiatives.

Method

Curriculum Development

Developed iteratively in 2024, the four-lesson curriculum covers food systems, waste impacts, and practical reduction

strategies at school and home. It was reviewed by three experts in environmental science, public health, and agriculture, revised based on feedback, and made publicly available online.

Lessons include adaptable PowerPoint presentations, hands-on activities, take-home challenges, and supplemental materials (e.g., activity sheets and Wasteless Plates recipes for repurposing foods). The curriculum aligns with Utah core standards and was promoted through partnership with Utah Agriculture in the Classroom. A core feature of NourishSmart is its train-the-trainer model. Rather than delivering content directly to students, program is focused on empowering educators with the tools and confidence to deliver the curriculum themselves.

Educator Training and Implementation

Between October 2024 and March 2025, six educator training sessions were conducted to equip participants with the tools, content knowledge, and instructional strategies necessary to implement the NourishSmart curriculum with confidence and fidelity. Formal classroom teachers and afterschool educators were invited to participate.

To expand outreach and ensure alignment with academic standards, a partnership was established with Utah Agriculture in the Classroom to promote the curriculum statewide. Utah Agriculture in the Classroom collaborates closely with K–12 educators to provide lesson plans aligned with Utah core standards and objectives. Through this partnership, the program was marketed broadly, and workshops were offered at no cost to participating educators to increase accessibility and participation.

Each training session included:

- An overview of the curriculum's core concepts, structure, and learning objectives.
- Demonstrations of lesson delivery and interactive classroom activities.
- Evidence-informed strategies to foster student engagement and support behavior change related to food waste reduction.
- Facilitated discussions on integrating food waste education into existing curricula while meeting state standards requirements.

Evaluation

To evaluate training effectiveness, educators completed retrospective pre- and post-training surveys measuring changes in knowledge, confidence, and intent to implement the curriculum. Survey instruments included both closed and open-ended questions aligned with the program's learning objectives.

Data was entered into Qualtrics for secure storage and management, then exported and analyzed using SAS statistical software. Descriptive statistics and paired Wilcoxon test were conducted to assess mean changes across key knowledge and confidence domains, with significance determined at $p < 0.05$. Qualitative feedback was thematically coded to identify common insights and suggestions for future improvements.

Results

Demographic Data (n=137)

A total of 137 educators across 15 Utah counties received training in six different training sessions, expanding the reach of NourishSmart to diverse learning environments. Demographic data revealed that majority of educators were female (84.7%) and white (83.2%). Details are presented in Table 1. These educators

represented middle and high school teachers, CTE teachers, and after-school program facilitators.

Perceptions of food waste

Open-ended responses to "What do you think of when you hear the phrase 'food waste'?" highlighted a range of emotional, environmental, and societal concerns. Prominent words included "hunger," "waste," "climate," "landfills," and "resources," reflecting the cross-cutting themes of food security and sustainability. To visually represent these themes, a word cloud was generated (Figure 1).

Thematic analysis identified eight categories:

- *Reasons for Food Waste (n=39): Educators frequently cited causes such as poor planning, excess food, picky eaters, and spoilage, indicating a strong awareness of behavioral and systemic contributors.*
- Disposal Destinations (n=35): Words like garbage, waste, and landfill reflected concern over the final destination of wasted food and its environmental burden.
- *Negative Emotions or Opinions (n=17): Terms such as sad, shame, and unnecessary suggest that food waste evokes strong emotional responses and moral judgments.*
- *Societal Consequences (n=13): Words like food insecurity and poverty emphasized the perceived injustice of wasting food in the context of hunger and inequality.*
- *Frequently Wasted Foods(n=19): Specific examples like leftovers and food scraps were commonly mentioned, indicating practical awareness of waste sources.*
- *Costs (n=10): Economic concerns were reflected in words like money and expensive, highlighting the financial implications of food waste.*

Figure 1. Word Cloud on question, *"What do you think of when you hear the phrase 'food waste'?"*

- *Solutions (n=8): Some responses pointed to mitigation strategies such as composting and feeding food to animals, suggesting a proactive mindset.*
- *Environmental Consequences (n=4): Though less frequent, terms like climate change and sustainability underscored the ecological dimension of food waste.*

Educator Prior Experience and Training Relevance

During trainings, 72% of educators reported prior experience with food waste reduction, primarily in home settings. Common practices included feeding scraps to animals, composting, and repurposing leftovers. Overall, 95% of participants rated the training as highly relevant to their teaching needs, underscoring its alignment with educators' existing interests and professional contexts.

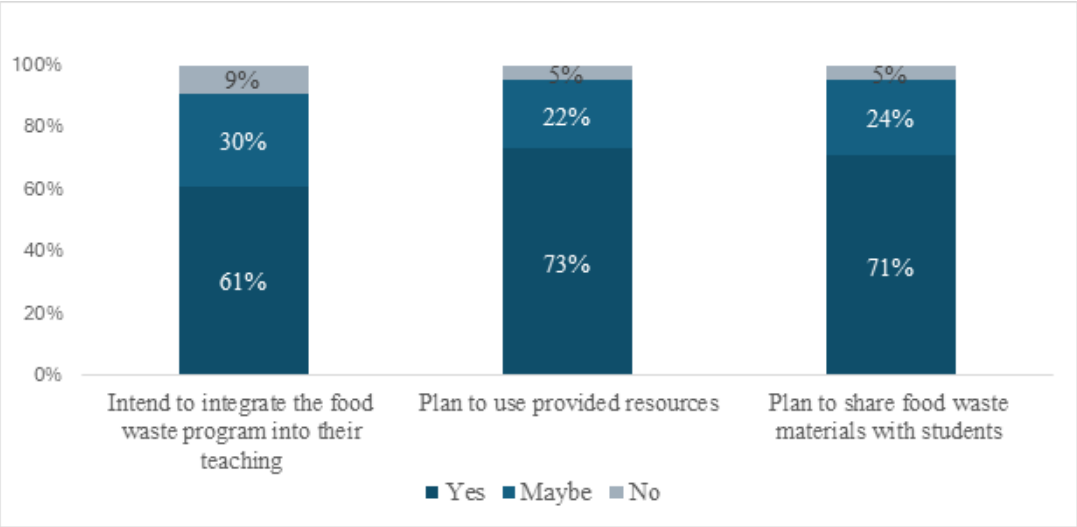
Educator Knowledge and Confidence Gains

Retrospective pre- and post-training surveys (n = 131) revealed highly significant improvements across all measured domains (Wilcoxon signed-rank test, all $p < .0001$). Participants showed substantial gains in understanding food waste as a Utah-specific issue, awareness of teaching resources, and confidence in curriculum integration (see Table 2). These results indicate that the brief training effectively built capacity for implementation.

Behavioral Intent

Educator responses demonstrated strong potential for sustained engagement with the NourishSmart curriculum (n=131). A majority (61%) reported clear intent to integrate the food waste reduction program into their classroom instruction, with an additional 30% considering it (Figure 2). Similarly, 73% of educators planned to utilize the provided curriculum resources, while 71% intended to share food waste materials directly with students- each supported by approximately one-quarter of respondents who were undecided but open to doing so. These findings suggest that the training not only increased knowledge but also fostered motivation and readiness to implement food waste education in both formal and informal learning environments.

Figure 2. Educator Behavioral Intent Following Training (n=131)



***Data from only 131 of the educators were collected and analyzed due to missing information from some educators**

Qualitative Reflections
Following the training sessions, educators were invited to reflect on the most valuable aspects of their experience. Feedback consistently highlighted appreciation for the interactive format, ready-to-use resources, and Utah-specific content.

Participants valued experiencing the curriculum as learners before implementing it in their classrooms. One educator noted, *"I loved that we experienced the same activities our students would be doing. They were simple enough for students to follow while still conveying the full intent."* Another shared, *"The resources provided are engaging and useful."* Similarly, a participant commented, *"I loved the resources shared at the end- very useful and applicable. The activities definitely made me reflect on my own food practices."*

The inclusion of Utah-specific data and context further enhanced perceived relevance. As one educator remarked, *"I enjoyed learning something new about Utah- especially the state-specific statistics and interactive polls."* Collectively, responses suggest that experiential learning, practical materials, and localized content contributed to both professional engagement and personal reflection.

Discussion

Findings from the NourishSmart educator training demonstrate strong potential to increase both awareness and behavior change related to food waste reduction. Post-training surveys revealed significant gains in educators' understanding of food waste in Utah, confidence in integrating waste education into their curricula, and familiarity with available resources. These

Findings from the NourishSmart educator training demonstrate strong potential to increase both awareness and behavior change related to food waste reduction. Post-training surveys revealed significant gains in educators' understanding of food waste in Utah, confidence in integrating waste education into their curricula, and familiarity with available resources. These results reflect current evidence that experiential learning, especially when tied to real-world sustainability challenges, enhances teacher capacity and classroom application (Savage et al., 2015; Monroe et al., 2019).

Educator intentions were also encouraging; over 60% expressed plans to integrate the NourishSmart curriculum into their teaching, while more than 70% committed to using and sharing the materials provided with students. These behavioral intentions are vital predictors of sustained program engagement and mirror broader research indicating that teacher motivation and perceived relevance are key to curriculum adoption (Aikens et al., 2016; UNESCO, 2021). Still, common barriers- such as time constraints, administrative limitations, and food donation policies, point to the need for institutional support and structural alignment to effectively scale these efforts (ReFED, 2023).

Open-ended reflections on the phrase "food waste" revealed that educators linked the issue not only to inefficiency but also to hunger, inequity, and environmental degradation. This aligns with recent literature highlighting the moral, social, and ecological implications of food loss and waste (Springmann et al., 2018; Thyberg & Tonjes, 2016).

Limitations of current program include retrospective design, self-reported data,

short-term evaluation, and lack of student-level outcomes. Future work should assess implementation fidelity, student impacts, and adaptations for diverse populations.

Implications for Extension

The NourishSmart program represents a practical, scalable model for Extension Family and Consumer Sciences (FCS) professionals to integrate food systems education into existing programming, addressing the interconnected challenges of food waste, sustainability, and food security. By equipping educators- particularly those in K-12 schools, afterschool programs, and youth initiatives like 4-H- with a ready-to-use, standards-aligned curriculum and hands-on training, NourishSmart empowers FCS agents and specialists to foster meaningful behavior change at the individual, household, and community levels.

Practical Adoption and Adaptation for FCS Educators

NourishSmart's train-the-trainer approach aligns well with Extension's emphasis on building capacity through peer education and experiential learning. The four-lesson curriculum, featuring adaptable PowerPoint presentations, interactive activities (e.g., waste audits, repurposing recipes via Wasteless Plates), and take-home challenges, allows FCS professionals to seamlessly incorporate food waste reduction into nutrition, health, sustainability, or family resource management programs. For instance, lessons on food systems and environmental impacts can enhance SNAP-Ed or EFNEP sessions, while practical strategies (composting, meal planning) support family budgeting and resource conservation efforts. The high post-training gains in knowledge (+1.92 to +2.08 points across domains) and confidence (+1.88) demonstrate that even brief trainings (one session) can build educator self-efficacy, enabling FCS staff to deliver content confidently without extensive additional preparation. Qualitative feedback emphasized the value of interactive replication- educators appreciated experiencing activities firsthand, making them easier to replicate with youth. This mirrors successful Extension models where experiential methods promote sustained adoption (Monroe et al., 2019; Savage et al., 2015).

Enhancing Youth and Community Impact Through Extension Partnerships

NourishSmart's integration with Utah Agriculture in the Classroom and ties to Utah 4-H programs like 4-H Entrepreneurs and Career readiness highlight opportunities for FCS professionals to collaborate across Extension areas. By partnering with agriculture educators or youth development specialists, FCS agents can extend reach to diverse audiences, including rural and urban youth. The program's focus on student-led action (e.g., school waste-reduction initiatives, food recovery) fosters leadership and civic engagement- key FCS outcomes. With 61% of trained educators intending definite curriculum integration and 73% planning to use resources, NourishSmart positions FCS programs to drive measurable community-level changes, such as increased composting or reduced household waste.

Addressing Barriers and Supporting Scalability Common Barriers to Implementation

Time constraints, administrative support, and school food donation policies- can be mitigated through Extension's strengths in professional development and advocacy. FCS professionals can advocate for policy supports like streamlined share-table guidelines or cafeteria composting infrastructure, aligning with EPA's 2030

food waste reduction goal and national food security priorities (ReFED, 2023). The program's low-cost, free-training model (partner-funded) makes it accessible for resource-limited counties. To enhance scalability, FCS agents could incorporate NourishSmart into ongoing professional development series or online modules, ensuring broader adoption across states.

Broader FCS Contributions to Sustainability and Equity

Educators' open-ended responses linking food waste to hunger, inequity, landfills, and climate (e.g., prominent themes in word cloud: "hunger," "food insecurity," "climate") highlight food waste as a moral and social justice issue central to FCS. By framing waste reduction as a pathway to food security, NourishSmart supports FCS priorities in health equity, resource stewardship, and family well-being. Longitudinal tracking of classroom implementation and student outcomes could further demonstrate impact, informing future FCS programming.

In conclusion, NourishSmart offers FCS Extension professionals a practical tool to advance food literacy, empower educators and youth, and contribute to sustainable communities. Its evidence-based, experiential design and strong behavioral intent from participants make it a valuable addition to the FCS toolkit for addressing emerging trends in food systems education.

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Tables

Tables 1. Demographic data of participants (n= 137)

	Number of Educators	Percent of Educators
Participant Gender		
Female	116	84.7%
Male	8	5.8%
Chose not to answer	13	9.5%
Participant Race		
White	114	83.2%
More than One Race	7	5.1%
Hispanic/Latino	2	1.5%
American Indian or Alaskan Native	1	0.7%
Asian	1	0.7%
Native Hawaiian or Pacific Islander	1	0.7%
Chose not to answer	11	8.0%

Table 2. Educator Knowledge Scores (n = 131*)

Domain	Pre-Training Mean	Post-Training Mean	Δ (Change)
Understanding food waste as a Utah issue	2.1	4.02	+1.92
Awareness of teaching resources	1.94	4.02	+2.08
Confidence in curriculum integration	2.1	3.98	+1.88

Data from only 131 of the educators were collected and analyzed due to missing information from some educators