

RESEARCH ARTICLE

Defining Food Education Standards through Consensus: The Pilot Light Food Education Summit

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ABSTRACT

BACKGROUND: Consistent with the Whole School, Whole Community, Whole Child Approach, food education encompasses nutritional status, culture, community, environment, and society. Unifying standards are needed to support food education integration in K-12 curricula. Pilot Light, a Chicago-based nonprofit, sought to generate such standards. This study reports a formative evaluation research process that led to the development of Food Education Standards (FES).

METHODS: Nine FES were drafted within the context of the National Health Education Standards. The 2-day Pilot Light Food Education Summit convened 26 experts and community members to review draft FES. A facilitated, consensus-building process generated refined FES and K-12 competencies. Drawing on Summit outcomes and expert feedback, a team of teachers subsequently drafted final FES. Summit participants completed pre- and post-Summit surveys to assess changes in food education priorities.

RESULTS: The initial 9 FES were refined to 7. Comparison data indicated shifts in endorsed priorities for food education, moving from prioritizing specific knowledge, such as “categorizing food into food groups,” toward “students having a conscious decision-making process around food.”

CONCLUSIONS: Developed with input from experts across multidisciplinary fields, the evidence-based Pilot Light FES can be feasibly implemented in multiple subjects across all school types and community socio-demographic levels.

Keywords: child and adolescent health; food education; organization and administration of school health programs; school health instruction; standards.

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The critical public health issues of childhood obesity^{1,2} and under-consumption of wholesome foods,³ coupled with the link between poor nutritional status and lower academic outcomes,^{4,5} underscore the need for today’s youth to acquire the knowledge and skills necessary to make informed eating choices that

promote healthy growth, development, and academic success. To address this need, and in concert with the then-First Lady Michelle Obama’s *Lets’ Move* campaign, 4 Chicago chefs founded the nonprofit organization Pilot Light in 2010 with the mission of “helping kids make healthier choices by connecting the lessons they

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learn in their classrooms to the foods they eat on their lunch trays, at home, and in their communities.”⁶ Since then, Pilot Light has uniquely served Chicago schools with high percentages of minority and low-income students through food education and cooking experiences provided via partnerships among local chefs, the food industry, and teachers.

Food education—defined here as education that supports learning about food, nutrition, and the role that food plays in one’s life, relationships, culture, communities, environment, and in history and society—has the potential to help youth develop the critical thinking skills necessary for making healthy choices in everyday life. Such holistic food education, also known by terms such as nutrition education, food/nutrition literacy, edible education, and others,⁷⁻¹⁰ has recently seen renewed interest. Regardless of description or definition, all such programs espouse the core goals of supporting children to adopt healthy choices, develop healthy habits and relationships with food, and achieve increased understanding of how food is systematically connected to nutrition, health, and their economic and social worlds.

Food education has high potential for success when contextualized within the Whole School, Whole Community, Whole Child (WSCC) model. WSCC combines a coordinated school health approach and the Whole Child Framework to support student health and achievement through policies and programming that are implemented within and across 10 components,^{11,12} including health education. WSCC espouses a collaborative approach to health education by utilizing schools as a key system for integrating health into the day-to-day lives of students and their communities.^{11,13} Within WSCC, health education is guided by the National Health Education Standards (NHES), which encompass concrete expectations for effective health education through delineation of what students should know and be able to do across multiple grade levels.¹⁴ The NHES are intended as a framework through which health promotion and disease prevention concepts related to the 10 traditional conceptual areas of health (including nutrition) and/or 6 priority health risk behaviors (including unhealthy eating) can be taught along with essential skills for adopting and sustaining healthy behaviors.¹⁴

Recognizing the opportunity presented by the NHES and capitalizing on its collaborative approach toward schools and communities, Pilot Light leaders determined that a unifying set of food education standards would both benefit schools that provide food education programming and help overcome barriers to food education implementation, such as competing demands in the classroom and the need for additional support for teachers to deliver food education in the classroom.¹⁵ That is, comprehensive

standards were needed in order to make food education a desired, accepted, and integrated part of school curricula. Moreover, food education standards (hereafter referred to as FES) could prove beneficial for meeting the United States Department of Agriculture (USDA) local school wellness policy mandate which, along with other provisions, requires a plan for nutrition education.¹⁶

To this end, a formative evaluation research process to develop FES was facilitated through the fall 2017 Pilot Light Food Education Summit (with pre- and post-Summit convening activities) involving experts, along with community members and educational professionals, especially teachers and school administrators, in a series of systematic, facilitated consensus-building activities (hereafter referred to as the Summit). Experts from multiple disciplines and backgrounds were involved due to the holistic nature of food education. Involvement of community members, teachers, and administrators was seen as essential for connecting FES to existing school practices and the everyday lives of students, as well as for avoiding inherent value judgements or assumptions within FES that could prove problematic for some communities and schools. As presented in detail hereafter, Summit activities addressed 3 purposes: (1) discuss skills and knowledge that enable children to develop healthy relationships with food; (2) develop and refine FES, with competencies, for grades K-12; and (3) reimagine food education as having a high priority and being fully integrated across K-12 curricula in multiple subjects.

METHODS

A systematic approach based on a modification of the Delphi method was used to gather input from a diverse group of experts¹⁷⁻¹⁹ and provide a formative evaluation research process in order to develop and refine the FES.^{20,21} This process involved consensus-building meetings, coupled with both face-to-face and web-based feedback that encompassed multiple iterations of drafting, critiquing, and refining FES and related competencies. To document Summit activities and verify outcomes, both qualitative and quantitative data were collected and analyzed.

Participants

Summit participants. A panel of 26 experts drawn broadly from the fields of health and nutrition education, food services, public health, and education participated in the Summit along with pre-Summit planning and subsequent post-Summit review activities. Self-selecting as many areas of expertise as relevant (could select more than one), 19 participants completing a pre-Summit survey identified themselves

Table 1. Teacher Review Panel School Demographics

	School 1 (N = 4)	School 2 (N = 1)	School 3 (N = 3)
Bilingual	11.3%	12%	11%
Free/reduced price lunch enrollment	31%	94.3%	48%
Student ethnicity			
White	44%	0.9%	17.7%
African American	8.8%	3.0%	60.3%
Native American	0.7%	0.5%	0.1%
Hispanic	36.8%	95.2%	8.4%
Multi-racial	2.3%	0.2%	5.1%
Asian	6.5%	0.1%	8%

Data drawn from National Center for Education Statistics, 2016-2017.

as experts in education (63%), culinary (26%), nutrition (47%), agriculture (32%), and/or health/public health (47%). Participants were affiliated with a broad range of private and government-sector organizations, including universities, schools, the food industry, the agricultural industry, the local health department, and the USDA; 3 represented the Pilot Light Board of Directors.

Teacher review panels. A total of 8 teachers and education professionals drawn from diverse schools in Chicago, Illinois, participated in teacher review panels (see Table 1). Teachers from grades 3-8, as well as one 11th grade history teacher and one instructional coach were included. This diverse teacher group was recruited to expand the range of schools in which the FES could be implemented, thus strengthening potential external validity.

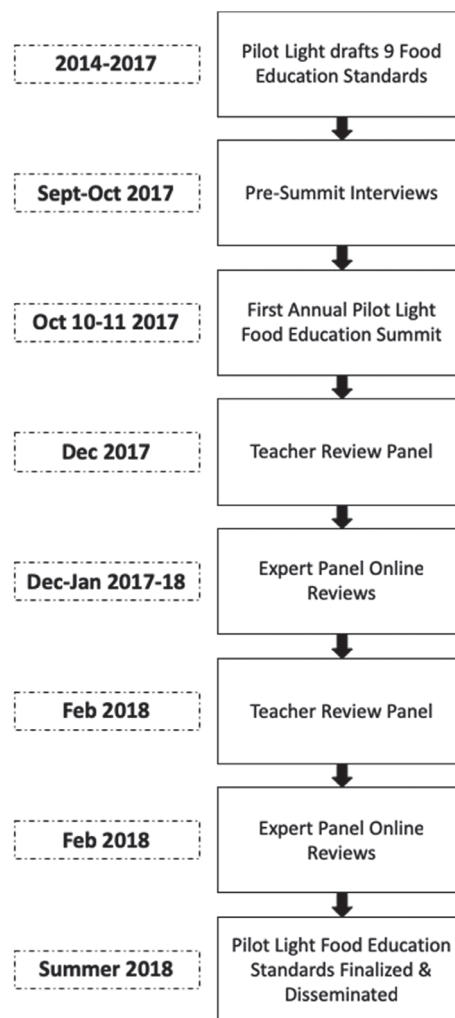
Procedures

Preparation of draft FES. The iterative, quasi-scientific process (Figure 1) of developing and refining FES and accompanying competencies began with the creation of 9 draft standards by a working group that comprised Pilot Light staff and Board members. Draft FES were developed by reviewing existing sources of health and nutrition education standards and sources of information about food education, including: the Institute of Medicine,²² State of Wisconsin Health Education Standards,²³ State of California Nutrition Standards,²⁴ and State of North Carolina Health Education Standards.²⁵ Crafting of draft FES was viewed as a naturally evolving progression guided by the NHES and WSCC.¹⁴

Prior to the Summit, draft FES were reviewed by 20 of the 26 expert panel members. Eight expert panel members completed reviews via phone interviews and 12 completed online written interviews via open-ended questions. Based on this expert feedback, initial draft FES were edited and refined by the Pilot Light team for presentation at the Summit.

Summit procedures. At the outset of the Summit, participants first ranked priorities for possible aspects

Figure 1. Timeline of Procedure for Developing and Refining Pilot Light Food Education Standards



and methods of food education on a paper survey. Then, a consensus-building activity was conducted through which participants reviewed wording of the most current 9 draft FES. Participants were asked to publicly endorse a stance on the wording of each standard by indicating full agreement with a “thumbs up,” partial agreement but willingness to accept wording with a “sideways thumb,” or disagreement with a “thumbs down.” Disagreeing participants were asked to explain their concerns and provide potential alternative wording. Through this process, draft FES wording consensus was reached with substantial change to only one standard.

Following agreement on draft FES wording, consensus-building shifted to the development of topics and competencies under each standard. To begin, each draft FES was written at the top of a large sheet of paper and displayed at separate stations around the room. Participants were asked to visit each

station and record key topics or competencies for each FES that they endorsed as important for student learners to master. At the end of the day, Pilot Light staff collected and compiled the ideas generated from this brainstorming activity.

During Summit day 2, participants were first asked to divide themselves by background (research, education, food industry) into small groups, with each group containing one or 2 participants from each disciplinary background. Each group was assigned a draft FES and provided with a compiled list of related, previously-generated topics, and competencies. Groups were then tasked with writing any additional competencies they believed were needed and dividing the competencies into grade-span clusters (K-2, 3-5, 6-8, 10-12). Upon task completion, each group presented their draft FES and competencies to the entire group of participants for discussion and feedback (recorded by Pilot Light staff). Participants then completed a post-Summit paper survey containing the same questions as the pre-Summit survey.

Post-summit teacher review panels. Pilot Light recruited teachers from multiple, diverse schools across Chicago for the teacher review panels. Between December 2017 and June 2018, teacher review panels refined Summit feedback and twice shared their output with Summit participants for comment. An initial teacher panel met in December 2017 to review draft FES and competencies refined during the Summit, along with all notes and feedback collected during the consensus-building process. Teachers were asked to draw both on the information provided from the Summit and their personal knowledge of K-12 curricula in conjunction with their perceptions of school and classroom needs. In addition, participants reviewed the NHES and, following discussion, made recommendations as to how FES should be similar to or different from the NHES. Via this process, the 9 Summit-derived FES were reduced to 7 by combining or eliminating overlapping concepts. Competencies were also further refined.

During the first teacher review panel, questions to pose for the expert panel (described below) were developed. Subsequently, a second teacher review panel was convened in January 2017 to review the most recent expert panel feedback and further refine competencies. After final expert panel commentary was provided in February 2018, teacher reviewers collaborated with Pilot Light staff to finalize the FES and competencies.

Expert panel online reviews. Summit participants provided additional feedback on draft FES and competencies via a collaborative Google platform where they entered comments. For the December through early January 2017-2018 online review, Pilot Light staff posted for comment the 7 refined draft FES and competencies that emerged from the first teacher

review panel; 4 Summit participants responded. A second, early to mid-February 2018 expert panel review was conducted using the same procedure; 6 Summit participants provided feedback. Summit participant comments were used by teacher reviewers and Pilot Light staff to make a final round of FES and competency revisions. Conceptually, these finalized Pilot Light FES (PL-FES) and competencies remain a living document that can be updated periodically.

Measures and Data Analysis

Priorities for food education. To document the consensus-building process followed during the Summit, participants' pre- and post-Summit priorities for food education were assessed via close-ended survey questions, including: (1) "Below is a list of possible aspects of a food education program. Please rank what you feel are the 3 most important aspects of a food education program from the list;" (2) "Below is a list of possible methods for teaching food education. Please rank what you feel are the 3 most important methods from the list;" and (3) "Below is a list of behaviors that you and/or your colleagues at this event identified as important outcomes of food education. Please rank what you feel are the 3 most important from the list." These questions were developed based on previous models of nutrition and health education policies and strategies,^{26,27} and a workshop related to nutrition standards in K-12 curricula.²² To compare priorities, responses were reverse coded such that higher priorities received more weight, and group priorities were ranked by taking the mean for each item and ordering items from highest average score to lowest.

Thematic analyses. Themes were identified from qualitative data collected at multiple time-points in order to assess topics that Summit and teacher review panel participants felt still needed to be addressed within the FES. This included responses to the pre-Summit interview question, "After reviewing the Pilot Light Food Education Standards, do you feel that any important content areas are missing? If so, what is not covered by the current standards?", and content topics and competencies generated during the Summit plus first and second round expert panel online review comments. Themes were initially identified by one investigator using a process by which key phrases, comments, and written responses were grouped based on similarly identified ideas. These thematic groupings were reviewed, discussed, and confirmed by 2 additional investigators and used to code all qualitative data. Themes were not mutually exclusive in that multiple themes could be ascribed to the same comment. Frequency counts and overall percentages were tabulated and examined across 4 time-points (pre-Summit, during Summit, and 2 post-Summit online review periods) to assess thematic shifts.

RESULTS

Priorities for Food Education

Mann-Whitney *U* tests were used to examine shifts in priority rankings related to food education (see Table 2). Overall, only one significant change in priority ranking was observed relative to priorities for aspects of a food education program, with “It is provided by a teacher with training in health education” moving from overall 6th priority pre-Summit to 8th post-Summit. The top 3 food education program priorities remained constant. Although no significant changes in ranking were detected for priorities of methods for teaching food education, the top 3 shifted slightly. Pre-Summit “Creating a classroom lesson that incorporates a school garden” was ranked third highest, but fell in ranking post-Summit. “Students assess the food environment where they live and advocate for some kind of improvement” increased in ranking to third highest priority. Similarly, no significant changes in ranking of priorities were observed for behaviors indicated as important outcomes of food education; however, the top 3 priorities changed slightly. Pre-Summit, “Students eat more fruits and vegetables” was ranked as third highest priority overall, but fell post-Summit to seventh ranking, while “Students have a conscious decision-making process around food” moved into the top 3.

Thematic Analyses

In total, 35 final themes were identified across the 4 qualitative data sets (Table 3), 32 of which were content-based topics. Three were related to agreement with or changes needed to draft FES structure or wording. Structural themes were not coded as part of the Summit consensus-building qualitative data because participants did not provide feedback on structure or wording at that time point.

In pre-Summit interviews, experts most commonly provided positive feedback related to draft FES (“*I think it’s a necessary component to overall education. Generally our kids don’t get this . . . the curriculum is necessary for everyone.*”), but also provided suggestions for wording changes (“#3. ‘*show connections’ to what? health? wellness? people?*”). Pre-Summit, experts indicated that topics of culture (“*Including student’s understanding of the relationship of food and culture . . . would make standards even more comprehensive*”) as well as production/food systems (“*How does [our] nation’s commodity system affect/influence eating and choices?*”), food choices (“*Do we want to include something that ties certain food choices to possible health outcomes (eg, diabetes, heart disease, etc.?)*”), and food preparation (“*I also strongly believe that basic cooking skills need to be taught by our schools*”) needed more emphasis in the FES.

During the Summit, content related to production/food systems and food choices were again among the most commonly occurring themes. Health (“*Build awareness of how food affects your physical/mental health*”), food access (“*this standard is missing the whole issue of access to foods and how that impacts behaviors (living in food desert, transportation, type of store available)*”), variety (“*Eat the Rainbow-assess colors and variety of foods in your diet*”), and environment (“*Would it be appropriate to include something here about climate change and its impact on food?*”) were also among the most commonly occurring topics that participants indicated should be addressed within FES.

During the first online expert panel review, positive comments and agreement with FES content were most commonly expressed with further wording changes suggested. Additional suggested content topics related to themes of social (“*Students understand social, emotional impact of food choices*”), media (“*I agree on the need to have the impact of pop culture and media somewhere in the standards. Advertising has such a huge impact on choices*”), and nutrients (“*Identify the importance of consuming a variety of foods and the impact missing major nutrients have on overall health*”).

Expert panel final round comments most often included agreement with the draft FES and competencies, along with suggested wording and structural changes. Only 2 content areas were among the most commonly occurring themes that still required attention, with health and guidelines (“*For this, add another competency or add to this one so that it captures nutrition guidance and nutrition programs (ie, MyPlate, Dietary Guidelines)*”) mentioned multiple times.

DISCUSSION

The main result of the Summit and related consensus-building activities is a set of holistic, PL-FES for implementation in K-12 classrooms. Draft FES were refined to a final set of 7 (Table 4), based on feedback from Summit participants, teacher review panels and online expert review, along with input from the Pilot Light Board. In addition, PL-FES and accompanying grade-cluster specific competencies can be aligned with existing K-12 curricula, such as Common Core, and moreover, represent a living document that can change over time with educational needs.

Results from the formative evaluation research process indicated that consensus-building activities shifted perceived food education priorities and coalesced around a holistic approach that encompasses concerns with health along with environment, culture, and society. For example, post-Summit, a top-ranked method for teaching food education was having students assess their local food environment and advocate for improvement. Additionally, participants highly ranked

Table 2. Changes in Rank for Priorities for Food Education from Pre- to Post-Summit Surveys (Values Presented are Overall Rank, with Mean Rank Weight in Parentheses, where Higher Values Represent Higher Rankings)

	Pre-Summit (N = 19)	Post-Summit (N = 20)		
	Rank (Mean Rank Weight)	Rank (Mean Rank Weight)	z	p value
Below is a list of possible aspects of a food education program. Please rank what you feel are the 3 most important aspects of a food education program . . .				
It does not take time from other academic instruction	7 (0.89)	7 (0.30)	-0.27	.26
It is inexpensive to provide	8 (0.89)	5 (1.25)	-1.13	.79
It is provided by a teacher with training in health education	6 (1.00)	8 (0.30)	-2.03	.04
It is provided by the classroom teacher	5 (1.21)	4 (1.50)	0.00	1.00
It is provided by classroom teacher with support from person or organization trained in health education	3rd (2.95)	3rd (2.50)	-0.34	.73
It is provided during regular school hours	2nd (3.26)	2nd (3.70)	0.73	.47
It is provided outside of regular school hours (for example: in an after-school program)	10 (0.16)	9 (0.26)	-0.45	.66
It should be provided as a dedicated unit of instruction (for example: a 6 week unit in gym class)	4 (1.47)	6 (0.95)	-0.43	.67
It should be provided regularly throughout the full school year	1st (4.21)	1st (4.45)	0.37	.71
Other	9 (0.42)	10 (0.00)	-1.41	.16
Below is a list of possible methods for teaching food education. Please rank what you feel are the 3 most important methods . . .				
Reading or watching media on food-related topics and using them as a basis for discussion, assignments or projects	8 (1.00)	7 (1.50)	0.85	.40
Creating a classroom lesson that incorporates a school garden	3rd (4.74)	5 (2.55)	-1.17	.24
Providing taste tests in the classroom (food is prepared outside of the classroom and brought in to be tasted)	5 (1.79)	4 (3.15)	0.82	.41
Providing cooking or food preparation demonstrations in the classroom	2nd (6.05)	1st (6.95)	-0.41	.68
Have students prepare food that is served in the school cafeteria	7 (1.05)	8 (1.15)	0.00	1.00
Taking a class field trip to a restaurant, food production/processing facility, or a farm	9 (0.79)	9 (0.70)	0.21	.83
Assign homework that involves cooking or preparing food at home (assume ingredients could be supplied to the student)	6 (1.16)	6 (1.70)	0.64	.53
Lessons centered around food and it's relation to other issues or topics (eg, the environment, history, culture, health, etc)	1st (6.63)	2nd (5.90)	-0.04	.97
Students assess the food environment where they live and advocate for some kind of improvement	4 (3.26)	3rd (3.75)	1.49	.14
Other	10 (0.37)	10 (0.35)	-1.00	.32
Below is a list of behaviors that you and/or your colleagues at this event identified as important outcomes of food education. Please rank what you feel are the 3 most important . . .				
Students choose to eat locally	13 (0.58)	13 (0.75)	1.07	.29
Students consider the environment when making their food choices	11 (1.58)	12 (1.30)	-0.85	.40
Students utilize food as a tool to explore cultural differences	12 (1.26)	9 (2.55)	1.53	.13
Students eat more fruits and vegetables	3rd (3.84)	7 (2.75)	0.12	.91
Students avoid sugary drinks	14 (0.32)	14 (0.40)	-1.00	.32
Students are active in food and health advocacy in their own community	9 (2.32)	6 (2.85)	0.72	.47
Students can make informed decisions about food	1st (6.11)	1st (6.45)	1.19	.23
Students can prepare a healthy meal	10 (1.63)	10 (2.45)	1.55	.12
Students have a conscious decision-making process around food	4 (3.74)	2nd (5.40)	-0.11	.92
Students are mindful of where their food comes from and how it gets to them (farm to fork)	5 (3.42)	11 (1.95)	0.21	.83
Students can find access to healthy food	7 (2.79)	8 (2.75)	-0.77	.44
Students appreciate the relationship between food and culture	6 (3.00)	5 (3.10)	1.12	.26
Students have a healthy relationship with food/do not use food for emotional needs	8 (2.53)	4 (3.15)	0.36	.72
Students are aware of the food environment they live in and know how to make healthy choices within it	2nd (4.21)	3rd (5.10)	-0.22	.82

Table 3. Frequency of Themes across 4 Time-Points of Comments on Topics still Needing to be Addressed in Pilot Light FES (Most Frequent Themes Bolded)

Themes	Pre-Summit Summit (N = 20)	Summit Consensus- Building (N = 26)	Expert Review #1 (N = 4)	Expert Review #2 (N = 6)
Culture	4 (8%)	34 (6%)		
Tradition		4 (.06%)		
Global	1 (2%)	4 (.06%)		2 (3%)
Local		21 (4%)		2 (3%)
Food access	2 (4%)	34 (6%)	1 (5%)	2 (3%)
Variety	2 (4%)	27 (5%)		
History	1 (2%)	8 (1%)		
Family	2 (4%)	17 (3%)	1 (5%)	3 (5%)
Production/system	3 (6%)	37 (6%)		1 (2%)
Food choices	3 (6%)	53 (9%)	1 (5%)	3 (5%)
Emotional		23 (4%)		2 (3%)
Policy	2 (4%)	15 (2%)		2 (3%)
Economic	1 (2%)	11 (2%)		1 (2%)
Social	1 (2%)	18 (3%)	2 (11%)	1 (2%)
Media		16 (3%)	2 (11%)	1 (2%)
Mindfulness	1 (2%)	5 (1%)	1 (5%)	
Health	2 (4%)	43 (8%)	1 (5%)	6 (9%)
Physical		11 (2%)		1 (2%)
Self-assessment		16 (3%)		
Agriculture	1 (2%)	24 (4%)	1 (5%)	1 (2%)
Seasonality		7 (1%)		
Sustainability	2 (4%)	11 (2%)		
Technology		5 (1%)		1 (2%)
Food preparation	3 (6%)	24 (4%)		
Nutrients		20 (3%)	2 (11%)	1 (2%)
Portions		5 (1%)		
Nutrition labels	1 (2%)	18 (3%)		2 (3%)
Guidelines		11 (2%)		4 (7%)
Critique information	1 (2%)	7 (1%)		1 (2%)
Advocacy	2 (4%)	14 (2%)		2 (3%)
Environment	3 (6%)	30 (5%)	1 (5%)	
Agree/positive	8 (16%)	—	3 (16%)	10 (17%)
Wording change	3 (6%)	—	2 (11%)	5 (9%)
Structural change		—	1 (5%)	4 (7%)

the need for students to utilize a conscious decision-making process around food to support dietary behaviors such as eating more fruits and vegetables, rather than prioritizing the behavior itself. These changes signify the importance of holistic standards that go beyond “just telling,” so children who learn about all aspects of food are empowered with the motivation and skills, and analytic capacity, to eat as well as they can within their specific context or community.

Qualitative data collected before, during, and after the Summit and coded themes further suggest that PL-FES refinement through the consensus-building activities was successful and led to inclusion of important themes focused on the local community, food access, and food production, as well as food choices and health. By the final review period, participants’ comments indicated agreement with draft

FES and suggested final wording and structural changes rather than a need to include additional content areas.

Building from the WSCC model^{11,12} and NHES framework,¹³ the PL-FES constitute a holistic, comprehensive set of standards that can be used across grade levels and diverse school settings. Similar to the NHES, but with a specific focus on food education, PL-FES are intended to be used as a guide for implementing curricula and developing lesson plans. Based on collaborative participation of community members, teachers and administrators, food industry professionals, public health officials, Pilot Light Board members, and academics, the resultant PL-FES encompass evidence-based recommendations for food and nutrition education plus novel approaches to food drawn from the food industry.

Limitations

Several limitations warrant mention. First, some expert participants were actively engaged in Pilot Light prior to the Summit and may have been predisposed to making recommendations consistent with Pilot Light existing model. While these participants represented a small portion of the full group (N = 3, 12% of sample), it is possible that their input and opinions could have biased others. Second, statistically significant changes in priorities for food education were not observed, suggesting the need to collect additional data related to priorities for food education, such as from teachers, students, and parents who are exposed to the PL-FES. Third, future efforts should seek to collect feasibility data for determining both barriers and facilitators to PL-FES implementation across different school settings.

Conclusions

In conclusion, our findings demonstrate that a formative evaluation framework that incorporates experts and community members can lead to changes in priorities as well as consensus on the necessary components for comprehensive FES. The PL-FES provide potential for creating holistic food education in schools that is easily accessible to teachers in divergent communities and that can be integrated across multiple school subjects and lessons. Moving forward, Pilot Light plans to utilize the PL-FES in professional development for teachers and, through collaborations between teachers and chefs, create an expanded food education lesson library. Furthermore, the Pilot Light team plans to use PL-FES as a metric for measuring program outcomes, while continuing with city, state, and national dissemination efforts. Finally, PL-FES remain a living document that will continue to be refined.

Table 4. Pilot Light Food Education Standards

Standard	Expectations for Students <i>Students who demonstrate understanding can:</i>
1	Food connects us to each other.
2	Foods have sources and origins.
3	Food and the environment are connected.
4	Food behaviors are influenced by external and internal factors.
5	Food impacts health.
6	We can make positive and informed food choices.
7	We can advocate for food choices and changes that impact ourselves, our communities, and our world.

For more information about Pilot Light and detailed description of each Food Education Standard with accompanying, grade-band specific competencies and connections with K-12 curricula, visit: <https://pilotlightchefs.org/>.

IMPLICATIONS FOR SCHOOL HEALTH

Provision of health instruction, especially in elementary schools, can prove challenging in this era of standardized testing and school accountability that is primarily based on test scores. In their current form, PL-FES can be applied to the health education component of the WSCC model separately or as integrated with curricula of multiple school subjects, including social and emotional learning, language arts, mathematics, social studies, science, and art. Besides more efficient use of instructional time, integration can provide the added benefit of generating renewed student enthusiasm and increased engagement with core academic subjects, potentially leading to impacts beyond the realm of food or health such as enhanced student attendance and attention. For example, a third-grade teacher using the PL-FES in Chicago noted: “Pilot Light has had a huge impact on my class’s attendance and it is the highest it’s ever been. Food gives them something hands-on to do in the classroom. I realized that as long as they’re making or doing something with food, they’ll come to school for it.”⁶

As outlined in this example, the PL-FES can be used to fulfill multiple academic standards in tested subjects, such as Common Core English/Language Arts and Math standards, as well as promote food education and social-emotional learning. In a lesson developed from PL-FES, students compare and contrast different whole grains used around the world and choose ingredients for making bread in order to learn how foods have sources and origins (standard 2) and how food connects us to each other (standard 1). Thus, simultaneously, they learn about biological processes (science) related to yeast and different types of measurement and conversion systems (mathematics). This learning is achieved in collaborative groups that require student use of appropriate interpersonal, emotional, and social skills. Individually, students can

be asked to write lab reports (language arts) and/or express what they learned through drawings and/or other mediums (art).

As evidenced by the thematic analyses, PL-FES have obvious implications for multiple additional WSCC components besides health education. For example, family engagement can be encouraged by discussing connections to traditions and cultural foods (standard 1), and the social and emotional climate by addressing external and internal factors that influence food behaviors (standard 4). Food and nutrition services can be structured so as to better make the healthy food choice the easy choice (standard 5), as well as by supporting classroom lessons involving meal and recipe development and ingredient selection (standard 6). Students can also become engaged with advocating for healthy, culturally appropriate food options in all school and community venues, including concessions, vending machines, and before- and after-school programs, as well as those offered through fund-raising efforts (standard 7).

PL-FES may further help districts and schools in meeting the USDA local school wellness policy mandate. Using the PL-FES as a model can help schools overcome barriers noted in recent research to creating wellness policies with specific, strong language that can be effectively implemented in their setting.^{28,29} Most directly, PL-FES can facilitate development of specific required wellness policy goals for nutrition promotion and education and, through promotion of increased knowledge and skills related food and nutrition, involve students in the creation, implementation, and review of the local wellness policy. To do this, schools can use the PL-FES, accompanying grade level specific competencies, and example lesson library⁶ as a starting point in creating their own local wellness policies at the district or school level. PL-FES can also help schools connect their local wellness policy with the broader community through student-produced

advocacy efforts that regularly report progress toward policy implementation. For example, through Pilot Light food advocacy projects students in Chicago have connected with their community by organizing a food drive for a local food pantry, writing letters to local politicians to advocate for food-related policies in underserved communities, and mapping community resources related to food access.⁶

Finally, application of Pilot Light's inherent, consistent community-based approach during development magnifies the potential of PL-FES for generating both positive health and educational student outcomes. Schools and teachers can collaborate with community partners to utilize PL-FES and accompanying competencies for producing learning experiences that fit within the topics and foods most relevant to their curriculum and community.⁶ For instance, through collaborations with local chefs and food industry professionals in the Pilot Light Institute for Food Education, teachers across the diverse communities and schools of Chicago apply the PL-FES to create lessons that are appropriate and specific to their context. For example, standard 2 (foods have sources and origins) can be used in conjunction with a school or community garden to document crop seasonality. A school with differing demographics and access to resources might use this same standard to develop a lesson about various types of flours and breads produced by culturally-focused bakeries to explore similarities and differences in cultures that settled in the Chicago area after the Great Chicago Fire. Ultimately, PL-FES accentuate the contributions of multiple WSCC components to promoting the roles of food and healthy eating in student health, well-being, and academic success.

Human Subjects Approval Statement

This research was approved by the university Institutional Review Board at the University of Illinois, Urbana-Champaign (IRB #19081) for secondary data analyses performed on data collected as part of the Pilot Light Food Education Summit.

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