# Are You What You Eat? Improving Food Literacy in School-Age Children

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I have no known conflict of interest to disclose.

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**Abstract**

Current school nutrition classes for middle school students do not improve food literacy (FL) or affect long-term dietary behaviors. This deficient education is contributing to the nationwide childhood obesity epidemic, with 20% of children considered overweight or obese. An evidence-based quality improvement project aims to implement an experiential nutrition curriculum, Choose Health: Food, Fun, and Fitness (CHFFF), with didactics, activities, culinary skills, school gardens, and farm field trips. CHFFF has significant potential to increase FL levels and positively influence food choices, reducing childhood obesity rates and improving overall health outcomes. Because it is based on social learning and environmental influences, the Social Cognitive Theory was used to guide the project. The course was taught for 90 minutes once a week for nine weeks to a class of 20 6$^{th}$-grade students at a low-income middle school in southern Arizona. IRB exempt status was obtained. The 15 question, Likert-scale EFNEP Youth Questionnaire was administered to the students, collecting data about dietary behaviors before and after the intervention. Descriptive statistics, paired t-test, and Wilcoxon signed rank test will be used for data analysis. Results indicated a statistically significant change in food safety ($p=.029$) but not dietary behaviors ($p=.980$) following the intervention. Research supports using an experiential nutrition curriculum; however, the intervention had major limitations. Further research to develop standardized nutrition education and data collection tools focusing on FL is warranted.

*Keywords:* food literacy, health literacy, middle school students, experiential curriculum, nutrition

# Are You What You Eat? Improving Food Literacy in School-Age Children

Health literacy (HL) encompasses a range of knowledge and abilities that guide health-related decision-making. Recently, this phenomenon has become a popular point of interest as a strategy to improve overall health and eliminate health disparities. A narrower focus on food literacy (FL) can improve youth's short- and long-term health outcomes by influencing their nutritional knowledge, dietary habits, and relationship with food. A school-based FL curriculum can reach all children at their most impressionable stages, regardless of socioeconomic status. Improving FL among children empowers them to make informed food-related decisions that can affect their lifelong health outcomes.

## Problem Statement

HL is defined as the ability to find, understand, and use information and services to inform health-related decisions and actions for themselves and others (HSS, 2021). A subsect of HL is FL, which is the knowledge, skills, and behaviors required to navigate a food system and make informed decisions about food and its impact on one's health (Amin et al., 2018; Silva et al., 2023). Food illiteracy has profound health implications, including the increased risk of obesity, cardiovascular disease, and diabetes mellitus, and contributes to health disparities, especially among minority populations (Silva et al., 2023). Since 1990, childhood obesity has quadrupled, with 20% of children aged 5-19 being overweight or obese (WHO, 2024). With obesity contributing to an estimated five million deaths annually, it is imperative to recognize HL and FL in childhood as a strategy to improve lifelong dietary behaviors and health outcomes.

## Purpose and Rationale

Children from low socioeconomic backgrounds are at an increased risk for health disparities, including low HL and FL. Schools are ideal for combatting this inequity as they

provide all children with equal learning opportunities. Internal data shows that change is needed in the current nutrition pedagogy. Implementing surveys regarding the students' dietary and food-related habits before and after they receive a new, evidence-based nutrition curriculum will allow for program evaluation. The goal is to increase FL by increasing whole food consumption and limiting processed food and sugar. Improving FL in school-aged children will aid in reducing health disparities and preventable diseases, bettering overall outcomes for the students and society.

## Background and Significance

While HL, including FL, in children and adolescents remains under-researched and measured, the link between health education and literacy with academic success is well noted. The school system is an ideal pathway to improve FL by integrating food-related knowledge, skills, and behaviors throughout K-12 education (Amin et al., 2018; Auld et al., 2020; Bailey et al., 2019). Youth consume one-third to one-half of their daily food intake at school, making this environment a major contributor to their food decision-making and attitudes (Bailey et al., 2019). However, standard nutrition education insufficiently supports changes in dietary behaviors (Amin et al., 2018; Bailey et al., 2019). Limited nutritional education in schools misses an opportune time of impressionability when foundational habits are formed.

HL has recently become a focus of public health organizations. The Centers for Disease Control and Prevention (CDC) published evidence-based characteristics of effective school-based health education programs, including ones focusing on FL. Most research on school-based education programs recommends using the CDC's framework of Whole School, Whole Community, Whole Child (WSCC) (Allen et al., 2020; Auld et al., 2020; Nash et al., 2021). This model uses a student-centered collaborative approach, acknowledging the connections between

health and academic success (CDC, 2023). The National Consensus for School Health Education (NCSHE) published the National Health Education Standards to update school health education. While there is no direct mention of FL within the eight standards, there is a focus on increasing HL, decision-making skills, and functional health knowledge to enhance students' health (NCSHE, 2022). There is a lack of translation from these plans into standardized, replicable curricula and measurement tools to be integrated into schools to achieve the set goals.

After reviewing the recent literature concerning school-based FL programs, it is evident that a multi-component, hands-on design is necessary for long-term success. Involvement from faculty, students, parents, and the community helps tailor it to local needs and ensures sustained engagement (Nash et al., 2021). A school-based FL curriculum focusing on food knowledge, cooking skills and preparation, and dietary behaviors with cross-curricular links to other HL areas can positively influence lifelong behaviors and well-being. Current research focuses on a collaborative, experiential approach to improving FL.

**Middle-school Students**

For this paper, middle-school students refer to 5$^{th}$ through 8$^{th}$ grade pupils between 10 and 14 years of age. More specifically, a focus will be on students who qualify for the School Lunch Program, meaning their family has an income at or below 130 percent of the federal poverty level (USDA, 2018). Students who participated in the project, qualified for this program. A low socioeconomic background places these students at an increased likelihood of having limited HL and FL and incurring other related health disparities, such as childhood obesity (Fleary & Joseph, 2018; Silva et al., 2023). Starting early in the school system and becoming health and food literate sets the course for lifelong health-promoting habits.

**Farm-to-School Programs**

Mishra et al. (2022) found that farm-to-school programs (FTSP) effectively solve health and food justice issues in low-income, urban communities. FTSP includes purchasing produce from local growers, school gardens, field trips to local farms, and associated nutrition-related education and skills. Measured benefits range from increased consumption of fruits and vegetables among students to aiding local communities economically and socially (Mishra et al., 2022). FTSP and school gardens help to bridge the gap between policy recommendations for children's diets and what is offered and consumed at school (Amin et al., 2018). While these programs increase the intake of fruits, vegetables, and whole grains during school, longitudinal studies are lacking or inconclusive for long-term behavioral changes (Bailey et al., 2019; Kelly & Nash, 2021). Increasing FL through FTSP is a form of primary prevention against preventable diseases and addresses socioeconomic disparities in low-income, urban areas (Mishra et al., 2022). Research supports using FTSP to mitigate childhood obesity and increase FL by positively affecting students' attitudes toward healthy and local foods.

**Experiential FL Education**

FL-focused education includes food knowledge, cooking skills, food preparation and safety, supply chain, food culture, and dietary behaviors (Amin et al., 2018; Bailey et al., 2019; Kelly & Nash, 2021). Using hands-on approaches, allowing the children to grow, prepare, and taste the food increases engagement and confidence within the food environment (Bailey et al., 2019; Johnston et al., 2018). The Food Doctors is an experiential, in-class FL education program for school-aged children, who qualify for the School Lunch Program that engages the WSCC and hands-on approach (Johnston et al., 2018). The students received culturally appropriate FL didactics and participated in food preparation and tastings. Results showed a significant increase in the students' FL and nutritional knowledge (Johnston et al., 2018). The Youth Chef Academy,

an interactive FL and culinary program for school-aged children, increased nutritional knowledge and fruit and vegetable consumption (Harley et al., 2018). The school environment is the ideal setting for teaching and practicing FL knowledge, skills, and behaviors to positively influence dietary behaviors in and out of the classroom (Amin et al., 2018; Bailey et al., 2019; Johnston et al., 2018; Kelly & Nash, 2021).

**Traditional Nutrition Classes**

Current nutrition classes do not address FL and the multidimensional complexities surrounding food and dietary relationships. Decades of research have shown that nutrition classes are unsuccessful in creating a positive change in food choices and lifelong behaviors (Amin et al., 2018; Bailey et al., 2019). This is evidenced by the increasing prevalence of childhood obesity and metabolic diseases (WHO, 2024). Traditional pedagogy focuses on nutritional content and calories, which lacks real-world applicability (Kelly & Nash, 2021). This type of curriculum has the potential to cause unintended harm in the form of eating disorders and fad dieting. Without first ensuring students can translate and apply the knowledge and have the necessary food-related skills, traditional nutrition classes are lacking.

**Increase Food Literacy**

After appropriate school-based interventions, the desired outcome would be an increase in the FL levels of middle-school students at a low-income school. These interventions would help to establish healthy behaviors in childhood, which is more cost-effective and successful than changing behaviors in adulthood (Auld et al., 2020; Nash et al., 2021). HL provides the tools to translate health knowledge into behavior, promoting better decision-making and academic performance. By using an enhanced, experiential approach to improving FL, school-aged children are empowered to make healthy choices that can prevent childhood obesity and other

long-term chronic diseases. Evidence supports interactive learning with a multidimensional approach, including school gardens, cooking skills, food preparation, and cross-curricula didactics versus traditional nutrition classes.

## Internal Data

A community-based non-profit organization in Southern Arizona identified a middle school nutrition education gap at a low-income school. The organization manages a bicycling program for 80 minority middle-school students, focusing on movement, nutritious foods, time outside, and connecting with others. All students in grades 5$^{th}$ through 8$^{th}$ participate. The program director voiced concern about the transferability of the skills learned into health knowledge that can impact their decision-making for life. The school's nutrition teacher noted that the current nutrition pedagogy was not tailored toward the school's population of minority, low-income students. Foundational vocabulary and knowledge were needed. An experiential FL curriculum was used to address this. It was anticipated that increasing FL would allow middle school students to better understand the nutrition education taught and empower them to continue making health-promoting choices beyond the program completion.

## PICOT Question

A literature review led to the clinically relevant PICOT question: "In middle-school students, how does an experiential nutrition curriculum compared to current nutrition classes affect food literacy?" and led to the following exhaustive search.

## Search Strategy

An extensive review of current evidence took place to answer the PICOT question. It was discovered that HL at large in school-aged children is an under-researched topic, especially within the United States (US). The concentration of FL within HL in this population yielded

higher-quality studies. Three databases were thoroughly searched – PubMed, Cumulated Index to Nursing and Allied Health Literature (CINAHL), and Educational Resources Information Center (ERIC). These databases were selected for their relevance to HL, FL, school, and health education. They are known for their quality, providing primary research and data in medicine and education. Grey literature of government publications from the CDC, NCSHE, and the US Department of Health and Human Services were also reviewed.

**Keyword Selection**

The initial search strategy included the keywords: *middle school (students), adolescents, youth, school-based program, health education, health class, physical education (PE), health literacy, health knowledge,* and *health understanding*. The Boolean connecter "or" was used for terms related to the population, intervention, and outcome in the PICOT question. Despite high yield values, a limited number of valuable results met the inclusion criteria and related to the PICOT question. Therefore, a narrower focus of study, FL, was conducted. A secondary search used the keywords: *food literacy, nutrition literacy, nutrition class*, and *food science* as the intervention and outcome. The population keywords: *middle school (students), adolescents,* and *youth* remained.

**Initial and Final Search Yields**

The search for *middle school OR adolescent OR youth AND "health literacy" OR health education* yielded over 28,000 results on PubMed, 8,000 on CINAHL, and 20,000 on ERIC. By applying limits to publication dates from 2018 to 2024 and using the English language, the final yields were halved for each database. Due to the heterogeneity of interventions and outcome tools and the lack of inclusion criteria, a revision to the PICOT question was made, leading to the following search.

A database search of *middle school OR adolescent OR youth AND food literacy OR nutrition literacy* yielded 1,000 results for PubMed, 88 for CINAHL, and 180 for ERIC. With the limitations of publication date from 2018-2024, English language, and primary research applied, a search produced 47 results on PubMed, 63 on CINAHL, and 48 on ERIC. Approximately one-third of the research articles on each database were conducted and published within the US.

The title and abstract of the final yields from the three databases were reviewed, and inclusion criteria were considered. 29 articles were selected for further evaluation and rapid critical appraisal, and 10 were chosen for this literature review. This included four quasi-experimental studies, four qualitative studies, and two systemic reviews.

### Limitations, Inclusion, and Exclusion Criteria

The search limitations were articles published from 2018 to 2024 and in English. The inclusion criteria comprised youth, elementary or middle school students, nutrition education, FL, nutrition literacy, HL, school-based interventions, and after-school programs. FL and nutrition literacy were used synonymously for this paper. Studies from the US and other countries were included. Of the final 10 articles, one was conducted in Turkey, one in Australia, and eight in the US. Only primary research studies from peer-reviewed journals were included, focusing more on populations from low socioeconomic backgrounds. Given the nature of a school-based topic and population, most studies were evidence level four or lower. Studies concentrated on children with a chronic disease or disease management were excluded. Exclusion criteria also omitted studies on mental health, media, or digital literacy. Inclusion and exclusion criteria were the same for all databases.

## Critical Appraisal and Synthesis of Evidence

A rapid critical appraisal tool was used to determine the quality of the included studies and their evidence levels (Melynk & Fineout-Overholt, 2019). The quantitative studies used quasi-experimental designs with pre-and post-surveys, lowering the level of evidence compared to other research designs. Overall, qualitative studies are considered a lower level of evidence; however, they offered insight into middle school students' perspectives on nutrition education and dietary choices, which can guide curriculum and approach. Information gleaned from quantitative studies (see Appendix A, Table A1) and qualitative studies (see Appendix A, Table A2) was used to support the practice of experiential nutrition curricula to improve FL among middle school students. The evidence from the 10 studies was synthesized (see Appendix A, Table A3).

The project subjects were all school-aged children, with a mean age of 10 years. Most were from low-income socioeconomic backgrounds and identified as a race other than white. The interventions took place in school during regular school hours, except for one outlier, which used a community center outside of school hours. The interventions and outcomes measured varied significantly between studies, highlighting the need for standardized youth HL and FL education and tools. The interventions most often used included experiential curriculum with culinary skills, FTSP, and nutrition didactics. The outcomes were measured using adapted tools or ones uniquely designed by the researchers, focusing on FL levels, nutrition and food knowledge, and dietary behaviors.

## Discussion

Research suggests that experiential nutrition curricula successfully increase FL, knowledge and behaviors among middle school students. Pedagogy includes nutrition foundations, HL and FL didactics, interactive food and meal preparation activities, school

gardens, and farm visits. Compared to traditional nutrition classes, this advanced education can potentially to increase FL levels and positively influence long-term dietary decisions. Improving youth's HL and FL is a critical first step in improving their overall health outcomes and encouraging health-promoting behaviors. With the rise in childhood obesity rates, children must receive the foundational food knowledge they need to mitigate this crisis. Using the information gathered from the 10 included studies, it is feasible to implement advanced experiential nutrition curricula in middle school classrooms to support FL levels, lifelong dietary behaviors, and health outcomes.

## Theoretical Framework Application

Understanding why individuals make health-related decisions for themselves, their families, their peers, and their communities is vital when designing a health program or education curriculum (Bensley & Brookins-Fisher, 2019). The Social Cognitive Theory (SCT) has been widely applied to human behavior and is appropriate for the evidence related to FL in school-aged children (Bandura, 1986). The theory describes a reciprocal phenomenon in which personal factors, environmental influences, and supportive behaviors affect learning and decision-making. Recognizing that learning occurs in a social context, it is known that individuals acquire new behaviors by observing others and through their own experiences. Middle school is a time of great impressibility and conformity, so the SCT is relevant to this population.

The personal cognitive construct includes self-efficacy, outcome expectations, and self-evaluation. Self-efficacy is a person's confidence in performing a specific behavior (Bandura, 1986). It is affected by their past experiences, capabilities, and knowledge. For youth, learning food skills and nutritional knowledge can increase their self-efficacy in making positive dietary

decisions (Adhikari et al., 2018). Environmental influences include students' families, homes, neighborhoods, schools, peers, and food accessibility. The Whole School, Whole Community, Whole Child (WSCC) framework acknowledges these interactions and strives to support and guide students within these realms (ASCD, 2024). Farm-to-school programs and experiential curriculum demonstrate the SCT and WSCC framework by partnering the school with the community, allowing for observational learning and mutual influence. Behaviors are represented in the research by food choices, engagement in food preparation, and culinary skills and are reflected by childhood obesity rates and other anthropomorphic measurements.

All the studies relevant to FL in school-aged children, whether explicitly stated or not, used the SCT and its constructs to change FL levels and food-related decisions. Students are most likely to change their dietary behaviors by having the necessary knowledge and skills (Bensley & Brookins-Fisher, 2019). The student is influenced by and influences their community and whom they interact with. Therefore, targeting HL and FL levels of youth can have positive transferable health impacts on their families and communities.

## Implementation Framework

The implementation of this project was guided by the Knowledge to Action (K2A) framework. This framework describes moving from discovery into action by translating evidence into a program or practice (Graham et al., 2006). The adaptable components of research, translation, and institutionalization make it applicable to multiple settings and interventions. It is designed to be nonlinear, allowing for multiple steps to occur simultaneously and to be revisited and revised as needed throughout the process (CDC, 2014). The K2A framework aligns with a doctoral-level project timeline, formulating an evidence-based solution from research and includes interventions specific to each situation.

Before starting the project and using the framework, a problem was identified. The next step involves knowledge creation, an inquiry into and synthesis of all existing research and strategies (CDC, 2014). This step mirrors the literature review conducted for this project and the critical appraisal of 10 selected studies. The information was then translated to fit the target audience's specific needs, addressing any barriers that were met. The evidence-based intervention was implemented, monitored, and evaluated. A valid pre- and post-survey and student, faculty, and community feedback were used to guide evaluation. The goal is institutionalization, which maintains the change as an established organizational activity (CDC, 2014). This project spanned the 2024-2025 school year with long-term plans to integrate the curriculum into future 6th-grade classes, achieving the institutionalization goal. This framework reflects implementing a research-supported nutrition curriculum in a middle school, monitoring the knowledge exchange, evaluating outcomes, and revising as needed.

## Setting and Stakeholders

The project was implemented at a private, tuition-free middle school, educating 4th to 8th-grade students from low-income, under-resourced families. The students all qualify for the National School Lunch Program, meaning their family has an income at or below 130% of the federal poverty level (USDA, 2018). The school is in an urban setting in Southern Arizona. They offer small class sizes, with a ratio of one teacher to 10 students, ensuring the students receive individual attention and guidance. They have an extended school day of 10 hours and are in session 11 months out of the year, providing a safe space and meals for students who are at risk for social disparities. While the school is associated with the Episcopalian faith, students from all beliefs, cultures, races, and backgrounds attend.

The middle school adheres to the WSCC framework, focusing on a comprehensive curriculum to aid in breaking the cycle of poverty. The culture is one of kindness and respect, with input from the students, families, faculty, and community all appreciated. They pride themselves on offering enrichment activities, such as a cycling program, art classes, a school garden, and comprehensive sexual education. The lunches and snacks are prepared by a local market with fresh ingredients daily, and the students plant, grow, and harvest fruits, vegetables, and herbs in the garden. The school strives to build confidence in the students and prepare them for high school and beyond as independent learners and doers. Currently, a complete nutrition curriculum is lacking to accompany and enrich the school garden and fresh meals experience and best equip them for the future.

The middle school's nutrition and life skills teacher taught the evidence-based nutrition curriculum. He holds a degree in education and has been employed at the school for several years, ensuring confidence. Having someone the students have rapport with implementing the intervention was paramount to the success of this project.

In addition to the nutrition teacher, the facilitator of the cycling program at the school assisted with the nutrition curriculum and ensured the students were physically active. The youth cycling program is part of a larger local, community-based non-profit that focuses on being active and understanding one's nutritional needs to improve overall health. The nutritional goals of the organization are to increase whole food consumption and limit processed, high-sugar foods in youth. These goals aided in guiding the literature review and focus of this project. Pairing an experiential nutrition curriculum with the cycling program for school-aged children follows the WSCC and SCT frameworks (see Appendix B). It allows for a reciprocal culture,

recognizing personal, environmental, and supportive factors' impact on learning and decision-making (Bandura, 1986).

## Participant Recruitment

The study participants were 6th-grade students at a private, low-income middle school in Southern Arizona. These students are 100% non-white and from various cultures and beliefs, primarily Latino and African descent. The entire 6th grade class of 20 students received the experiential nutrition curriculum intervention. The project curriculum was integrated into their school day and was mandatory for all students per the school's guidelines. All 6th-grade students also participated in the cycling program. Therefore, no active recruitment took place for the intervention portion. The students had the option to participate in a pre-and post-survey and data analysis. A brief introduction to the project and an explanation of the surveys and data process was delivered orally to the students during school. Assent from the students who chose to participate was obtained via a form. A consent form was sent home with the students to inform their legal guardians and was obtained before the start of the curriculum.

The inclusion criteria were 6th-grade students enrolled at the middle school where the project was implemented, qualified for the National School Lunch Program, participated in the cycling program, and were proficient in English, as determined by the school's standards. Exclusion criteria included 4th, 5th, 7th, and 8th-grade students at the middle school, because they did not receive the intervention curriculum. Those who were not proficient in English, did not participate in the cycling program, and missed more than two classes of the nine-week curriculum were excluded from the data collection. For data to be analyzed, the students must complete the pre and post-survey in the correct timeframe.

## Project Description

After implementing an evidence-based, experiential nutrition curriculum, is there an increase in whole food consumption and a decrease in intake of processed and high-sugar foods among school-aged children? Evidence supports using of an experiential curriculum to increase FL and improve dietary habits among middle school students. This can potentially to improve overall health outcomes, life-long food patterns, and childhood obesity rates. Partnering with a local non-profit organization that prioritizes nutrition and a low-income middle school needing dietary change, an evidence-based curriculum was implemented, monitored, and evaluated following the K2A framework.

A nine-week nutrition curriculum for 6th-grade students was integrated into their fall semester classes. This included nine 90-minute classes and two hours a week of a cycling program, during which key lessons learned in the classroom were reiterated and reinforced. The cycling program was facilitated in full by the non-profit organization. Using the K2A framework, input from stakeholders, including students, faculty, and community members, was obtained throughout the proposal process to ensure the project is culturally sensitive and adapted to the local context. Barriers were assessed, and reasonable solutions were discussed and implemented.

A hands-on, evidence-based curriculum, Choose Health: Food, Fun, and Fitness (CHFFF), was the foundation of the intervention (see Appendix C, Figure C1). The curriculum consists of six lessons intended for 3rd to 8th-grade students targeting behaviors that reduce unhealthy weight gain and chronic diseases (Cornell University, 2020). It was developed by Cornell University's Division of Nutritional Sciences and Cornell Cooperative Extension's 4-H Youth Development Program with significant guidance from community members and youth participants. The program was designed for families and youth from low socioeconomic statuses,

making it appropriate for this project's population. The lesson plans and all materials needed are available online, printed in color, and arranged in a binder for each student. Using experiential learning, lessons focused on teaching healthy eating, active play, and nutritional knowledge.

CHFFF supports the Dietary Guidelines for Americans as prescribed by the USDA and the US Department of Health and Human Services (Cornell University, 2020). It meets the National Health Education Standards (see Appendix C, Table C1). Research shows that CHFFF promotes positive behavior change, significantly improving whole food consumption, sweetened drinks, reading nutrition labels, and other food-related behaviors (Cornell University, 2020). Each lesson included interactive nutrition activities, food preparation, active games, a goal-setting challenge, and a family newsletter. This curriculum aligns with the SCT by addressing personal, environmental, and supportive factors. Permission to use CHFFF is granted for education purposes (see Appendix C, Figure C2).

The additional three weeks in the curriculum focused on instilling foundational nutritional knowledge and how one's food choices affect health. A school garden already existed with hands-on activities for the 6$^{th}$-grade students, including planning, planting, growing, and harvesting fruits and vegetables. Barriers include limited space within the urban setting and Southern Arizona's hot, dry climate. Food safety, preparation, and culinary skills were included as opportunities to perform and practice during class time. One week consisted of a school trip to a local urban farm to learn about the production of vegetables using responsible growing practices while participating in snack preparation and other team-building and leadership exercises.

While doing physical activity with the cycling program, the importance of nutrition and the knowledge learned in the classroom was reiterated and transferred to a real-life scenario. This

allowed the students to apply what they had learned and know how to fuel their bodies best. All liability with the cycling program lies with the non-profit organization and the school. The curriculum was adapted to fit the student's unique cultural and socioeconomic needs. A Spanish version of CHFFF is available, and coursework translation was necessary to ensure that each student was given an equal learning opportunity. Research supports this multi-faceted, experiential pedagogy to increase FL and food-related decision-making in youth.

This project aimed to increase FL, as shown by increases in whole food consumption, such as fruits, vegetables, and whole grains, and decreases in processed foods and sweetened drinks. Food safety and nutritional knowledge were also evaluated. Participants were given the $6^{th}$ – $12^{th}$ Grade EFNEP Youth Questionnaire before the intervention and one week after the curriculum was completed (see Appendix D, Figure D1). The pen and paper survey was completed in the classroom with the teacher and project facilitator as guides. The survey allowed data analysis to evaluate whether the CHFFF curriculum positively changed dietary behaviors among school-aged children.

The timeline for the project was as follows. The curriculum was developed and finalized, following the SCT and WSCC framework, in July 2024. Input from stakeholders was used. Arizona State University (ASU) Institutional Review Board (IRB) approval was applied for and obtained by August 12, 2024. Assent forms from the participants and parental consent forms were distributed and collected the last week of September before the CHFFF curriculum and nutrition course began. The intervention was implemented from September 2024 to November 2024, with a pre-survey obtained before and a post-survey obtained one week after. The cycling program mirrored the intervention timeframe in the fall semester. Statistical evaluation and dissemination took place from February 2025 to March 2025.

## Data Collection

Data was collected from the participants to evaluate changes made to food-related decision-making and other relevant topics. Qualitative data was obtained using open-ended questions (see Appendix D, Figure D2). This data will aid in future curriculum implementation and provide evidence of any statistical changes related to dietary behaviors. The survey was distributed before the start of the curriculum and one week after the completion of the nine-week course. Parental permission and student assent were obtained for the data collection portion of this project.

### Instrument

The EFNEP $6^{th}$ – $12^{th}$ Grade Youth Questionnaire was used (see Appendix D, Figure D1). Face validity for the survey was guaranteed via cognitive interviews with a convivence sample (Gratopp & Bastian, 2023). Internal reliability was assessed using an exploratory factor analysis interpreted using inter-item correlations and Cronbach's correlation coefficient. Results showed a Cronbach's $\alpha$ of 0.68 (Gratopp & Bastian, 2023). Criterion validity was assessed using Spearman rank correlations and Bland-Altman plots. The survey had a robust correlation at $p = 0.55$, and the Bland-Altman plots showed acceptable agreement (Gratopp & Bastian, 2023). There is always the limitation of overreporting or underreporting when administering self-reported questionnaires.

The survey contains 15 Likert scale questions and takes approximately 15 minutes to complete. Demographic information, such as the participant's age, gender, and ethnicity, will be collected on the survey. The qualitative survey questions were developed by the school's nutrition teacher and cycling program facilitator and were used as supportive data. The

information was voluntary and did not impact participation in the survey. The participants were given a subject ID to ensure the responses were kept anonymous.

### Outcome Measurement

This evidence-based practice project sought to determine whether an experiential nutrition curriculum changes participants' FL-related behavior. The questionnaire asked about consuming certain food items, such as vegetables, fruits, sugary drinks, and whole grains. It also contained questions about food-related decision-making and safety measures and three about physical activity. The qualitative data sought to understand how the students were applying the information reviewed in the FL curriculum to their lives outside school. Bandura's SCT supports this survey in evaluating environmental, personal, and behavioral factors. Knowing how each of these realms is affected by the interventional curriculum provided a robust evaluation of the project.

### Data Analysis Plan

The data collected was transferred to Intellectus Statistics, an online statistical evaluation software, for analysis. The surveys containing the subject ID were translated into numerical codes (100, 101, 102…) to ensure further participant anonymity and privacy protection. The data was analyzed using the paired t-test, Wilcoxon signed rank test and other statistical tools as appropriate. Descriptive statistics was used for the demographic information. The parental permission forms, assent forms, and collected surveys will be stored in a locked file cabinet. The project lead has the password for entry. The information will be shredded three years after the project's closure.

## Ethical Considerations

Implementing a project involving a vulnerable population, including minors and those from low socioeconomic backgrounds, required a framework of ethical considerations. Fundamental principles guiding this project included autonomy, fidelity, beneficence, and nonmaleficence.

The participants, 6th-grade students, were required to take a nutrition course, which is the intervention of this project. Autonomy is the right to decide about one's health, life, body, and participation (Melnyk & Fineout-Overholt, 2019). While the course was mandatory, the students could choose to participate in pre- and post-surveys and choose whether to follow any recommendations. Parental permission was obtained from the student's legal guardians via a consent form sent home with the student. Assent was obtained from the students. The forms were written in the participants' preferred language and in a manner that is easily understood. Melnyk and Fineout-Overholt (2019) note that informed consent involves an open and ongoing dialogue about the study and its purpose. In doing this, fidelity, or trust and honesty, between all parties will be upheld, which is crucial in the context of vulnerable populations.

To ensure human rights protection, beneficence, and nonmaleficence were upheld. Beneficence is doing good for the subject (Melnyk & Fineout-Overholt, 2019). The evidence-based nutrition curriculum can potentially decrease the risk of childhood obesity and lifelong health complications. Nonmaleficence, the importance of not harming subjects, was upheld by ensuring the information was culturally sensitive and science-based (Melnyk & Fineout-Overholt, 2019). The IRB at ASU reviewed the project's methodology to ensure ethical principles are being upheld and that the human rights of the participants, both the student and their guardians, are protected and respected.

## Sustainability

The driving force behind this evidence-based practice project was the site champion, who serves as the executive director of a non-profit community-based organization. This individual oversees a youth cycling program at the middle school project site. The program is funded through external grants and her own volunteer time. It is implemented at low-income schools at no additional cost to the school or the non-profit organization. The organization focuses on positive body movement, connecting with others, and nutrition.

The project's intervention involved a nutrition curriculum executed by a certified teacher at the school. The curriculum, CHFFF, was developed by Cornell University (2020) and is available for free for youth education. The site champion reiterated key food literacy points during the cycling program, focusing on nutrition needs to best fuel one's body during physical activity and throughout the day. The nutrition teacher and site champion, both critical stakeholders for this project, worked together to ensure evidence-based information reached the students and was culturally and age-appropriate.

To confirm sustainability, this project's budget was considered (see Appendix E). The direct and indirect costs, funding, and healthcare savings for reducing the incidence of childhood obesity, cardiovascular disease, and metabolic problems were measured. Ling et al. (2023) estimate that a 10-year-old child with obesity incurs healthcare costs up to $19,340 more in their lifetime compared to a child with a healthy weight. This potential saving made the project feasible and financially appropriate for implementation and sustainment.

After this project, the school and cycling program will have access to the nutrition curriculum, evidence of dietary changes, and student feedback concerning the program. The middle school will have all the materials to implement this curriculum with future 6$^{th}$-grade students. The curriculum can function with or without the cycling program adjunct. The site

champion will use the evidence gathered at this school to inform a nutrition curriculum for other low-income middle schools participating in the cycling program. The curriculum and measurement tools developed and evaluated for this project are available for other middle schools to improve food literacy among their students.

Long-term sustainability plans were a key focus of this project. They include the continued use of the evidence-based nutrition curriculum at other middle schools participating in the cycling program. The curriculum was designed to be taught by a certified educator and does not require additional, specific training. The site champion can continue to guide the curriculum and oversee the process in classrooms and on the bicycle. This project was committed to making science-driven, evidence-based nutrition education available for all middle schools that partner with the youth cycling program.

## Results

Intellectus Statistics software was used to store, manage, and analyze the data. A total of 20 participants were recruited and 19 (n=19) completed both the pre and post-survey. The average age of the sample was 11 years (SD=0.65). Ages ranged from 10 to 12 years and 11 of the participants were male (55%), with the remaining nine being female (45%). The majority identified as Hispanic/Latino (13, 65%), and the remainder identified as Black/African American (7, 35%) (see Table 1). The students were introduced to food literacy and a foundation was set to be built upon in future classes, at home, and in the community.

**Table 1**

*Frequency Table for Demographics*

| Variable | *n* | *%* |
|---|---|---|
| Gender | | |
| Male | 10 | 52.63 |
| Female | 9 | 47.37 |
| Ethnicity | | |
| Hispanic/Latino | 13 | 68.42 |

| | | |
|---|---|---|
| Black/African American | 6 | 31.58 |

**Quantitative Data**

Statistical analysis was conducted on dietary behaviors, which included diet quality, physical activity, food safety, and food resource management. Overall, no significant change was seen in dietary behaviors between the pre and post survey means of 51.63 and 51.68 (see Table 2). Slight negative changes were reported with participants consuming fewer whole foods, such as fruits, vegetables, and whole grains, and participating in fewer physical activities after the intervention. However, none of these results were statistically significant with a reported extremely small effect size (Cohen's d = 0.01), which means it is likely not practically significant either.

There was a statistically significant increase in food safety behaviors with pre and post-survey medians of 14 and 17 (p=.029). These behaviors included hand washing with soap and water for at least 20 seconds before making or eating food, washing fruits and vegetables before eating them, using separate cutting boards for raw meats and fresh produce, and putting food back in the refrigerator within two hours of taking them out. Food safety and culinary behaviors are an important part of learning food literacy skills.

**Table 2**

*Two-Tailed Paired Samples t-Test for the Difference Between pre_dietary behaviors and post_dietary behaviors*

| Pre_dietary_behaviors | | Post_dietary_behaviors | | | | |
|---|---|---|---|---|---|---|
| *M* | *SD* | *M* | *SD* | *t* | *p* | *d* |
| 51.68 | 11.00 | 51.68 | 11.91 | -0.02 | .980 | 0.01 |

**Qualitative Data**

The qualitative data was comprised of three questions answered pre and post intervention. The results indicated a negative change in dietary habits and activity levels following the intervention. Question one involved choosing a drink and snack from a convenience store. After the intervention the participants were more likely to choose a sugary drink over water compared to before the intervention. The snack choices stayed the same, with most participants buying chips (takis, hot Cheetos, potato chips). Question two asked about preparing dinner for their family if money and transportation were not a variable. The pre-survey revealed that 84% of the participants chose to make a homecooked meal consisting of various cultural foods, meat, vegetables, and carbohydrates. The remaining 16% chose quick-cook meals, such as pizza, pasta, or a microwaved meal. The post-survey results saw a decrease in homecooked meals with 47% of participants, and an increase in quick-cook meals with 53% of participants. It is generally assumed that homecooked meals have a higher nutritional value than quick-cook meals, although this was not specifically tested with this data. The third question asked about spending time with a friend outside of school hours. The pre and post-survey generally showed the same results with the majority (12, 63%) choosing an indoor activity, such as watching TV, using the phone, or playing video or board games. The remaining participants (7, 37%) chose outdoor activities like sports, bicycles, playing in the backyard, or swimming. The outdoor activities were more physically active while the indoor activities tended to be sedentary.

## Limitations

There were limitations found in this project, primarily within the intervention and data collection methods. The results revealed no statistically significant change in dietary habits, such as consuming more whole foods and less processed, high-sugar foods. The expectation was that

implementing an experiential nutrition curriculum was more likely to affect dietary habits compared to traditional nutrition classes. A major limitation of this project is the lack of a control group to compare the dietary changes that occurred with those of a traditional nutrition class. This was impossible to implement because the school only had one class per grade.

During the implementation of the curriculum, many unforeseen barriers were incurred. The curriculum required a large space for the activities which was impossible within the project site. The noise level during the activities proved problematic for students and teachers in other classrooms. The curriculum was planned for 90 minutes, which the project site planned for. However, several minutes were lost as students transitioned to and from classrooms and settled in to begin the nutrition lesson. The teacher noted that parts of the lesson plan had to be omitted due to the lack of time, such as preparing the food. The students commented that they did not enjoy most of the planned snacks. Evidence shows that preparing the food and learning culinary skills is an integral part to the success of an experiential nutrition curriculum, which could explain in part the negative results seen with this project.

There is a large paucity of research concerning youth food literacy with no standardized educational curriculum or assessment tool. There is no database containing large-scale youth food literacy levels. While the intervention used in the project, CHFFF, is research-based and tailored towards minority youth, the project site educators did not fully agree with the pedagogy or materials. The curriculum focused heavily on avoiding all fats and labeled this food group 'bad.' However, certain fats are an essential part to a well-balanced diet, as a source of essential fatty acids, to aid in vitamin A, D, and E absorption, and are high in energy (CDC, 2022). The educators stated the lesson plan required the instructor to talk for most of the class, limiting the time the students could participate in hands-on activities.

Using a Likert scale data collection was a potential limitation in the validity and reliability of the participants' self-reported dietary behaviors. Research has shown that participants give higher ratings on self-reported scales the first time they take a survey than subsequent times (Anvari et al., 2023). It is also known that adolescent study participants are less likely to approach the survey seriously and are more likely to answer erratically rather than truthfully. This was seen within the data collected for this project, with participants choosing all of one number or making a pattern with the bubbled in circles. Social desirability can influence how one answers questions about their behaviors when using self-reported data (Anvari et al., 2023). It is preferable to use direct observation whenever practicable. The barriers seen with this data collection method further highlight the need for a standardized food literacy tool designed for youth.

## Project Impact and Future Recommendations

Low HL and FL levels among school-aged children are contributing to the rising rates of childhood obesity and obesity-related deaths. Locally and nationally, traditional nutrition classes have proven insufficient to increase nutritional knowledge and positively influence dietary choices. A literature review was conducted, and evidence supports using experiential pedagogy, including nutrition didactics, culinary skills, school gardens, and farm field trips, to increase FL. An evidence-based FL project was implemented using the CHFFF curriculum and the $6^{th}$-$12^{th}$ grade EFNEP youth questionnaire. The intervention improved food safety habits and laid the foundation of food literacy within the classroom, home, and community.

Due to the lack of statistically significant changes in dietary habits, much work still needs to be done within the context of youth food literacy. A standardized educational approach to food literacy, using the WCCC framework, is needed to increase the possibility of sustainable change.

The content needs to be integrated into every classroom and school subject, with support from those at home and in the community. The participants need repeated exposure to the information to gain the knowledge, skills, and behaviors necessary to see sustained changes in dietary habits. Longitudinal data is needed for future, more complete and accurate insight into the participant's dietary changes.

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# Appendix A

## Evaluation and Synthesis Tables

**Table A1**

*Evaluation Table for Quantitative Studies*

| Citation | Theoretical/ Conceptual Framework | Design/ Method/ Purpose | Sample/Setting | Variables | Measurement/ Instrumentation | Data Analysis | Results/ Findings | Level of Evidence; Application to practice; Generalization |
|---|---|---|---|---|---|---|---|---|
| Ozturk et al., (2023), The effect of structured health promotion education given to adolescents on health literacy and health-promoting behaviors<br><br>**Country**: Turkey<br><br>**Funding**: The Scientific and Technological Research Council of Turkey project | inferred SCT | **Design:** Quasi-experimental (pre- & posttest)<br><br>**Purpose:** Determine the effect of structured health promotion education given to SAC on HL and HP level | **N**= 171<br><br>**Demographics:** SAC age 11-13 years in 6th, 7th, and 8th grade<br>55.6% were male<br>72.5% were from moderate-income families<br>83% of students reported no chronic disease<br><br>**Setting:** school<br><br>**Exclusion:** visual or hearing impairment or any neuropsychiatric diagnosis<br><br>**Attrition:** 10.5%<br>20 lost to follow up | **IV1:** Structured HP education<br><br>**DV1:** HL<br><br>**DV2**: HP level<br><br>**DV3:** NK<br><br>**DV4:** Exercise<br><br>**DV5:** Stress management<br><br>**DV6**: Social support<br><br>**DV7**: Life satisfaction<br><br>**DV8**: Health Responsibility | **Tools:**<br>Sociodemographic form<br>HL Scale for SAC<br>Adolescent HP Scale<br><br>**Validity/ Reliability:**<br>HL Scale for SAC- Cronbach alpha 0.79<br><br>Adolescent HP Scale - Cronbach alpha 0.90 | **Statistical Tests Used:**<br><br>Chi-square test<br><br>Independent sample t-test | No significant difference in pretest scores for IG and CG<br><br>**DV1:** increase for IG compared to CG, p= 0.003<br><br>**DV2:** increase for IG compared to CG, p=0.009<br><br>**DV3:** p<0.001<br><br>**DV4:** p=0.152<br><br>**DV5:** p=0.015<br><br>**DV6:** p=0.722<br><br>**DV7:** p=0.029 | **LOE**: IV<br><br>**Strengths**: Contributions to the literature, no biases stated. reliable and valid tools<br><br>**Weakness**: Limited generalizability, causal factors, lack of follow-up testing<br><br>**Feasibility**: during school intervention. Need school nurse or trained educator. no report on cost of training or development<br><br>**Application**: Schools should provide structured HP education to SAC to increase HL |

Key: **Cr** Curriculum, **FV** Fruit and Vegetable, **HP** Health Promoting, **LI** Low Income, **LOE** Level of Evidence, **MI** Moderate Income, **NA** Not Applicable, **NR** Not Reported, **NW** Non-white, **QE** Quasi-experimental, **Qual** Qualitative, **SAC** School-aged Children, **SR** Systematic Review, **yrs** years, ↑ increased, ≠ not statistically significant, • discussed as significant (no reported measures)

| Citation | Theoretical/ Conceptual Framework | Design/ Method/ Purpose | Sample/Setting | Variables | Measurement/ Instrumentation | Data Analysis | Results/ Findings | Level of Evidence; Application to practice; Generalization |
|---|---|---|---|---|---|---|---|---|
| **Bias**: None recognized | | | | | | | **DV8**: p=0.039 | |
| Harley et al., (2018), Youth Chef Academy: Pilot results from a plant-based culinary and nutrition literacy program for sixth and seventh graders<br><br>**Country**: United States<br><br>**Funding**: National Center for Advancing Translational Sciences<br><br>**Bias**: possible with self-reported data, selection and measurement bias | SCT | **Design:** Quasi-experimental (pre- and post-test)<br><br>**Purpose:** examine effectiveness of a classroom-based EC, culinary, and FL intervention for 6th and 7th graders designed to impact healthy eating | **N=** 195<br><br>**Demographics:** SAC age 11-13 in 6th and 7th grade<br>84% RPL<br>68% NW<br><br>**Setting:** school<br><br>**Exclusion:** none listed<br><br>**Attrition:** 21%<br>53 lost due to missed surveys | **IV1:** Youth Chef Academy: Culinary and FL EC<br><br>**DV1:** NK<br><br>**DV2:** fruit/vegetable consumption<br><br>**DV3:** vegetable consumption<br><br>**DV4:** whole grain consumption | **Tools:**<br>Youth Risk Behavior Survey<br>Power of 3<br>NK survey<br>Sociodemographic form<br><br>**Validity/ Reliability:**<br>modified surveys<br>Cronbach's alpha =.72 | **Statistical Test Used:** independent samples t-test<br><br>Multiple imputation | **DV1:** p< .001<br><br>**DV2:** difference 0.82, 95% CI, p< .05<br><br>**DV3:** difference 0.58, 95% CI, p< .05<br><br>**DV4:** difference -0.3, 95% CI, p=.10 | **LOE:** IV<br><br>**Strengths:** large sample, adds to FL database, valid tool<br><br>**Weakness:** limited generalizability, differences in race between CG and IG, self-reported data<br><br>**Feasibility:** cost- and time effective solution to improve FL and academics<br><br>**Application:** culinary-based FL EC is linked to academic standards, tangible skills, NK, and improved dietary behaviors |

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| Citation | Theoretical/ Conceptual Framework | Design/ Method/ Purpose | Sample/Setting | Variables | Measurement/ Instrumentation | Data Analysis | Results/ Findings | Level of Evidence; Application to practice; Generalization |
|---|---|---|---|---|---|---|---|---|
| Johnston et al., (2018), The Food Doctors: A pilot study to connect urban children and medical students using nutrition education<br><br>**Country**: United States<br><br>**Funding**: none<br><br>**Bias**: none recognized | Transtheoretical model | **Design:** quasi-experimental (pre- and post- test)<br><br>**Purpose:** to create a medical student created and operated nutrition education intervention for urban underserved SAC | **N**= 83<br><br>**Demographics:** SAC<br>46 3rd grade students<br>37 4th grade students<br>99% NW<br>100% RPL<br><br>**Setting:** school<br><br>**Exclusion:** none listed<br><br>**Attrition:** 0% | **IV1:** EC, school-based nutrition education<br><br>**DV2:** food group components<br><br>**DV3:** whole vs enriched grains<br><br>**DV3:** health benefits of various colors of foods<br><br>**DV4:** composing a complete, healthy meal | **Tools**: NK surveys, interactive clicker-based surveys, student satisfaction surveys, open-ended response questionnaire<br><br>**Validity/Reliability**: designed by authors with no validity testing listed | **Statistical Test Used:** twin sample t-test, Likert scale with mean calculation | **DV1:** $p < .008$<br><br>**DV2:** $p < .001$<br><br>**DV3:** $p < .001$<br><br>**DV4:** $p < .03$ | **LOE:** IV<br><br>**Strength:** low cost, no attrition, culturally appropriate, theory driven<br><br>**Weakness:** limited generalizability, lack of standardized valid testing tools<br><br>**Feasibility:** low cost to implement ($5 per student), need school space, time, and trained educator<br><br>**Application:** Use of EC to improve FL and NK among SAC |
| Hartson et al., (2021), Testing the effects of two field-to-fork programs on the nutritional outcomes of elementary | SCT | **Design:** quasi-experimental (pre- and post-test)<br><br>**Purpose:** evaluate the effects of two FTS programs on nutritional outcomes of SAC | **N**= 264<br><br>**Demographics:** SAC (3rd to 5th grade)<br>72-94% RPL<br>75% NW<br><br>**Setting:** 4 schools | **IV1:** Field-to-Fork Multi-visit program (EC)<br><br>**DV1:** knowledge of recommendations | **Tools**: pencil and paper self-report surveys with questions concerning NK, consumption, and cooking<br><br>**Validity/Reliability**: | **Statistical Test Used**: McNemar's and Wilcoxon signed rank test<br>Chi-square and Fisher's | **DV1:** $p = .272$<br><br>**DV2:** $p = .002$<br>$Z = -3.148$<br><br>**DV3:** $p < .001$<br><br>**DV4**: $p = .061$ | **LOE:** IV<br><br>**Strength:** large sample size, low attrition, focus on FTS programs<br><br>**Weakness:** limited generalizability, |

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| Citation | Theoretical/ Conceptual Framework | Design/ Method/ Purpose | Sample/Setting | Variables | Measurement/ Instrumentation | Data Analysis | Results/ Findings | Level of Evidence; Application to practice; Generalization |
|---|---|---|---|---|---|---|---|---|
| school students form diverse and lower-income communities<br><br>**Country**: United States<br><br>**Funding**: USDA NIFA Grant to The Food Literacy Project Inc.<br><br>**Bias**: None recognized | | from urban, diverse, and lower-income communities | **Exclusion:** none listed<br><br>**Attrition:** 16.5% | for daily FV intake<br><br>**DV2:** FV consumption<br><br>**DV3**: knowledge of cooking a healthy recipe<br><br>**DV4**: desire to farm fresh foods at school | Designed by authors with no validity testing listed | exact test | | lack of standardized valid testing tools<br><br>**Feasibility:** school curriculum time, fieldtrips, educator, access of EC from the Food Literacy Project<br><br>**Application:** FTS programs can increase knowledge of cooking vegetable rich recipes and FV intake among SAC from diverse, urban, and lower-income communities |
| Kelly et al., (2021), Food literacy interventions in elementary schools: A systematic scoping review<br><br>**Country**: unknown | SCT | **Design:** Systematic Scoping Review following PRIMSA guidelines<br><br>**Purpose:** To characterize FL interventions among SAC in elementary schools | **N=** 116 studies<br><br>**Databases Searched:** PubMed, Web of Science, EBSCO [CINAHL, ERIC]<br><br>**Inclusion Criteria:** peer-reviewed original research, | **IV:** School-based FL curriculum<br><br>**DV1:** Functional FL<br><br>**DV2:** Interactive FL<br><br>**DV3:** Critical FL | Modified-Knowledge, Attitude, Behavior survey, Coordinated Approach to Child Health survey, food frequency surveys or recall,<br>FL domains: skills and behaviors, food/health choices, culture, knowledge, | PRISMA Extension for Scoping Reviews, search strategy guided by FL domain keywords and health services librarian. Two | **DV1:** 100% of studies. NK, didactic, classroom setting, food groups, food content<br><br>**DV2:** 77% of studies. EC- food preparation, | **LOE:** I<br><br>**Strengths:** large number of studies, multiple aspects of FL<br><br>**Weakness:** heterogeneity of interventions, no standardized FL outcome tools |

Key: **Cr** Curriculum, **FV** Fruit and Vegetable, **HP** Health Promoting, **LI** Low Income, **LOE** Level of Evidence, **MI** Moderate Income, **NA** Not Applicable, **NR** Not Reported, **NW** Non-white, **QE** Quasi-experimental, **Qual** Qualitative, **SAC** School-aged Children, **SR** Systematic Review, **yrs** years, ↑ increased, ≠ not statistically significant, • discussed as significant (no reported measures)

| Citation | Theoretical/ Conceptual Framework | Design/ Method/ Purpose | Sample/Setting | Variables | Measurement/ Instrumentation | Data Analysis | Results/ Findings | Level of Evidence; Application to practice; Generalization |
|---|---|---|---|---|---|---|---|---|
| **Funding**: none listed<br><br>**Bias:** None recognized | | | conducted in humans, published in English, elementary or primary or school for children aged 4-12 years programs, reported an outcome related to FL, published up until May 13, 2020 | | emotions, food systems | reviewers to verify eligibility. Citation manager and analytic grid used. | cooking, school gardens, game-based, peer-to-peer, take-home information<br><br>**DV3:** 28% of studies food choices, production, environmental impacts, sustainability | **Conclusion:** HL first to obtain FL. Focus on whole foods, food groups, dietary patterns with EC -school gardens, cooking and tasting, and cross-curriculum education to increase youth FL |
| Mishra et al., (2022), Farm-to-School programmes, benefits, health outcomes, and barriers: A structured literature review<br><br>**Country**: United States<br><br>**Funding**: none listed | Inferred SCT | **Design:** Systematic review<br><br>**Purpose:** to explore FTS programs: health and related benefits, benefits to stakeholders, institutional barriers, policy and environmental aspects | **N=** 152<br><br>**Databases searched:** CAB Direct, PubMed, GreenFILE, ERIC, CINAHL, Agricultural and Environmental Science, Web of Science<br><br>**Inclusion Criteria:** published in English, related to FTS programs in | **IV1:** FTS Program<br><br>**DV1:** food waste<br><br>**DV2:** healthy consumption<br><br>**DV3**: health impacts | Food frequency questionnaires NK surveys photographs of school lunches observational data | Rowley and Slack's 5 step systematic review method Integrated conceptual framework for concepts of FTS and HL Refworks to identify duplicate studies | **DV1:** total FV on lunch trays increased. No change in amount wasted (up to 70% of FV)<br><br>**DV2:** 25-84% increase in FV consumption, decrease in school vending-machine sales, significant increase in | **LOE:** I<br><br>**Strength:** unique focus on FTS programs, multiple databases searched<br><br>**Weakness:** heterogeneity of interventions, no standardized outcome tools<br><br>**Conclusion:** FTS can increase NK and result in better health outcomes for SAC. FL supports |

Key: **Cr** Curriculum, **FV** Fruit and Vegetable, **HP** Health Promoting, **LI** Low Income, **LOE** Level of Evidence, **MI** Moderate Income, **NA** Not Applicable, **NR** Not Reported, **NW** Non-white, **QE** Quasi-experimental, **Qual** Qualitative, **SAC** School-aged Children, **SR** Systematic Review, **yrs** years, ↑ increased, ≠ not statistically significant, • discussed as significant (no reported measures)

| Citation | Theoretical/ Conceptual Framework | Design/ Method/ Purpose | Sample/Setting | Variables | Measurement/ Instrumentation | Data Analysis | Results/ Findings | Level of Evidence; Application to practice; Generalization |
|---|---|---|---|---|---|---|---|---|
| **Bias**: None recognized | | | the United States with a political, economic, or health behavior outcome, research about FTS, local food policies, school health and science curricula | | | | willingness to try new foods Lower soft drink intakes<br><br>**DV3**: significant reduction in overweight/ obesity odds, increase in belief scores ("if I eat better, I will do better") | self-efficacy regarding foods and lifetime dietary behaviors |

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**Table A2**

*Evaluation Table for Qualitative Studies*

| Citation | Theory/ Conceptual Framework | Design/ Method/ Sampling | Sample/ Setting | Major Themes Studied/ Definitions | Measurement/ Instrumentation | Data Analysis | Findings/ Themes | Level/ Quality of Evidence; Decision for/ Application to practice; Generalization |
|---|---|---|---|---|---|---|---|---|
| Amin et al., (2018), Identifying food literacy educational opportunities for youth<br><br>**Country:** United States<br><br>**Funding:** Newman's Own Foundation<br><br>**Bias:** possible selection bias in focus groups, social desirability may have led to overreporting positive skills and behaviors, $10 participation gift card | inferred SCT | **Design:** grounded theory qualitative study<br><br>**Method:** 6 focus groups (5-6 students), 30-45 minute sessions<br><br>**Purpose:** to assess the FL experiences, perceived skills, and NK of SAC to inform FL educational opportunities | N= 31<br><br>**Demographics:** SAC 9-12 years in 4th, 5th, and 6th grade<br>65% female<br>43% NW<br>43% RPL<br><br>**Setting:** school<br><br>**Attrition:** 0% | **RQ1**: Food systems concepts<br><br>**RQ2**: Growing foods<br><br>**RQ3**: Food preparation/cooking skills<br><br>**Definitions:**<br><br>FL- everyday practicalities associated with navigating a food system and using it to ensure regular food intake consistent with nutrition recommendations | **Data Collection:** Semistructured interviews moderated by research team member. Probing and clarifying questions incorporated. Note taker present. Saturation ensured by reviewing grid of key FL concepts.<br><br>**Data Dependability:** Audiotaped and transcribed verbatim, reviewed by 3 team members | 2 team members independently reviewed and coded transcripts. Cohen's alpha for interrater reliability was between 80-100% across all domains. Themes identified by inductive and deductive contact analysis. QSR International's NVivo 10 software for coding and further analyses. | (1) food systems concepts<br><br>(2) food safety and freshness<br><br>(3) gardening environment, perceived skills, and knowledge<br><br>(4) cooking environment, perceived skills, and safety<br><br>(5) autonomy of meal preparation | **LOE:** VI<br><br>**Strengths:** racially, socioeconomically diverse sample, 0% attrition, insight for future FL education<br><br>**Weakness:** limited generalizability, potential biases<br><br>**Feasibility:** feasible to implement with short (30-45 minute) sessions. Each student received $10 totaling $310 in participation costs.<br><br>**Application:** FL curriculum in schools can improve key NK, skills, and behaviors in SAC |

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| Citation | Theory/ Conceptual Framework | Design/ Method/ Sampling | Sample/ Setting | Major Themes Studied/ Definitions | Measurement/ Instrumentation | Data Analysis | Findings/ Themes | Level/ Quality of Evidence; Decision for/ Application to practice; Generalization |
|---|---|---|---|---|---|---|---|---|
| Wickham et al., (2018), "Just Say It Like It Is!" Use of a community-based participatory approach to develop a technology-driven food literacy program for adolescents<br><br>**Country**: United States<br><br>**Funding:** Academy of Nutrition and Dietetics and the General Mills Foundation<br><br>**Bias**: $20 participation gift card | Community-based participatory research | **Design:** grounded theory qualitative study<br><br>**Method:** 1 hour small group discussions<br><br>**Purpose:** to form an advisory group of SAC to direct the design of a FL program and the potential of technology to influence participation | N=4<br><br>**Demographics:** SAC age 13-16 years<br>3 males<br>1 female<br>100% low-income families<br>100% NW<br><br>**Setting:** Community center in the summer<br><br>**Attrition:** 0% | **RQ1:** Knowledge, Attitude, Behavior survey<br><br>**RQ2:** Program Activities<br><br>**RQ3:** Taste Tests and Recipes<br><br>**RQ4:** Technology and Text Messages<br><br>**RQ5:** Music and Incentives | **Data Collection:** semi structured interviews with questions from guide developed to prompt discussion of key program topics. Facilitator and audio recorder present.<br><br>**Data Dependability:** audiotaped and transcribed verbatim, checked to verify quality and content. | Coded for recurrent themes using QSR NVivo Version 11.3.2. Qualitative data analyzed using IBM SPSS Statistics Version 24. Surveys modified from American Heart Association and Choose MyPlate questionnaires | (1) difficulty understanding food terms<br><br>(2) preferred EC with hands-on activities, creativity, challenging<br><br>(3) preconceived biases about food items<br><br>(4) food needs flavor<br><br>(5) direct, simple, fun messages<br><br>(6) participation prizes and gift cards | **LOE:** VI<br><br>**Strengths:** focused feedback on program, increased participation in pilot program, theory driven<br><br>**Weakness:** small sample size, limited number of sessions, low generalizability<br><br>**Feasibility:** monetary participation rewards, cost of implementing pilot program, kitchen facilities needed<br><br>**Application:** youth can improve FL and HP through a technology-driven FL program |
| Velardo et al., (2018), Qualitative insight into primary school children's | Socio-ecological framework | **Design:** qualitative, interpretive approach<br><br>**Method:** 6 focus groups, 14 in-depth | N=38<br><br>**Demographic:** SAC age 11-12 years | **RQ1:** intrapersonal (individual) factors<br><br>**RQ2:** Interpersonal (family and friends) factors | **Data Collection:** Focus groups and individual semi-structured interviews. Use of | Thematic techniques, manually coded multiple times and cross- | (1) food dichotomies (good/bad)<br><br>(2) physical effects to | **LOE:** VI<br><br>**Strength:** theory driven, sociocultural |

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| Citation | Theory/ Conceptual Framework | Design/ Method/ Sampling | Sample/ Setting | Major Themes Studied/ Definitions | Measurement/ Instrumentation | Data Analysis | Findings/ Themes | Level/ Quality of Evidence; Decision for/ Application to practice; Generalization |
|---|---|---|---|---|---|---|---|---|
| nutrition literacy<br><br>**Country**: Australia<br><br>**Funding**: none listed<br><br>**Bias**: none recognized | | individual interviews<br><br>**Purpose:** to explore HL, in a FL context, from SAC's perspectives | 14 boys, 24 girls From socially disadvantaged areas<br><br>**Setting:** school<br><br>**Attrition:** 0% | **RQ3:** Organizational (school) factors<br><br>**RQ4:** Community factors | rewording and probing questions<br><br>**Data Dependability:** audio-recorded, transcribed verbatim, checked for quality and content | checked by second author | determine health status<br><br>(3) parents and teachers as reliable sources<br><br>(4) household food availability<br><br>(5) whole-school health education<br><br>(6) school cafeterias<br><br>(7) mass media, social marketing campaigns, TV<br><br>(8) no use of internet for nutrition information | approach to FL, SAC's insight<br><br>**Weakness:** limited generalizability, missing parents' and teachers' perspectives<br><br>**Feasibility:** low cost to implement, short (45 min) interview sessions<br><br>**Application:** value of more EC to increase FL in home, school, and community settings. Influence of sociocultural factors. |
| Fleary et al., (2021), Adolescents' health literacy and decision | Information-Motivation-Behavior Skills model | **Design:** grounded theory qualitative study | N= 37<br><br>**Demographic**: SAC<br>91.9% RPL | **RQ1:** Perceptions of HL use | **Data Collection:** Sociodemographic form<br>Newest Vital Signs | Thematic analysis using Microsoft Word Open coding process by 2 | (1) types of HL: Functional-FL and reading labels | **LOE:** VI<br><br>**Strength:** representative of high-risk groups for |

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| Citation | Theory/ Conceptual Framework | Design/ Method/ Sampling | Sample/ Setting | Major Themes Studied/ Definitions | Measurement/ Instrumentation | Data Analysis | Findings/ Themes | Level/ Quality of Evidence; Decision for/ Application to practice; Generalization |
|---|---|---|---|---|---|---|---|---|
| making: A qualitative study<br>**Country**: United States<br><br>**Funding**: National Institute of Health<br><br>**Bias**: refreshments and $10 giftcard may have influenced participation | | **Method:** 6 focus groups<br><br>**Purpose:** explore SAC's use of HL in their health-decision making | 91.9% NW<br>86.5% female<br>58.3% adequate HL, 41.7% possibility of limited HL<br><br>**Setting**: School<br><br>**Attrition**: 0% | **RQ2:** Factors associated with use of HL<br><br>**RQ3:** Confidence in skills | Focus groups after school dismissal.<br>Trained moderators<br>Random assignment<br>Semi-structured discussions with clarifying and probing questions<br><br>**Data Dependability:**<br>Newest Vital Signs Cronbach's alpha = .78<br>Recordings transcribed verbatim and checked for quality and content by 3 team members | coders (Kappa = .81)<br>Thematic map | Interactive-online sources, questions<br><br>(2) barriers and protective factors with HL utilization: Food choices, physical activity<br><br>(3) HL skills confidence: HP decision-making, behavior and knowledge alignment | HL interventions, valid tools, point-counter-point dialogue<br><br>**Weakness:** small sample size, limited generalizability, no individual interviews<br><br>**Feasibility:** low cost of study, conducted at school in after school hours.<br><br>**Application:** HL influences health decision-making and HP behaviors. Important to consider developmental characteristics and a socioecological approach |

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**Table A3**
*Synthesis Table*

| **Author**<br>**Year** | Ozturk et al., 2023 | Harley et al., 2018 | Johnston et al., 2018 | Hartson et al., 2021 | Kelly et al., 2021 | Mishra et al., 2022 | Amin et al., 2018 | Wickham et al., 2018 | Velardo et al., 2018 | Fleary et al., 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Design**<br>**LOE** | QE<br>IV | QE<br>IV | QE<br>IV | QE<br>IV | SR<br>I | SR<br>I | Qual<br>VI | Qual<br>VI | Qual<br>VI | Qual<br>VI |
| | | | | | | | | | | |
| **Sample** | | | | | | | | | | |
| *N=(subjects/studies)* | 171 | 195 | 83 | 264 | 116 | 152 | 31 | 4 | 38 | 37 |
| *Ages*<br>*School grade* | 11-16 yrs<br>6th, 7th, 8th | 11-13 yrs<br>6th, 7th | 8-10 yrs<br>3rd, 4th | 8-11 yrs<br>3rd, 4th, 5th | 4-12 yrs<br>NA | SAC<br>NA | 9 – 12 yrs<br>4th, 5th, 6th | 13-16 yrs<br>NR | 11-12 yrs<br>5th, 6th | SAC<br>NR |
| *Socioeconomic status* | 72.5% MI | 84% LI | 100% LI | 72-94% LI | NR | NR | 43% LI | 100% LI | 100% LI | 91.9% LI |
| *Ethnicity* | 100% NW | 68% NW | 99% NW | 75% NW | NR | NR | 43% NW | 100% NW | NR | 91.9% NW |
| **Setting** | | | | | | | | | | |
| *School* | X | X | X | X | X | X | X | | X | X |
| *Community Center* | | | | | | | | X | | |
| **Interventions** | | | | | | | | | | |
| *HP Education* | X | | | | | | | | | |
| *Experiential Cr* | | X | X | X | X | X | | | | |
| *Culinary Skills* | | X | X | X | X | | X | | | |
| *Nutrition Cr* | X | X | X | X | X | X | | | | |
| *Food Literacy Cr* | | X | | | X | | X | X | X | |
| *Farm-to-School* | | | | X | X | X | X | | | |
| *Health Literacy Cr* | X | | | | X | | | | X | X |
| **Outcomes/ Themes** | | | | | | | | | | |
| *Health/Food Literacy* | ↑ | | | | • | | • | • | • | • |
| *Nutrition Knowledge* | | ↑ | ↑ | ≠ | • | | • | | • | |
| *FV consumption* | | ↑ | | ↑ | | ↑ | | | | |
| *Food preparation* | | | ↑ | ↑ | • | | • | | | |
| *Food waste* | | | | | | ≠ | | | | |
| *HP Behaviors* | ↑ | | | | • | ↑ | | | | • |

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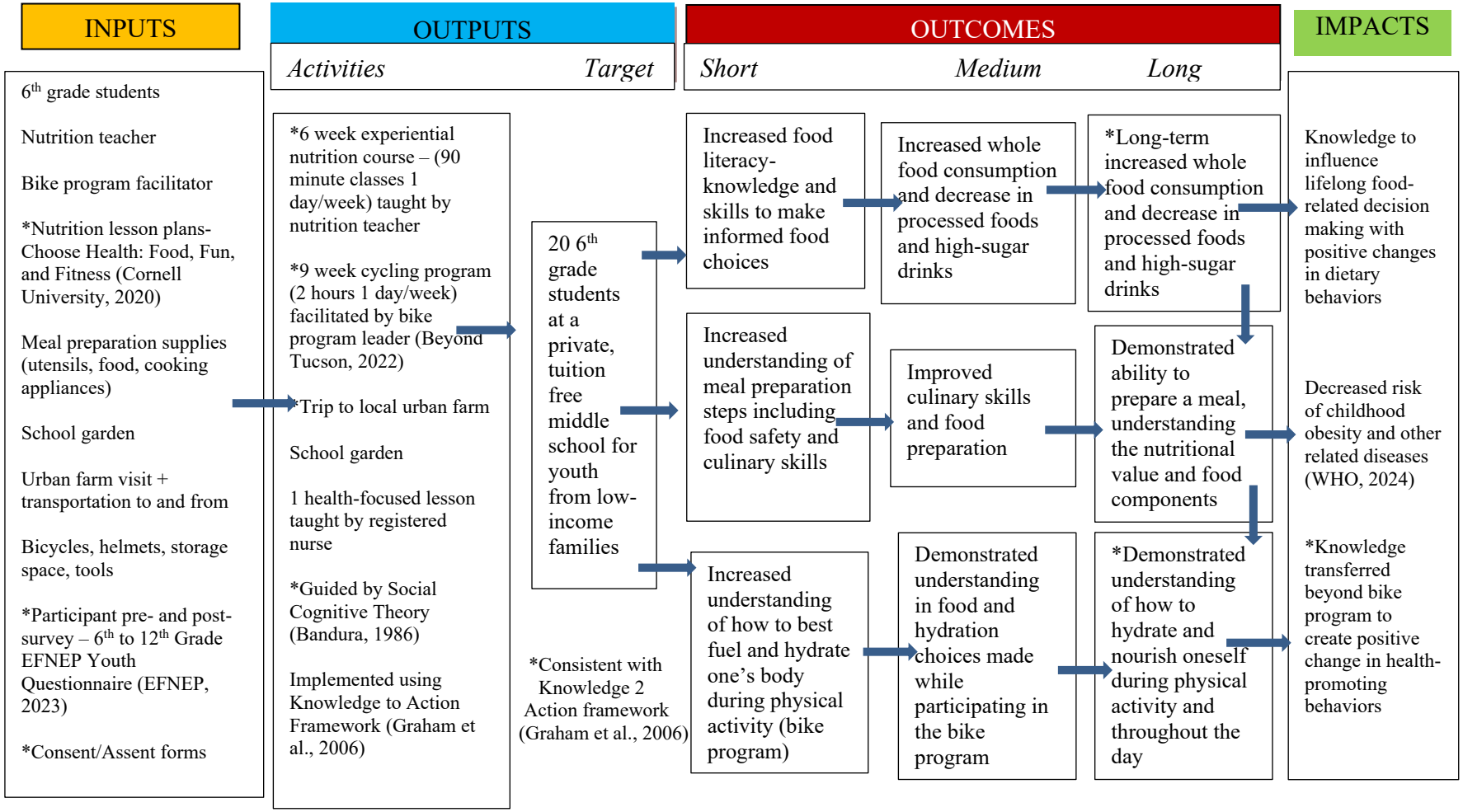
## Appendix B

## Logic Model

**Goals:** The purpose of this evidence-based project is to develop and deliver an experiential nutrition course alongside a cycling program to 6th grade students at a low-income middle school, with the goal of increasing food literacy levels and positively influencing dietary behaviors.




**Assumptions:** The project site is willing to teach the evidence-based experiential nutrition course- CHFFF. The students will participate in the nutrition course. The students and their parents will consent/assent to pre- and post-surveys. The curriculum will elicit positive behavior change, significantly improving whole food consumption, sweetened drinks, reading nutrition labels, and other food-related behaviors (Cornell University, 2020). The nutrition course and impacted dietary behaviors will reduce the risk of childhood obesity (Cornell University, 2020; WHO, 2024).

## Appendix C

## Choose Health: Food, Fun, and Fitness

**Figure C1**
*Introduction Flyer*

HANDOUT 0-1: INTRODUCTORY FLYER

CHOOSE HEALTH: FOOD, FUN, AND FITNESS

EFNEP Expanded Food and Nutrition Education Program

Cornell Cooperative Extension

# Choose Health: Food, Fun, and Fitness

## Encourage Children to Eat Healthy and Play Actively!

The Choose Health: Food, Fun, and Fitness curriculum helps children learn healthy eating and activity habits through engaging, hands-on activities, along with fun active games and preparing and tasting healthy snacks.

As parents, teachers, and other role models, you can help children practice the healthy habits they learn in CHFFF by reinforcing these at home, school, food stores, and other settings.

## The Choose Health Lessons

The following lessons and topics will be covered:

1. **Drink Low-Fat Milk and Water Instead of Sweetened Drinks**
2. **Color Your Plate! Eat More Vegetables and Fruits**
3. **Read It Before You Eat It! The Nutrition Facts Label**
4. **Make Half Your Grains Whole! Eat More Whole Grains**
5. **Healthier Foods Fast: Eat Fewer High-Fat, High-Sugar Foods**
6. **Power Up Your Day: Eat Breakfast!**

## Why These Lessons?

Every lesson is focused on information and behaviors that lead to living a healthy lifestyle. Research says that following the six behavior goals to the right help children – and adults – develop and maintain healthy eating and activity habits.

In each lesson the children will:

- Play active games – learning new ways to get some of the recommended 60 minutes of active play a day.
- Try a healthy recipe, helping to prepare it when feasible!
- Receive a Family Newsletter like this one to bring home. Each newsletter has two healthy recipes and tips to help your family be active and healthy!



(Cornell University, 2020)

**Table C1**

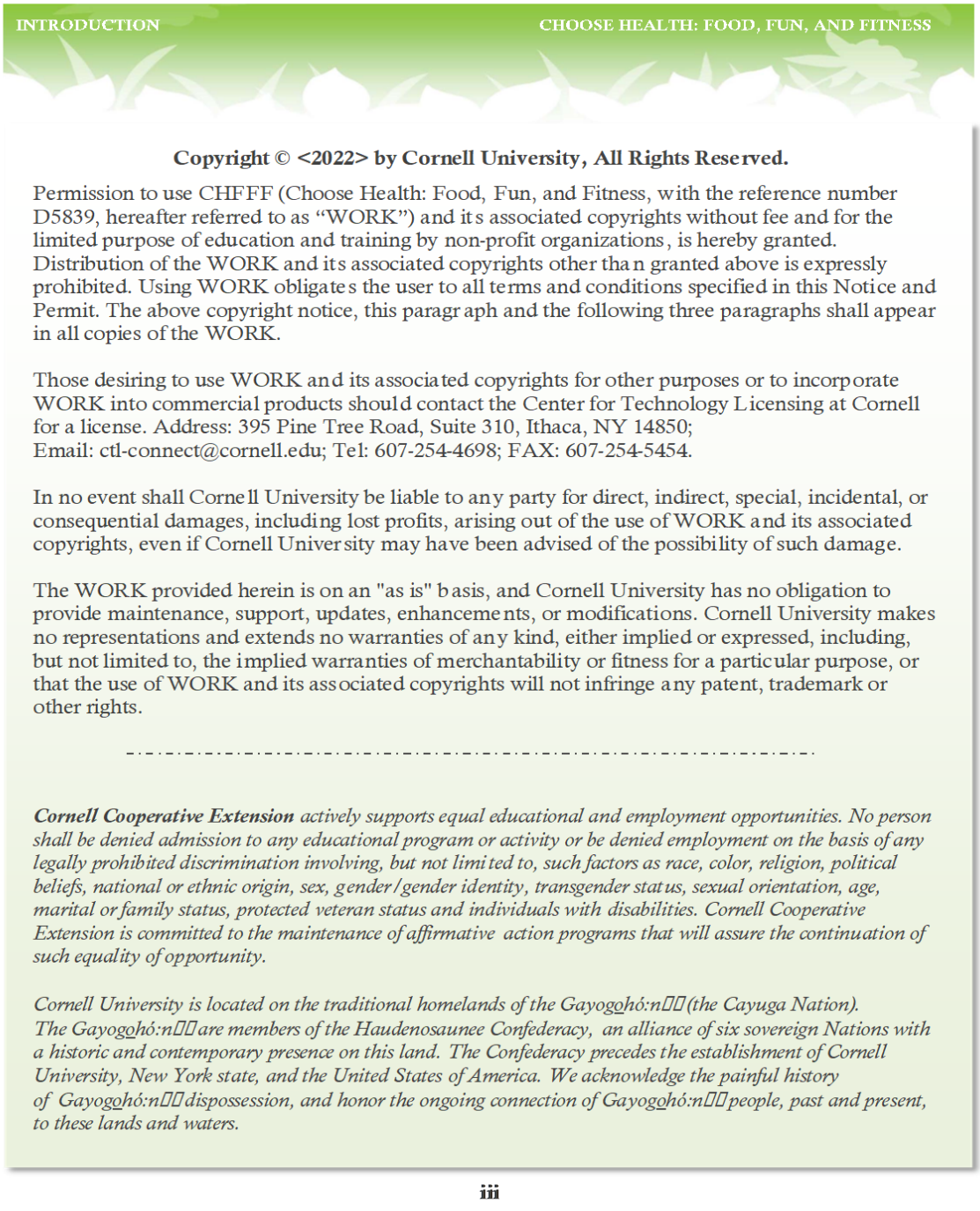
*National Health Education Standards*

**How CHFFF Meets National Health Education Standards**

| National Health Education Standards | Performance Indicators for Grades 3-5 met by CHFFF | Performance Indicators for Grades 6-8 met by CHFFF |
|---|---|---|
| 1. Students will comprehend concepts related to health promotion and disease prevention to enhance health. | 1.5.1 Describe the relationship between healthy behaviors and personal health. | 1.8.1 Analyze the relationship between healthy behaviors and personal health.<br>1.8.7 Describe the benefits of and barriers to practicing healthy behaviors. |
| 2. Students will analyze the influence of family, peers, culture, media, technology, and other factors on health behaviors. | 2.5.1 Describe how family influences personal health practices and behaviors. | 2.8.1 Examine how the family influences the health of adolescents.<br>2.8.8 Explain the influence of personal values and beliefs on individual health practices and behaviors. |
| 3. Students will demonstrate the ability to access valid information, products, and services to enhance health. | 3.5.1 Identify characteristics of valid health information, products, and services.<br>3.5.2 Locate resources from home, school, and community that provide valid health information. | 3.8.2 Access valid health information from home, school, and community.<br>3.8.5 Locate valid and reliable health products and services. |
| 4. Students will demonstrate the ability to use interpersonal communication skills to enhance health and avoid or reduce health risks. | 4.5.1 Demonstrate effective verbal and nonverbal communication skills to enhance health.<br>4.5.2 Demonstrate refusal skills that avoid or reduce health risks. | 4.8.1 Apply effective verbal and nonverbal communication skills to enhance health..<br>4.8.2 Demonstrate refusal and negotiation skills that avoid or reduce health risks. |
| 5. Students will demonstrate the ability to use decision-making skills to enhance health. | 5.5.1 Identify health-related situations that might require a thoughtful decision.<br>5.5.3 List healthy options to health-related issues or problems.<br>5.5.5 Choose a healthy option when making a decision. | 5.8.1 Identify circumstances that can help or hinder healthy decision making.<br>5.8.2 Determine when health-related situations require the application of a thoughtful decision-making process.<br>5.8.4 Distinguish between healthy and unhealthy alternatives to health-related issues or problems.<br>5.8.6 Choose healthy alternatives over unhealthy alternatives when making a decision. |
| 6. Students will demonstrate the ability to use goal-setting skills to enhance health. | 6.5.1 Set a personal health goal and track progress toward its achievement.<br>6.5.2 Identify resources to assist in achieving a personal health goal. | 6.8.1 Assess personal health practices.<br>6.8.2 Develop a goal to adopt, maintain, or improve a personal health practice.<br>6.8.3 Apply strategies and skills needed to attain a personal health goal. |
| 7. Students will demonstrate the ability to practice health-enhancing behaviors and avoid or reduce health risks. | 7.5.2 Demonstrate a variety of healthy practices and behaviors to maintain or improve personal health.<br>7.5.3 Demonstrate a variety of behaviors to avoid or reduce health risks. | 7.8.2 Demonstrate healthy practices and behaviors that will maintain or improve the health of self and others.<br>7.8.3 Demonstrate behaviors to avoid or reduce health risks to self and others. |
| 8. Students will demonstrate the ability to advocate for personal, family, and community health. | 8.5.1 Express opinions and give accurate information about health issues.<br>8.5.2 Encourage others to make positive health choices. | 8.8.2 Demonstrate how to influence and support others to make positive health choices.<br>8.8.3 Work cooperatively to advocate for healthy individuals, families, and schools.. |

(Cornell University, 2020)

**Figure C2**
*Copyright*



INTRODUCTION CHOOSE HEALTH: FOOD, FUN, AND FITNESS

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*Cornell University is located on the traditional homelands of the Gayogohó:nǫ̀ (the Cayuga Nation). The Gayogohó:nǫ̀ are members of the Haudenosaunee Confederacy, an alliance of six sovereign Nations with a historic and contemporary presence on this land. The Confederacy precedes the establishment of Cornell University, New York state, and the United States of America. We acknowledge the painful history of Gayogohó:nǫ̀ dispossession, and honor the ongoing connection of Gayogohó:nǫ̀ people, past and present, to these lands and waters.*

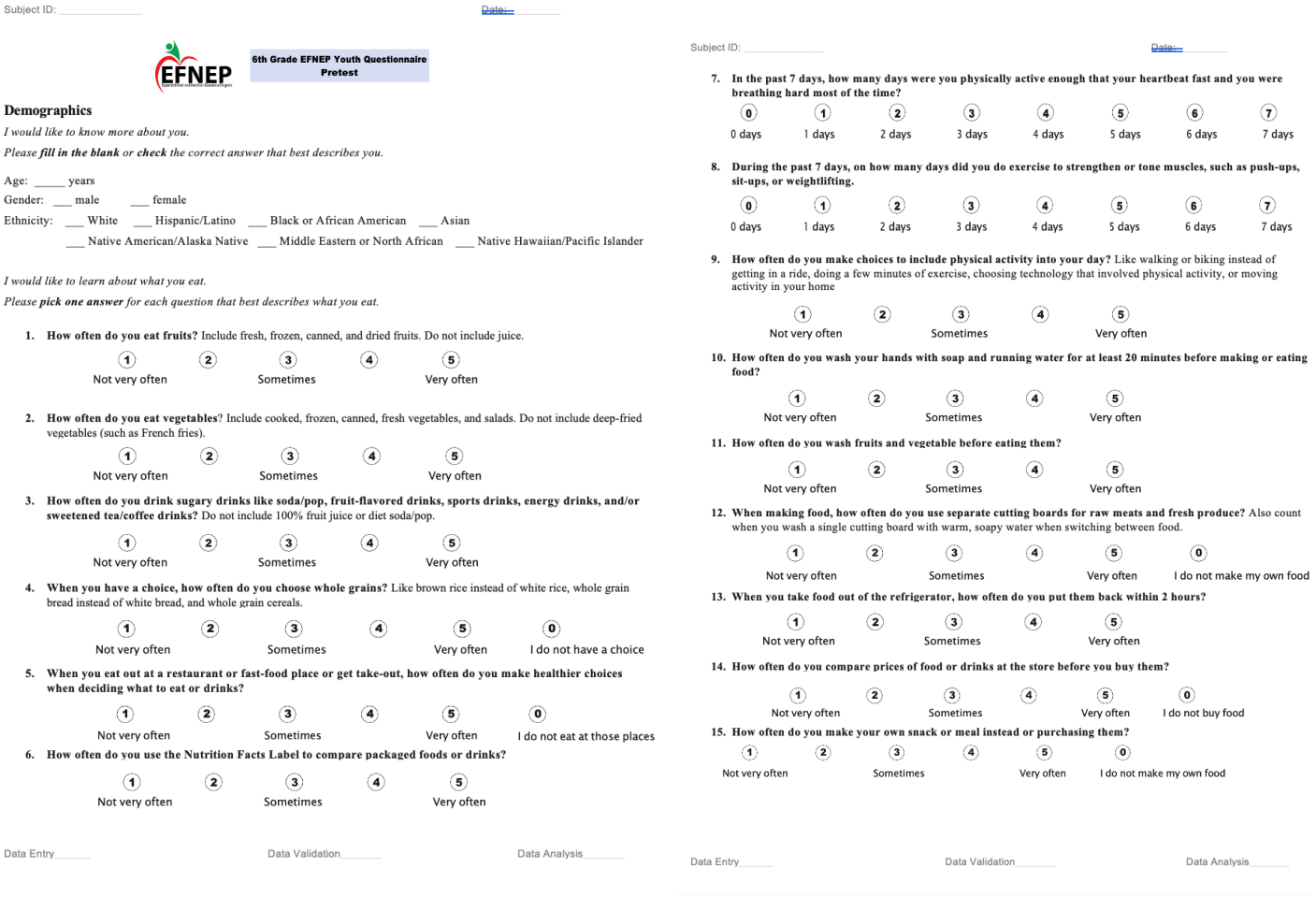
iii

(Cornell University, 2022)

# Appendix D

## Measurement Tools

**Figure D1**
*6th Grade EFNEP Youth Questionnaire*



Subject ID: _____ Date: _____

EFNEP

**6th Grade EFNEP Youth Questionnaire Pretest**

**Demographics**

*I would like to know more about you.*

*Please **fill in the blank** or **check** the correct answer that best describes you.*

Age: _____ years
Gender: ___ male ___ female
Ethnicity: ___ White ___ Hispanic/Latino ___ Black or African American ___ Asian
___ Native American/Alaska Native ___ Middle Eastern or North African ___ Native Hawaiian/Pacific Islander

*I would like to learn about what you eat.*

*Please **pick one answer** for each question that best describes what you eat.*

1. **How often do you eat fruits?** Include fresh, frozen, canned, and dried fruits. Do not include juice.
   (1) Not very often (2) (3) Sometimes (4) (5) Very often
2. **How often do you eat vegetables**? Include cooked, frozen, canned, fresh vegetables, and salads. Do not include deep-fried vegetables (such as French fries).
   (1) Not very often (2) (3) Sometimes (4) (5) Very often
3. **How often do you drink sugary drinks like soda/pop, fruit-flavored drinks, sports drinks, energy drinks, and/or sweetened tea/coffee drinks?** Do not include 100% fruit juice or diet soda/pop.
   (1) Not very often (2) (3) Sometimes (4) (5) Very often
4. **When you have a choice, how often do you choose whole grains?** Like brown rice instead of white rice, whole grain bread instead of white bread, and whole grain cereals.
   (1) Not very often (2) (3) Sometimes (4) (5) Very often (0) I do not have a choice
5. **When you eat out at a restaurant or fast-food place or get take-out, how often do you make healthier choices when deciding what to eat or drinks?**
   (1) Not very often (2) (3) Sometimes (4) (5) Very often (0) I do not eat at those places
6. **How often do you use the Nutrition Facts Label to compare packaged foods or drinks?**
   (1) Not very often (2) (3) Sometimes (4) (5) Very often

Data Entry_____ Data Validation_____ Data Analysis_____

Subject ID: _____ Date: _____

7. **In the past 7 days, how many days were you physically active enough that your heartbeat fast and you were breathing hard most of the time?**
   (0) 0 days (1) 1 days (2) 2 days (3) 3 days (4) 4 days (5) 5 days (6) 6 days (7) 7 days
8. **During the past 7 days, on how many days did you do exercise to strengthen or tone muscles, such as push-ups, sit-ups, or weightlifting.**
   (0) 0 days (1) 1 days (2) 2 days (3) 3 days (4) 4 days (5) 5 days (6) 6 days (7) 7 days
9. **How often do you make choices to include physical activity into your day?** Like walking or biking instead of getting in a ride, doing a few minutes of exercise, choosing technology that involved physical activity, or moving activity in your home
   (1) Not very often (2) (3) Sometimes (4) (5) Very often
10. **How often do you wash your hands with soap and running water for at least 20 minutes before making or eating food?**
    (1) Not very often (2) (3) Sometimes (4) (5) Very often
11. **How often do you wash fruits and vegetable before eating them?**
    (1) Not very often (2) (3) Sometimes (4) (5) Very often
12. **When making food, how often do you use separate cutting boards for raw meats and fresh produce?** Also count when you wash a single cutting board with warm, soapy water when switching between food.
    (1) Not very often (2) (3) Sometimes (4) (5) Very often (0) I do not make my own food
13. **When you take food out of the refrigerator, how often do you put them back within 2 hours?**
    (1) Not very often (2) (3) Sometimes (4) (5) Very often
14. **How often do you compare prices of food or drinks at the store before you buy them?**
    (1) Not very often (2) (3) Sometimes (4) (5) Very often (0) I do not buy food
15. **How often do you make your own snack or meal instead or purchasing them?**
    (1) Not very often (2) (3) Sometimes (4) (5) Very often (0) I do not make my own food

Data Entry_____ Data Validation_____ Data Analysis_____

(EFNEP, 2024)

**Figure D2**

*Qualitative Survey*

**Qualitative Survey**

1. Imagine you are given $10 to go get a drink and snack from a gas station nearby… what would you get for yourself?

2. Imagine you are given sufficient money and transportation (and help) to get supplies at a grocery store to make dinner for your family.. what would you buy and want to make for your family for dinner?

3. Imagine a good friend of yours is coming over on a beautiful fall day… what do you want to do with your time together?

4. What do you hope and/or expect to learn from this nutrition program/class? What are any specific questions you have about nutrition and health that you would like to get answered/discussed?

# Appendix E

## Budget Plan

| Category | Activities | Cost | Total |
|---|---|---|---|
| **Direct Cost** | Print Choose Health: Food, Fun, and Fitness curriculum, games, recipes, family newsletter- approximately 2,000 pages | $300 | |
| | 3 ring hole puncher | $5 | |
| | 20 3-ring binders | $60 | |
| | Print Choose Health teaching kit (29 pages) for teacher | $5 | |
| | 1 3-ring binder | $3 | |
| | Food for meal preparation throughout curriculum | $100 | |
| | Field trip to Tucson Village Farms ($9/student) | $180 | |
| | Transportation via bus for 25 people | $150 | |
| | Maintain school garden (soil, seeds, tools, water) | $30 | |
| | Print 6th-12th Grade EFNEP Youth Questionnaire - 2 pages per student for pre and post intervention (approximately 80 pages) | $12 | |
| | Print 6th-12th Grade EFNEP Youth Questionnaire Facilitator Guide – 20 pages for teacher and project facilitator (40 pages) | $6 | |
| | 20 Pencils for questionnaire | $3 | |
| | | | **+$854** |
| **Indirect Costs** | Teacher curriculum training (3 hours) | $60 | |
| | Time to prepare curriculum materials, food, and games (4.5 hours) | $130 | |
| | Time donated by cycling program facilitator to reenforce key curriculum points (volunteer-based) | $0 | |
| | | | **+$190** |
| **Funding Sources** | School is financially funded through donations from community | | |
| | Cycling program is funded through the OutRide grant | | |
| | Potential: USDA – Office of Partnerships and Public Engagement grant to support evidenced-based nutrition courses | -$500 | |
| | | | **-$500** |
| **Savings** | Reduction in childhood obesity, cardiovascular diseases, and metabolic disease (lifetime health care cost for 1 child due to childhood obesity) | -$19,340 | |
| | | | **-$19,340** |
| **Net Cost** | | | **-$18,796** |