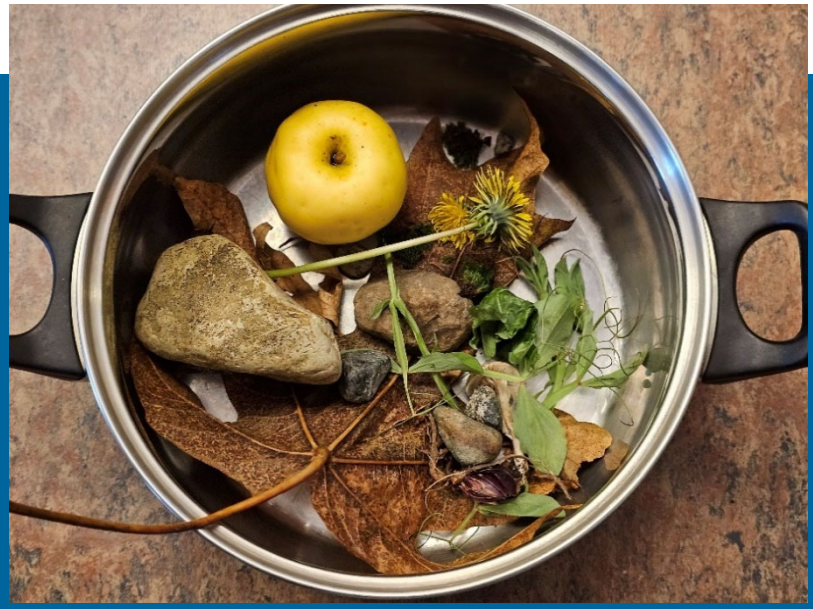
Evidence Brief:

# A Systematic Scoping Review of the Scope & Effectiveness of Food Literacy Interventions on Food Literacy

August 1, 2024



Provincial Health Services Authority

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## Acknowledgements

The British Columbia Centre for Disease Control's (BCCDC) works in collaboration with various groups throughout British Columbia and across diverse communities and populations, including First Nations, Métis, and Inuit peoples. We are grateful to all the First Nations who have cared for and nurtured the lands and waters around us for all time.

Our main office is located on the traditional and ancestral lands of the xʷməθkʷəy̓əm (Musqueam), Sḵwx̱wú7mesh Úxwumixw (Squamish), and səl̓ílwətaʔ (Tsleil-Waututh) Nations.

We acknowledge the past and current inequities experienced by Indigenous Peoples and are committed to advancing Indigenous-specific anti-racism and creating culturally safer environments.

### Prepared for

Food Skills, Prevention & Health Promotion team, BC Centre for Disease Control (BCCDC)

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## Key Messages

Community-based interventions to improve food literacy and promote healthy eating are a popular strategy in public health, however there is a gap in knowledge on best practices for food literacy interventions. We conducted a systematic scoping review of food literacy program evaluations to inform updates to the BC Centre for Disease Control's Food Skills for Families program.

Most food literacy interventions focus on improving individuals' food, nutrition and cooking knowledge, skills, and behaviors. Fewer interventions focus on the environments, social factors or systems that shape individuals' decisions about food.

The outcomes of food literacy interventions were very mixed. There is some evidence that food literacy interventions improve food and nutrition knowledge and cooking skills and shift some related attitudes, but these changes do not lead to consistent changes in eating and cooking practices or result in observable health changes.

Including a focus on environments in systems in program design and evaluating the impact of programs on those outcomes would respond to gaps in our understanding of the effectiveness of food literacy programs.

## Executive Summary

Population diets represent an important modifiable risk factor for the development of chronic disease.[1] Community-based interventions to improve food skills (FS) and food literacy (FL) have gained momentum as a public health strategy to promote healthy eating. As a result, there is a need to determine best practices for evidence-based FL interventions.

**We conducted a systematic scoping review to:**

1. Identify the definitional and theoretical foundations of FL and FS programs.
2. Characterize what components are included in FL and FS programs and how they may be classified within FL frameworks.
3. Identify what outcomes have been measured in experiential FL and FS programs.
4. Determine the effectiveness of FL and FS programs in achieving their desired outcomes and if outcomes differ between population groups.

A systematic literature search was conducted using PubMed, CINAHL, and Scopus in January 2024 and 57 studies met the full inclusion criteria. The included studies were analyzed for program scope and outcomes and categorized according to FL frameworks. The FL programs in this review mainly focused on improving individuals' food, nutrition and cooking knowledge, skills, and behaviors. Fewer interventions focus on the environments, social factors or systems that shape individuals' decisions about food.

There was significant heterogeneity in the literature regarding the structure of FL interventions, duration of intervention and follow-up, comparison groups, and outcomes measured. The effectiveness of these interventions remains unclear. Many studies found mixed results, but there is some evidence to suggest that FL interventions improve food and nutrition knowledge and cooking skills (CS) and shift some related attitudes, but these changes do not lead to consistent changes in eating and cooking practices or result in observable health improvements.

Robust evaluation of FL programs would be a valuable contribution to the current gaps in evidence and thus inform the designing curricula grounded in a clear understanding of what FL is and how it can be improved, addressing relational and systems competencies required to support nutritious and sustainable diets in nutrition education, and relatedly including program components that address system-level, or community and environmental, barriers to change.

# Background & Context

## Food Literacy & Population Health in BC

Population diets are an important modifiable risk factor for the development of chronic disease.[1] Sub-optimal diets are one of the leading causes for deaths and quality adjusted life years in Canada and globally[1,2] and a driver of health disparities[1,3]. Promoting and supporting more nutritious diets has been one strategy to improve population health outcomes.[4] In response, community-based interventions to improve food literacy (FL) and promote healthy eating have been a priority for the public health system in British Columbia (BC). Since 2008, the Food Skills for Families (FSF) program has delivered a hands-on, or experiential, food skills (FS) curriculum to communities across BC. FL is important to achieving adequate nutrition in food environments where low-cost, low-nutrient, high-calorie foods are readily available and heavily marketed, and in the context of colonization that disconnected many Indigenous Peoples from their lands and cultural practices.[5] The lasting effects of colonialism on Indigenous foodways on Turtle Island are well-studied and demonstrated to continue to negatively impact Indigenous food security and sovereignty.[6]

FL is a complex concept that has evolved over the past two decades from a narrower focus on individual food-related knowledge, skills, attitudes, and behaviors or practices such as purchasing, preparing, handling and storing food to also include external social, cultural, and environmental factors related to food.[7] These external factors include how food environments, food systems, and social factors impact individuals' decisions about food, and in turn, how individuals' food choices impact the food system. Across these factors are also vital social connections between people, food, identity, and land. Several recent reviews have been conducted that propose specific FL attributes, competencies, and themes[7-11]; however, there is no consensus on a definition of FL that includes these multifaceted concepts. While FL is interpreted and applied in many ways, few reviews have been published that characterizes the programs or interventions delivered under the umbrella of FL and report on intervention outcomes.[12]

## Purpose of the Review

The aim of this systematic scoping review was to synthesize available evidence on the scope and impact of FL interventions to inform updates to the BC Centre for Disease Control's FSF program.

**The objectives of the review are to:**

- Identify the definitional and theoretical foundations of FL and FS programs.
- Characterize what components are included in FL and FS programs and how they may be classified within FL frameworks.
- Identify what outcomes have been measured in experiential FL and FS programs.
- Determine the effectiveness of FL and FS programs in achieving their desired outcomes and if outcomes differ between population groups.

# Methods

## Approach

This review is a scoping study that uses a systematic approach to map the evidence on FL program components and outcomes.[13,14] A scoping review is appropriate to determine the coverage and range of literature on a topic and characterize studies that use different types of study designs.

**Our methodology consisted of the following steps:**

1. Identifying research questions;
2. Identifying relevant studies;
3. Selecting studies;
4. Extracting data; and
5. Synthesizing and analyzing results.

Studies were reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Review (PRISMA-ScR) guidelines[15] excluding quality appraisal. PROGRESS-plus was used to identify equity-relevant data on the sociodemographic characteristics of participants and the intervention setting.[16]

## Search Strategy & Article Selection

A systematic literature search was conducted in January 2024 for articles published between 2004 and 2024 given the increasing interest surrounding FL and FL programs over the last two decades. MeSH terms and text terms were input into PubMed, CINAHL, and Scopus. Search terms included: 'food skill*', 'food litera*', 'nutrition litera*', 'nutrition skill*', 'cooking skill*', 'culinary education', and 'experiential food', combined with AND 'program', 'intervention', 'curriculum', 'initiative', 'training', or 'workshop' AND 'evaluat*', 'outcome*', 'result*', 'impact', or 'effect*'.

## Articles were eligible for **INCLUSION** if they were:

1. Empirical studies that described an experiential FL intervention (including virtual interventions with an expected experiential component),
2. Reported outcomes or impacts (broadly defined),
3. Published in English, and
4. Applicable to the BC context (i.e., primarily from Organization for Economic Co-Operation and Development countries).

A preliminary literature search yielded an abundance of articles for the capacity of this review, lending to the development of exclusion criteria.

## Articles were **EXCLUDED** if they were:

1. Interventions delivered to children under 18 years of age without adult participation or as a school-based intervention, or
2. Designed for clinical populations or conditions that impact diet and eating behavior.

These exclusion criteria were selected to fit the current focus of BC Centre for Disease Control's FSF program. References from included articles were hand searched for additional relevant studies. Titles and abstracts were imported into Covidence, a systematic review platform. Two reviewers independently screened 50 titles and abstracts to ensure inter-rater agreement – initially reaching 80% agreement, and then came to consensus on all studies through discussion.

## Data Extraction & Synthesis

Following the screening process, full text articles were retrieved and reviewers co-screened one article with at least one other reviewer to confirm agreement on full text inclusion and data extraction. Altogether, six reviewers determined full-text inclusion and simultaneously extracted data from included articles. A data charting form was used to extract relevant details on publication characteristics, food and nutrition literacy and food and nutrition skills definitions, the intervention, participant characteristics, study design, and results (Appendix A).

Data synthesis involved producing descriptive quantitative summaries for study designs and participant characteristics. Additional analysis was conducted for FL intervention components and outcomes to using *a priori* core tenants or attributes of FL to further organize the literature. The Food Literacy Competencies for Young Adults framework by Slater et al.[7] was selected as a model to code intervention components. This model was selected as a FL framework that characterizes FL competencies at different levels, which is consistent with a socio-ecological perspective on healthy eating. Intervention outcomes were also themed based on higher-order concepts for consistency in reporting and to facilitate overall conclusions on the effectiveness of FL interventions. An outcome was coded as positive if it demonstrated a statistically significant improvement ($p<0.05$) towards a desired behaviour (i.e., a characteristic associated with increased FL) or a significant decrease in a less desirable behaviour (i.e., a characteristic associated with decreased FL).

In cases where different measurement tools were used to assess the same concept (e.g., food and nutrition knowledge) and produced different results, or if authors reported both positive and null results for different items in a tool or measure, results were coded as mixed. Based on limited quantitative reporting of differences in outcomes between groups, qualitative synthesis was conducted to identify the role of equity-related factors in intervention effectiveness.

# Results

Systematic database searches yielded 1102 articles after duplicates were removed. Based on title and abstract, 79 articles were identified for full-text review. An additional 22 articles were excluded in full text review. The primary reason for full-text exclusion was the intervention not including an experiential learning component. Other reasons for exclusion included: insufficient or absent outcome analyses, evaluation of more than one program that did not fit the inclusion criteria, and lack of a mandatory educational sessions (e.g., educational handouts mailed to participants' homes). Fifty-seven studies met the full inclusion criteria and were reviewed.

## Study Characteristics

Of the included studies, 10 were published between 2004 and 2013, 44 were published between 2014 and 2023, and 3 were published after 2023. The studies were mainly conducted in the United States (*n*=29) and Australia (*n*=11), followed by Canada (*n*=5), the United Kingdom (*n*=5), Scotland (*n*=3), the Netherlands (*n*=2), and one each in Ireland and Denmark. Sample sizes ranged from 2 to 62,000 participants; however, the one large sample size was a retrospective analysis of evaluation reports from a longstanding program.[17] Most studies included fewer than 200 individuals after accounting for attrition at the last reported time point for data collection.

Study designs were classified as quasi-experimental single-arm pre-post designs (*n*=43), experimental studies randomizing participants to an intervention or control arm (*n*=11), or qualitative studies (*n*=3). Twenty-three studies employed mixed methods: twenty-two combining quasi-experimental and qualitative methodology, and one combining experimental and qualitative methodology. Of the total number of included studies, the majority used repeated measures at various time points (*n*=54) with fewer measuring outcomes beyond immediate program completion (*n*=22). The time from enrollment/baseline to final data collection was typically at program completion after four to eight weeks. Of the 22 studies that measured longer-term outcomes, follow-up occurred most often at 6 months post-program completion and 24 months was the longest follow-up period.

## Participant Characteristics

In this review, participant socio-demographics were extracted based on PROGRESS-plus criteria including age, sex and/or gender, race/ethnicity, socio-economic status, and the community environment when reported by studies. Age was reported by 49 studies with most participants ranging from 37 to 45 years. Fifty-two studies reported sex or gender, and no studies reported both characteristics. Most samples were made up of majority participants who identified as female or woman, unless the intervention was targeted at males or men (e.g., fathers). Forty articles reported race, ethnicity, culture, or language, with most studies having a majority sample who identified as Caucasian or White and Black or African American; several programs also targeted Hispanic populations. Thirty-nine articles reported on participants' socioeconomic status based on proxy measures such as government assistance program participation or eligibility (e.g., United States Supplemental

Nutrition Assistance Program, Temporary Assistance for Needy Families, Medicaid) or area-level socioeconomic indices (e.g., Scottish Index of Multiple Deprivation, Socio-Economic Indexes for Areas). Nineteen studies described the community environment or context where the intervention was delivered, including geographic regions such as rural and remote areas or areas with poor food access (*n*=8) or living in areas of high social deprivation or disadvantage (*n*=12).

Studies were designed to reach and deliver interventions based primarily on familial status (e.g., parents of young children, grandparents, fathers of adolescents) (*n*=29), race, ethnicity, culture, or language (*n*=4), post-secondary education enrollment (*n*=4), age (e.g., older adults) (*n*=2), and health conditions (*n*= 2). As reported above, low-income was an additional focus for many interventions (*n*=39). Other eligibility criteria frequently cited throughout the literature included the ability to speak, read, and understand English, the absence of severe medical conditions, child age requirements (i.e., having children aged within a specific range), being the main meal preparer in the household, having no prior formal nutrition training or education, and interest in healthy eating and improving CS.

## FL Interventions: Theoretical Foundations & Program Logistics

Thirteen of the fifty-seven studies provided a definition of food or nutrition literacy, food or nutrition skills, or CS (**Table 1**). No articles provided a definition of more than one concept and generally, the terms were defined similarly. However, one definition of CS placed sole emphasis on the ability to prepare specific dishes. The other descriptions varied but shared several common concepts, notably food and nutrition-related knowledge (*n*=10), skills (*n*=12), and behaviors (*n*=10). Together, these pillars were identified as necessary to plan and manage, select, prepare, cook, and eat food. One study clearly acknowledged the understanding and navigating of external influences on the food system – or identified a systems-level component – as part of FL, and defined it as "greater resilience against food insecurity through the ability to employ multiple coping strategies to maximize limited resources and reduce impact on dietary intake".[18] In addition, one article that defined CS acknowledged the "complex environmental factors" (e.g., individual, social, and physical contexts) that influence food provisioning and cooking behaviours.[19] Definitions of FS placed more emphasis on specific food- and nutrition-related skills, such as budgeting, label reading, and storing foods.

**Table 1. Descriptions of FL, FS, & CS.**

| Defined Concept*: Food Literacy* | |
|---|---|
| **Author** | **Description** |
| **Parekh** [20] | “A person’s ability to access, process, and understand nutrition information” |
| **Begley** [21] | “A term to conceptualize the knowledge, skills and behaviours required to achieve healthy dietary intake/diet quality covering four domains of planning and management, selection, preparation and cooking and eating” |
| **Begley** [22] | "…. ‘composed of a collection of inter-related knowledge, skills, and behaviours required to plan, manage, select, prepare, and eat food to meet needs and determine intake’. The four domains—planning and management, selection, preparation, and cooking and eating—are essential components of a food literate person” |
| **Begley** [23] | "The interrelated knowledge, skills, and behaviors required to plan, select, prepare, and eat healthy foods” |
| **Bessems** [24] | "... has been distinguished into functional literacy and interactive or critical nutrition literacy. Functional literacy refers to “knowing what,” which relates to declarative knowledge, including reading and understanding information on factors that can affect health. Interactive or critical literacy refers to “knowing how” and has been related to procedural knowledge, which is how to translate declarative knowledge into positive dietary change” |
| **Dumont** [18] | "The knowledge, skills, and behaviours required to plan and prepare healthy, affordable food. A food literate person is thought to have greater resilience against food insecurity through the ability to employ multiple coping strategies to maximize limited resources and reduce impact on dietary intake” |
| **Tartaglia** [25] | “The combination of knowledge, skills and behaviours used to plan, manage, select, prepare and eat a healthy diet” |

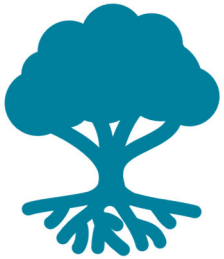
| **Defined Concept*: Food Skills*** | |
|---|---|
| **Butcher** [17] | “Collection of inter-related knowledge, skills, and behaviors (components) essential to achieving a healthy diet, captured within the four domains of plan and manage, select, prepare, and eat” |
| **Fultz** [26] | “Meal planning, preparation, shopping, budgeting, resourcefulness, and label reading/consumer awareness” |
| **Mahmoud** [27] | “The processes of planning, preparing, and storing food” |
| **Orr** [28] | "Knowledge about diet and nutrition and develop food-related skills such as cooking, budgeting and shopping” |
| **Defined Concept*: Cooking Skills*** | |
| **Beck** [29] | "Whether they could prepare a specific food item or a specific dish” |
| **Garcia** [19] | “Comprehensive set of knowledge, skills and behaviours, acknowledging the complex environmental factors that influence food provisioning and cooking behaviours” |

Thirty-one of the fifty-seven studies reported using a theory to understand health-promoting behaviors and the physical and social environments that support the desired change. Out of the 31 articles, 15 reported more than 1 theory of change. The most cited theoretical basis was Social Cognitive Theory (*n*=18), Theory of Planned Behaviour (*n*=4), and Experiential Learning Theory (*n*=3). Twenty-three other theories were referenced, four of which had an explicit socioecological approach as evidenced by the name of the theory or framework. The definitions of frequently cited theories or models are outlined in **Figure 1**.

**Figure 1: Definitions of Theories or Models Applied in Food Literacy Programs**

***Social Cognitive Learning Theory:*** Integrates the determinants of behavior with **methods for behavior** change by emphasizing the importance of observational learning (or modelling), reinforcement, and social experiences to the learning process. Social Cognitive Learning Theory also considers the interaction between personal factors such as self-efficacy and the social and physical environments.

***Theory of Planned Behavior:*** Sees **intention as the most important determinant of behavior**. Intention is influenced by attitudes towards a behavior, the perceived social expectations or norms from people in an individual's circle to perform the behavior and how important that opinion is, and an individual's perceived sense of control based on past experiences and anticipated obstacles.



***Experiential Learning Theory:*** Grounded in the idea that **learning is a holistic process** across cycles of engaging in a concrete new experience, reflecting on the experience from various perspectives, forming new ideas based on reflections, and engaging in active experimentation in real world contexts and observing the outcomes.

***Socioecological Model:*** Illustrates how behavior happens at the **interplay** between individuals and their intrapersonal, interpersonal, organizational, community, and policy/systems environments. Socioecological models are most often use to design comprehensive interventions that address **multiple levels of influence on a behavior.**

Of the 57 articles, 55 reported the duration of the FL program which varied from 1 to 40 weeks, with 42 of the 57 articles reporting a program duration of 4 to 12 weeks. The number of sessions held throughout the program was reported by 52 studies, and 42 of these had 4 to 10 sessions. On average, FL programs were comprised of 6 sessions. Several program models were evaluated by more than one study, including Food Sensations, Cooking Matters, Healthy Home Offerings via the Mealtime Environment, Jamie's Ministry of Food, Eat Better Feel Better, FoodMate by SecondBite, iCook 4-H, and Padres Preparados, Jóvenes Saludables [Geared Up Parents, Healthy Youth].

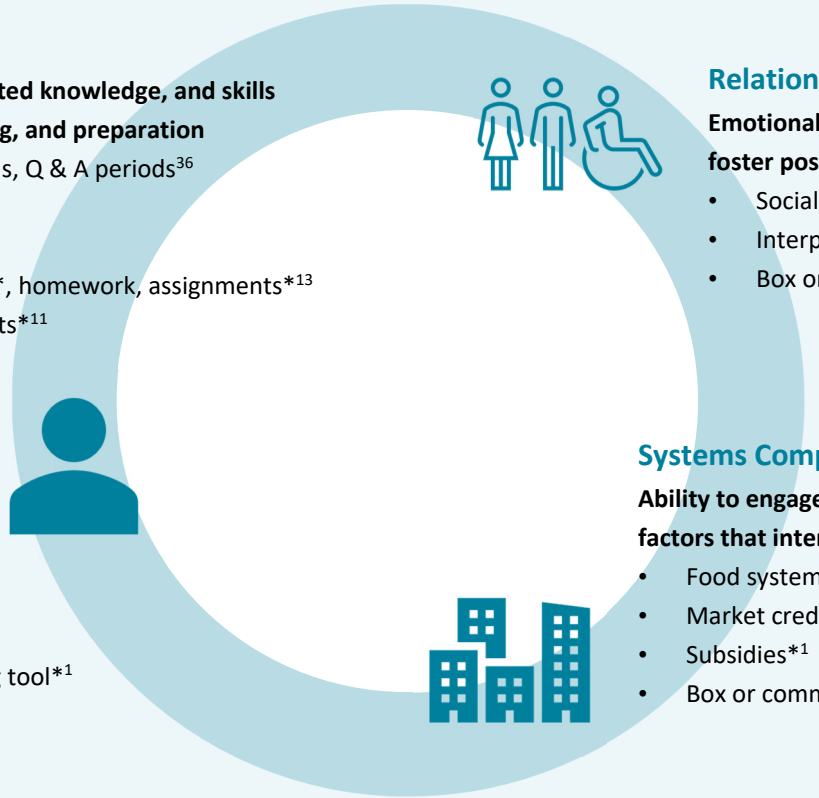
Many studies (44 of the 57) were identified as single component interventions that delivered FL education as a standalone program, and the remaining 13 described interventions that offered program components in addition to the baseline FL program such as take-home assignments, a box or community garden, and good food boxes. One of the multi-component interventions was evaluated with a randomized trial that compared the effectiveness of a single component FL intervention alone to that of the same program delivered alongside other intervention components to address determinants of healthy eating.[30]

## FL Intervention Characteristics

Based on the inclusion criteria all studies delivered an experiential food preparation component in the program or intervention delivery. **Figure 2** demonstrates FL intervention components and complementary activities organized according to Slater et al.'s Food Literacy Competencies.[7] Functional competencies include knowledge of food, nutrition and food safety along with food planning, budgeting, and preparation skills. Most interventions focused on developing functional competencies, delivered mainly through food and nutrition education and educational activities (e.g., group work, games, discussion, etc.), as well as food tastings, and cooking demonstrations. Food- and nutrition-related concepts covered during the program sessions varied, with some tailoring their content to the interests of the priority population. **Figure 3** reports select examples of lesson topics or concepts covered as part of food and nutrition education. Relational competencies include emotional and cultural dimensions such as eating and cooking with others and having a positive relationship with food. More than a quarter of interventions (*n*=15) featured relational competencies through social eating (i.e., sharing a meal with other participants), focusing on the importance of preparing and eating food with others. Systems competencies, or the ability to engage with and understand external influences on the food system, were addressed in a small number of interventions through complementary components to support engagement with local food systems such as vouchers for farmers' markets. Only one intervention explicitly targeted systems competencies in understanding issues of equity and sustainability in food systems through land-based learning.[31]

Of the 16 interventions that delivered additional (i.e., complementary) program components, many included ingredients for participants to take home to prepare foods demonstrated in class (*n*=11). Other examples of multi-component intervention components included educational materials (*n*=13), credits for farmer's markets (*n*=2), phone calls (*n*=1), and text messages (*n*=1). Complementary activities are denoted with a (*) in **Figure 2**.

**Figure 2. FL Intervention Components According to FL Competencies**



### Functional Competencies

**Food-, nutrition- and food safety-related knowledge, and skills pertaining to food planning, budgeting, and preparation**

- Activities – e.g., games, discussions, Q & A periods[36]
- Nutrition education[27]
- Food tasting[14]
- Take home educational materials*, homework, assignments*[13]
- Take home food and/or ingredients*[11]
- Goal setting[8]
- Grocery store tour, market visit[3]
- Kitchen tool kit*[3]
- Reading, books*[2]
- Emails*, newsletters*[2]
- Videos*, film screening[2]
- Parenting education*[2]
- Gardening classes[1]
- Home food environment scanning tool*[1]
- Online tools*[1]
- Phone calls*, text messages*[1]

### Relational Competencies

**Emotional and cultural influences that foster positive relationships with food**

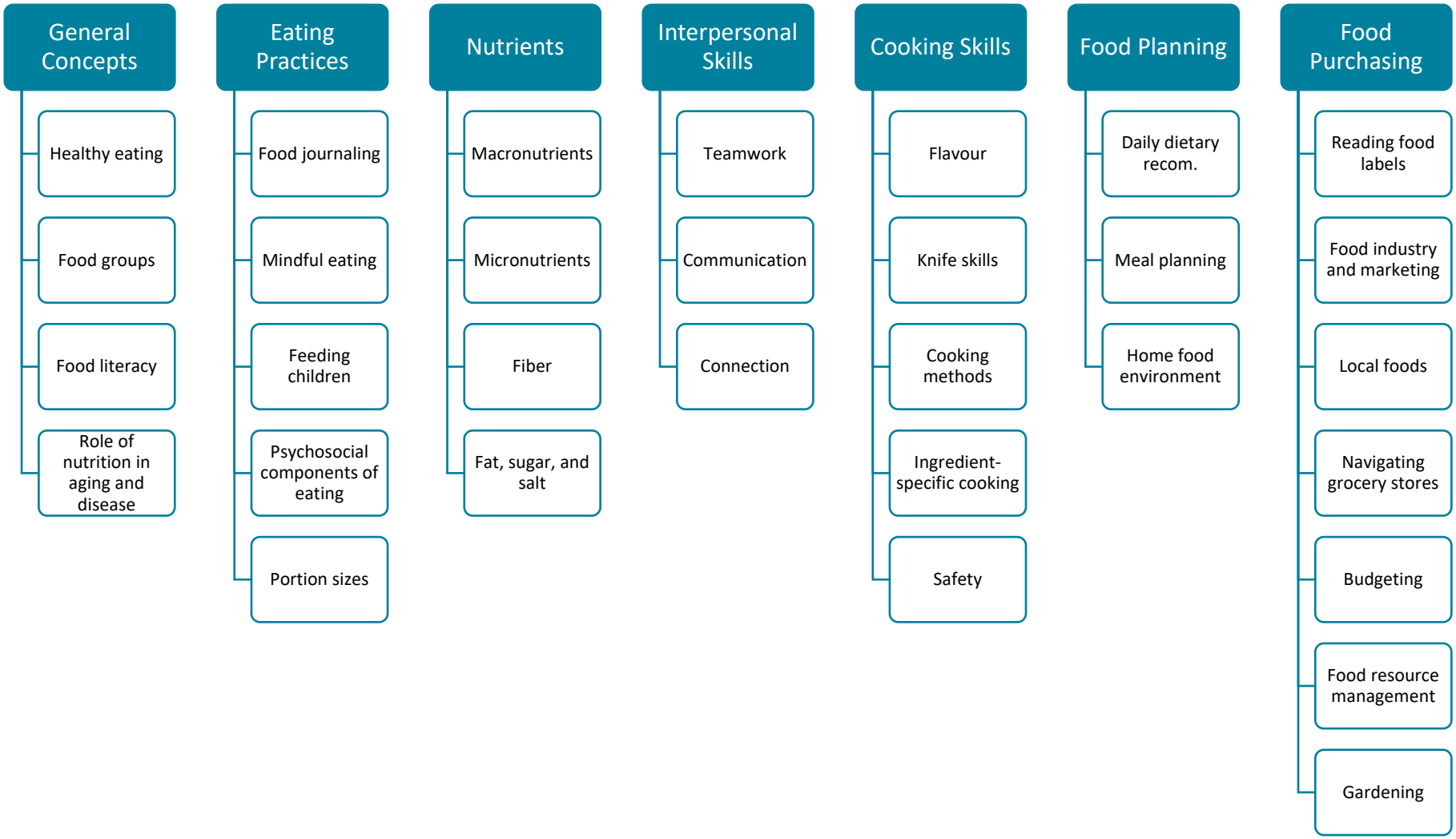
- Social eating[15]
- Interpersonal interactions[2]
- Box or community garden*[1]

### Systems Competencies

**Ability to engage with, and understand external factors that interact with food systems**

- Food system sustainability[1]
- Market credit*[2]
- Subsidies*[1]
- Box or community garden*[1]

**Figure 3. Examples of Food- & Nutrition-Related Categories Covered in Food & Nutrition Education Components of FL Programs**



## FL Intervention Outcomes

Fifty-four studies included an experimental or quasi-experimental quantitative design, of which forty-six reported at least one significant effect in one of the measured outcomes, meaning a significant difference between pre-post assessment or between the experimental or control groups. The majority of studies measured several outcomes and found positive results for some outcomes and no effect or mixed results for other outcomes. Often, authors defined an overall outcome (e.g., food and nutrition knowledge) but reported changes in the outcome of interest according to sub-components, particularly in cases where some sub-components were positive (e.g., knowledge of vegetable intake) but others were null (e.g., knowledge of fruit intake). While data extraction was conducted for sub-components, outcomes in studies that found a positive result for one sub-component but null for another sub-component were re-coded as a mixed result for the overall 'themed' outcome.

A total of 22 themed outcome measures were found across studies (**Table 2**). The most measured FL themes across all studies were adult (*n*=30) and child (*n*=4) dietary intake, adult (*n*=18) and child (*n*=3) CS, cooking confidence (*n*=20), and eating behaviors (*n*=17). The other measured outcomes included cooking practices and behaviors, cooking barriers, cooking attitudes, food resource management, the home food environment, self-efficacy, eating attitudes, food security, social connection, food and nutrition knowledge, food and nutrition beliefs, physical body measurements, and self-rated health. The results of FL interventions were highly variable across studies. Of the outcomes that were reported across several studies, the most consistent positive effects were observed for CS, cooking behaviors and practices, and food and nutrition attitudes. Less consistent results were reported for food and nutrition knowledge, eating attitudes, cooking confidence, food resource management, and dietary intake. Limited effects were observed for cooking attitudes, sense of self-efficacy, eating behaviors, the home food environment, and physical body measurements.

A small number of studies (*n*=16) using various methods reported differences in the effectiveness of interventions across populations. Of the studies that reported differences between sub-groups there were limited differences in reported outcomes based on educational attainment, race/ethnicity, and age. When differences were observed, these related to fewer improvements in dietary intake for younger populations and people with physical impairments[38], less change in food selection behaviors for metropolitan versus non-metropolitan participants[18], and a lower likelihood of improved cooking confidence and eating behaviors for participants from areas with high socio-economic deprivation[25].

No significant differences were reported between the results of single component and multi-component FL interventions – both yielded heterogenous results.

**Table 2. Descriptive Summary of Food Literacy Intervention Study Results**

| Outcome | # of studies measuring outcome | Subcategory Examples | Results (# of studies) |
|---|---|---|---|
| Cooking confidence | 20 | Level of confidence in cooking or preparing basic ingredients or following a recipe; cooking new foods | Positive (10) [18,25,32–39)]<br>Null (5) [26,40–43]<br>Mixed (5)[19,44–47] |
| Cooking skills | 18 | Food handling and preparation skills; ability to follow a simple recipe | Positive (13) [17,18,21–23,27,32,36,43,48–51]<br>Null (5): [29,39,41,52,53] |
| Cooking skills (child) | 3 | Food handling and preparation skills | Positive (2) [29,54]<br>Mixed (1) [55] |
| Cooking practices and behaviors | 6 | Frequency of eating ready-made meals, cooking in bulk, food waste | Positive (4) [49,51,54,24]<br>Null (1) [43]<br>Mixed (1) [39] |
| Cooking barriers | 2 | Time as a barrier | Null (2) [32,40] |
| Cooking attitudes | 7 | Enjoyment of cooking; belief that cooking is important for health | Positive (1) [56]<br>Null (5) [19,32,34,43,53]<br>Mixed (1) [40] |
| Food resource management | 15 | Planning, preparing, budgeting, shopping and label reading; | Positive (7) [18,21,22,27,49,50,57]<br>Null (4) [32,36,39,58]<br>Mixed (4) [23,24,56,59] |
| Home food environment | 7 | Food availability in home (e.g., fruit, vegetables, sugar sweetened beverages) | Positive (2) [32,51]<br>Null (5) [34,43,50,55,60] |
| Self-efficacy | 11 | Ability to eat healthier, ability to eat the recommended number of fruit/vegetable servings | Positive (3) [50,51,56]<br>Null (5) [35,43,47,55,58]<br>Mixed (3) [23,24,61] |
| Self-efficacy (child) | 2 | Ability to carry out food skills, ability to try new foods | Positive (2) [32,40] |

| | | | |
|---|---|---|---|
| Eating behaviors | 17 | Emotional eating; mindful eating; family dinner frequency; mealtime practices | Positive (5) [25,32,46,49,62]<br>Null (4) [40,52,55,58]<br>Mixed (8) [36,39,44,54,24,56,63,64] |
| Eating attitudes | 3 | Desire to eat more healthily; food preferences, openness to trying new foods | Positive (1) [56]<br>Null (2) [40,29] |
| Dietary intake (child) | 4 | Consumption of fruit and vegetables, takeaway and ready meals, and sugar sweetened beverages | Positive (1) [50]<br>Null (1) [40]<br>Mixed (2) [44,63] |
| Dietary intake (adult) | 30 | Consumption of fruit and vegetables, takeaway and ready meals, and sugar sweetened beverages | Positive (11) [30,25,36,38,45,21,51,54,24,57,65]<br>Null (8) [40,41,50,29,63,52,66,67]<br>Mixed (11) [18,20,22,23,28,35,42,46,48,60,61] |
| Food security | 4 | Running out of food by end of the month | Positive (1) [51]<br>Null (3) [33,49,58] |
| Social connection | 1 | Cooking and eating together | Null (1) [29] |
| Food and nutrition knowledge | 10 | Food and nutrition knowledge related to dietary recommendations, food groups, healthy food choices, and diet and weight management | Positive (5) [17,35,40,26,68]<br>Null (4) [34,24,56,65]<br>Mixed (1) [39] |
| Food and Nutrition knowledge (child) | 1 | Food and nutrition knowledge related to dietary recommendations, food groups, healthy food choices, etc. | Positive (1) [40] |
| Food and nutrition attitudes/beliefs | 5 | Costs of healthy foods, food preferences, preference toward cooking at home | Positive (4) [17,50,24,65]<br>Mixed (1) [56] |
| Food and nutrition attitudes/beliefs (child) | 1 | Preference toward cooking | Null (1) [40] |
| Anthropomorphic measurements *(e.g., Body Mass Index, waist circumference)* | 4 | Body Mass Index | Null (4) [55,56,63,64] |
| Self-reported health | 1 | General health | Positive [56] |

## Discussion

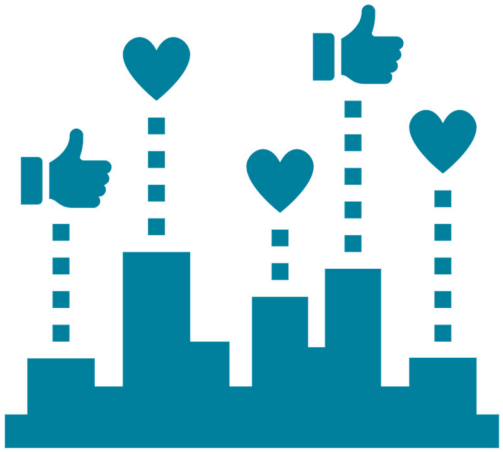
This scoping review identified a wide range of FL interventions delivered to diverse populations in community settings. Interventions followed a similar structure to BC Centre for Disease Control's FSF program, with each session including food and nutrition knowledge and skills, activities, discussions, and a cooking segment to reinforce knowledge and skills, as well as build self-efficacy and confidence. There was considerable variation in the program duration and target populations.

Our review found that only over half of the studies were based on theoretical models that offer a conceptual basis for behavioral change, consistent with other scoping reviews on FL interventions[12]. Only a small number of studies proposed a specific definition or set of competencies for food or nutrition literacy, which reflects a lack of clarity of these concepts in the broader FL literature.[7-11] To respond to this gap, we applied a FL model proposed by Slater et al.[7] and categorized intervention components as functional, relational, and systems competencies. Functional competencies include basic or procedural food and nutrition knowledge, and FS related to planning, preparation, and disposal. The relational dimension is the social, emotional, and cultural practices and competencies of eating and sharing food. System competencies are the interplay between individuals and the social, environmental, and economic facets of food systems. Although Slater et al.[7] highlight necessity of a comprehensive approach to FL curricula to address increasingly complex competencies, the studies in our review mainly focused on functional competencies, fewer on relational competencies and a very limited emphasis on systems competencies. Systems-level competencies were more addressed in a small number of multi-component interventions that targeted food environment barriers to more nutritious diets by reducing cost (e.g., market credits) or increasing accessibility (e.g., good food boxes) of food. It is possible that systems competencies could have been addressed in interventions that included information about the social and environmental impacts of the food system in as part of nutrition education, however without more detailed information on program content it is difficult to determine the extent of this focus. In the studies reviewed, limited attention to the effectiveness of addressing systems-level factors through FL interventions is a challenge given substantive evidence demonstrating that physical and social environments are important enablers and barriers to health behaviours, more than knowledge alone.[69-71] For example, a large number of the studies included in this review were targeted to households facing economic deprivation, yet there is evidence that food insecure individuals do not report significantly lower food and nutrition knowledge or FS than households who do not face economic barriers to food[72]. This review highlighted the emphasis FL program evaluation places on the role of functional competencies in improving dietary behaviours, and thus indicates the need for further research on the relational and systems impacts of interventions. Relatedly, there is a need to better understand the relative effectiveness of interventions that are more narrowly focused on basic knowledge about food and nutrition compared to interventions that address other critical barriers to more nutritious diets, such as income and food access, on food- and nutrition-related behaviors.

Consistent with the significant focus on functional competencies in interventions, dietary intake, cooking confidence, CS, and eating behaviors were most frequently measured across studies. Evidence for the effectiveness of FL programs for these and other outcomes was mixed, with the most consistent evidence for CS. Studies incorporating health measures reported consistently insignificant results, with limited impact on body mass index. Results were similarly insignificant for the effectiveness of FL interventions on improving food security. Notably, the social benefits of participating in these community initiatives were rarely measured; social connection was usually defined as frequency of doing tasks with others as opposed to more relational components like sense of belonging or increased feelings of social support. Inconsistent findings may be due in part to differences in the content and duration of interventions across studies, as well as differences in outcome definition and measurement. Overall, there is some evidence to suggest that FL interventions improve food and nutrition knowledge and CS and shift some related attitudes, but that these changes do not lead to consistent changes in eating and cooking practices or result in observable health improvements.

## Limitations

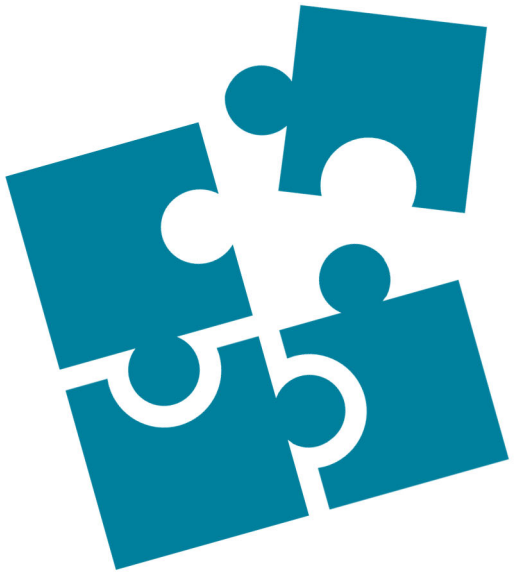
Research on the effectiveness of FL interventions is limited by significant differences in study designs, and in how FL is measured and reported. Additionally, few studies measured impacts beyond program completion, limiting the ability to draw conclusions about whether effects sustain after the completion of an intervention. Studies additionally had high attrition both during the intervention, and in the follow-up period. Commonly, studies featured small sample sizes, and employed convenience sampling methods. As such, interventions may have attracted participants who were already interested in cooking and recipe use, thereby increasing the baseline level of skills observed and deflating the impact of programs. In other words, programs were likely not reaching an audience who would truly benefit from attending them – those at highest risk of diet related disease.[42]



## Implications for Practice

As the importance of FL becomes increasingly recognized within public health initiatives, evaluating the effectiveness of these programs can refine program delivery, maximize impact, and inform policy and funding decisions. This review contributes to a growing body of reviews in this area; however, many questions remain about the impact of FL interventions and best practices to implement them. Gaps include the lack of clear consensus on FL, limited attention to the relationship between individuals and their environment, and minimal focus on the equity impact of programs, including the relevance of FL interventions to individuals who face systemic oppression.

To respond to these gaps, robust evaluations may help inform designing FL program curricula grounded in a clear understanding of what FL is and how it can be improved, addressing relational and systems competencies required to support nutritious and sustainable diets in nutrition education, and relatedly including program components that address system-level, or community and environmental, barriers to change. Nonetheless, BC Centre for Disease Control's FSF program may use the findings of this scoping review to refine their current curriculum (e.g., increase emphasis on engagement with food systems), explore additional program components (e.g., working with local community partners), and measure neglected program outcomes during program evaluation (e.g., relational competencies such as sense of belonging).



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## Appendix A: Data Charting Template Used to Extract Relevant Study Details

| | |
|---|---|
| **Article details**<br>Title<br>Authors<br>Article DOI<br>Year of publication<br>Country | **Intervention characteristics**<br>Intervention name<br>Theory of change<br>Geographic location<br>Intervention setting<br>Target population or community<br>Intervention duration – # of weeks<br>Intervention duration – # of sessions<br>Intervention durations – length of sessions<br>Timeframe<br>Single- or multi-component<br>Food skills or food literacy intervention details<br>Other intervention components<br>Intervention comparison for experimental designs |
| **Definition of food or nutrition skills/literacy**<br>Definition of food or nutrition skills (Y/N)<br>If yes, food or nutrition skills definition<br>Definition of food or nutrition literacy (Y/N)<br>If yes, food or nutrition literacy definition | |
| **Study design**<br>Aim of study<br>Type of study<br>If qualitative design, type of methods<br>If quantitative design, type of methods<br>Method of recruitment of participants<br>Total number of participants – intervention<br>Total number of participants – control (*if experimental design)<br>Total number of participants after lost to follow-up | **Results**<br>Main outcome of interest<br>Timepoints outcome reported<br>Outcome definition<br>Is the outcome/tool validated<br>Results<br>Results – additional notes<br>Differences between subgroups (Y/N)<br>Differences between subgroups – additional information<br>Author summary of main findings<br>Additional notes |
| **Participant characteristics**<br>Population – age<br>Population – sex<br>Population – gender<br>Population – race/ethnicity/culture/language<br>Population – socioeconomic status<br>Population – community environment<br>Other eligibility criteria | |