Canadian Food Studies La Revue canadienne des études sur l'alimentation

Perspective

Toward a common understanding of food literacy: A pedagogical framework

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Abstract

Food literacy is an evolving term fundamental to both health and education. The concept of food literacy (FL) typically has been informed by nutrition-focused thinking, with particular emphasis on food skills. Moving beyond this traditional focus is necessary to address the demands of consumers navigating today's complex food environments. Although the term is increasingly recognized, there is no consensus regarding the definition of food literacy or its conceptual dimensions. This paper describes a *Food Literacy Conceptual Model* that integrates multiple food literacy perspectives and theoretical frameworks. This *Food Literacy Conceptual Model* provides an enhanced framework with potential application as a pedagogical tool. As an interdisciplinary approach to food literacy, the conceptual model has the potential to increase teaching and learning effectiveness in the learner's context through educating on the core components of this construct. In addition, a learner's food literacy may be enhanced with the application of this practical and more inclusive, applied framing in the conceptual model.

Keywords: Food literacy

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DOI: 10.15353/cfs-rcea.v8i4.467
ISSN: 2292-3071

Introduction

Without a common understanding of FL, there are no shared identifiable variables and indicators for analysis, parameters for inquiry, or measurement tools (Pleasant et al., 2016; Rosas et al., 2019). This limits progress on "providing practical tools and tailored methodologies" (Palumbo, 2016, p. 105) for FL teaching, education, and learning, as well as policy and program development, implementation, and evaluation. To achieve this multifaceted goal and ultimately effect social change, a common understanding of, and respect for, FL needs to be more centrally positioned within education, social discourse, and public conscience.

How FL is conceptualized and communicated is therefore of timely importance. Through developing shared understanding and agreement around approaches, skills required, and use of resources by various researchers, government departments, non-government organizations, and schools, more attention can be directed at developing and enhancing FL. Understanding FL as comprising multiple interdisciplinary components has the potential to create opportunities for researchers, educators, practitioners, and policy makers to harness and situate their currently profound, yet, disparate perspectives. This new way of thinking has been identified as a new approach to teaching and learning (Classens & Stysma, 2020) and may, in fact, better position learners, researchers, educators, practitioners, and policy makers to explore the variety of factors and components within this construct in ways central to enhancing their collective practices and outcomes. Specifically, this new approach to FL has the potential to contribute to increasing the effectiveness of situating FL in the learner's context by emphasizing elements of systems thinking that may empower the learner to take action towards social change. The aim of this paper is to describe this more inclusive and applied interpretation and introduce a *Food Literacy Conceptual Model,* which provides an enhanced framework with potential application as a pedagogical tool to effectively plan and evaluate food literacy teaching, education, and learning as well as policies, programs, practices, and initiatives.

Literacy

Given that the concept and definition of 'literacy' has evolved over the years with varying perspectives but still no consensus, it is not surprising that we see a lack of a shared definition of FL which emerges from understandings of both literacy and health (also lacking a universal definition). In fact, Barton (2007) asserts identifying a precise definition of literacy may be an impossible undertaking. Notwithstanding the evolving, dynamic nature of defining literacy, four understandings of literacy have appeared in the literature which align with Pace's (1982) understanding of literacy as both a process and a product: 1) literacy as an autonomous set of skills; 2) literacy as applied, practiced and situated; 3) literacy as a learning process; and 4) literacy as text (UNESCO, 2006). Sørensen et al. (2012) assert literacy also includes contextual and societal transformation. Therefore, literacy can be viewed as the ability to construct meaning

in any given context (Pahl & Rowsell, 2005) that is embedded in social practices. Barton & Hamilton (1998) support this social perspective of literacy:

> Literacy is primarily something people do; it is an activity, located in the space between thought and text. Literacy does not just reside inside people's heads as a set of skills to be learned, and it does not just reside on paper, captured as text to be analyzed. Like all human activity, literacy is essentially social, and it is located in the interaction between people. (p. 3)

As such, a literate person must possess a wide range of abilities and competencies in the 21st century (NCTE, 2008), identified as multiliteracies. This concept of multiliteracies is inherently complex and social.

It is important to acknowledge that the term multiliteracies identifies learners' worldviews as a key component of their literacy development (New London Group [NLG], 1996) and is suggestive of a holistic approach to literacy comprising the "mind, society and learning" (NLG, 1996, p. 83). In fact, the original intent of multiliteracies was a pedagogical approach created for teachers in elementary and secondary schools (Cope & Kalantzis, 2000); however, with the changes in society due to globalization and the advancement of technology, our evolving understanding of literacy and literacy practices are continually being challenged. For that reason, health literacy, and by extension, nutrition and FL have emerged in recent years as specific components within literacy.

Health literacy

There has been increased awareness of the correlation between literacy and health with recent public health actions and interventions to promote health equity (Gillis, 2016). The term 'health literacy' was first coined in the 1970s and gained attention from education and healthcare; but has since expanded its scope and depth to include public health. In the early days of health literacy, there was a primary focus on "an individual's capacity (and motivation to learn) and the resources provided by the health care system" (Baker, 2006, p. 878). However, Nutbeam (2000), acknowledged health was not only "influenced by individual characteristics and behavioural patterns (lifestyle) but continues to be significantly determined by different social, economic, and environmental circumstances of individuals and populations" (Nutbeam, 2000, p. 260). This view is consistent with the emergence of health promotion thinking over the past 40 years and, in particular, with social determinants of health discourse.

Health literacy's importance is increasingly being recognized as a means to "meet the complex demands of health in modern society" (Sørensen et al., 2012), though there is "no universally shared definition" (Gillis, 2016, p. 87). In Canada, an expert panel on health literacy adopted the following definition of health literacy: "the ability to access, understand, evaluate and communicate information as a way to promote, maintain and improve health in a variety of

settings across the life-course" (CPHA, 2008, p. 11). Sørensen et al. (2012) addressed the issue of competing definitions of health literacy through research, which resulted in an integrated health literacy definition and framework. While "the current health literacy movement seeks to improve health outcomes and reduce health disparities through improved health communication systems and health education programs" (Freedman et al., 2009, p. 446), it is imperative that "communication…draw[s] upon personal experience, invite[s] interaction, participation and critical analysis" (Nutbeam, 2008, p. 2075). This perspective reflects the typology of functional, communicative/interactive, and critical health literacy as found in Table 1 (Nutbeam, 2000). This "typology for health literacy…has relevance to health promotion practice, including implications for framing [nutrition and] food literacy" (Gillis, 2016, p. 89) in programs aiming to increase FL teaching, education, and learning.

Table 1: Functional, Interactive, and Critical Health Literacy (Nutbeam, 2000)

Functional health literacy	Basic health literacy skills that are sufficient for individuals to obtain relevant health information and apply that knowledge to a limited range of prescribed activities
Interactive health literacy	More advanced literacy skills that enable individuals to extract information and derive meaning from different forms of communication; to apply new information to changing circumstances; and to interact with greater confidence with information providers such as health care professionals
Critical health literacy	Most advanced cognitive skills which, together with social skills, can be applied to critically analyze information, and to use this information to exert greater control over life events and situations

Nutrition literacy

Evidence suggests that "health literacy skills were found to correlate with numerous nutrition-specific skills such as estimation of portion sizes, understanding of nutrition labels, and seeking of and trust in nutrition information sources (Carbone & Zoellner, 2012). The connection between health and nutrition literacy surfaced since individuals with low literacy and numeracy levels are more likely to have poorer diet and health outcomes (Higgins et al., 2008). Nevertheless, many researchers such as Kickbush (2001) have highlighted that the health literacy construct is complex; Velardo (2015) notes ''it can mean many different things for different people" (p.386). Correspondingly, research has found the following concrete examples of health literacy application in nutrition knowledge and skills: knowledge of macronutrient intake, food groups, and food composition, combined with basic math and measurement competencies, as well as the ability to understand nutrition concepts if an individual is presented with a disease that has nutrition implications (Gibbs & Chapman-Novakofski, 2012).

Recently, a scoping review of nutrition literacy definitions was conducted and 14 definitions were found "which generally described knowledge, skills, and competence necessary for nutritional health" (Vetorri et al., 2019). A systematic review found six original definitions of nutrition literacy (Krause et al., 2018) and most of the definitions have "described the abilities necessary to obtain and understand nutrition information" (Krause et al., 2018, p.381) whereas,

> All definitions of nutrition literacy centered on an individual's cognitive capacities and strongly emphasized basic literacy and numeracy skills needed to understand and use information about nutrition. They argue that without these skills people cannot access and understand nutrition information and thus cannot build on nutritional knowledge, which is one of the keys to healthier eating practices. (Krause et al., 2018, p.381)

Parallel to health literacy, "three cumulative levels of nutrition literacy referred to as 'functional', 'interactive' and 'critical' nutrition literacy" (Guttersrud, Dalane, & Pettersen, 2014, p. 877) have been developed. Gillis (2016) notes, "nutrition literacy tends to align with the clinical [individual] approach to health literacy…rather than a health promotion context" (p. 95). Furthermore, nutrition literacy often takes the form of nutrition education to increase knowledge and practical skills. Murimi (2013) points out that "nutrition education focuses on food intake and how the body utilizes nutrients for growth, development, and health" (p. 195). This limits the focus to that of individuals and does not reflect the two sided approach to health literacy that looks beyond individual skills to the demands and complexities of the systems through which information is provided (Pleasant et al., 2016). This displaces the opportunity to engage in teaching, education, and learning about the far broader 'scope' related to FL.

Food literacy

Food literacy has been explored as a "sub-concept of health literacy", but it has recently emerged "as a relevant concept in its own right" (Gillis, 2016, p. 98). Progressing from food and nutrition knowledge and skills, FL is an evolving term fundamental to both health and education as it "is currently discussed as an aim of food education in the western world, partly inspired of a fundamental literacy understanding and partly of health literacy or other related literacy areas to food" (Benn, 2014, p. 13). A recent scoping review examined 38 novel FL definitions that demonstrated the breadth and depth of meanings that exist in health and education research (Truman et al., 2017). However, as often as FL is defined and referenced, there is no common understanding of this construct. Existing definitions vary greatly and repeatedly interrelate nutrition education, improved nutrition abilities, and cooking skills, while often reflecting the interests and discipline-specific context of those involved in developing them. These narrow interpretations miss the opportunity to connect "well-being at both the individual and collective level" (Palumbo, 2016, p. 104). Given these varying definitions of FL (akin to health literacy), it is not surprising that teaching, education and learning programs, practices, and policy initiatives are inadequate or compete against each other (Finley et al., 2017; Malloy-weir et al., 2016). Researchers, educators, practitioners, and policy makers' expertise may be adopted for diverse contributions to this evolving field of inquiry and practice; yet advancing the outcomes of FL, like improving individual and systems level health and well-being, requires some shared momentum and vision (Cardwell, 2005; Vigden & Gallegos, 2014). This work has begun;

Truman et al. (2017) found that despite the many novel, yet, diverse FL definitions, there are six common themes woven throughout these conceptualizations: knowledge, emotions, skills/behaviours, health/food choices, culture, and the broader food system. Rosas et al. (2019) explored domains, factors of influence, and potential determinants to advance the construct of FL and found congruence for many of the attributes acknowledged in the literature, though some concepts, specifically around influential factors and determinants, were presented and require further consideration.

Food literacy paradigms

Food literacy appears to be situated within two paradigms as reflected in various definitions throughout the literature. Some view FL as apolitical, highly individualistic, and lacking an overt consideration of the wide-ranging social or ecological context (Block et al., 2011; Bublitz et al., 2011; Cullerton et al., 2012; Fordyce-Voorham, 2011; Howard & Brichta, 2013; Kolasa et al., 2001; Murimi, 2013; Pendergast et al., 2011; Thomas & Irwin, 2013). In contrast, others argue the need to consider the broader environmental, social, economic, cultural, and political forces implicit in FL (Belotti, 2010; Benn, 2014; Cullen et al., 2015; Desjardins & Azevedo, 2013; Dyg, 2014; Kimura, 2010; Martin, 2018; Stinson, 2010; Sumner, 2013). By way of example, Vigden (2016) draws attention to the term FL as being "most often applied to the outcome of nutrition but is also applied to other food related outcomes, particularly environmental sustainability, informed consumerism, active citizenship, and food security" (p. 2). Given the expansive scope concerning food related outcomes, Sumner (2013) recognized there is a need to reframe FL as a social practice. She has connected Habermas' (1978) theoretical understanding of the three domains of knowledge to FL: empirical/analytic knowledge (reflects knowledge and skills adopted through individualistic approaches to food); historical/hermeneutic knowledge (understanding culture and meaning associated to food), and critical/emancipatory knowledge (critical reflection; exposing the hidden power within food system structures for social transformation). Slater (2013) advanced this notion whilst "encompassing applied and theoretical aspects of functional, interactive and critical 'food literacy'" (p. 623), which aligns with Nutbeam's (2000) typology of health literacy. Researchers have also acknowledged that multiple literacies such as civic literacy and cultural literacy (Zarcadoolas et al., 2005) and literacies related to agriculture and environment (Yeatman, 2016) are well aligned with FL, which considers the notion of how social, structural, and economic components interact with and influence food systems. This broader food systems lens has been described as 'food systems literacy' (Widener & Karides, 2014) which is outside the scope of this paper.

Food literacy has been described "as a crucial determinant of health improvement, environmental sustainability, and social equity" (Palumbo, 2016, p. 104). This broader, more comprehensive FL definition acknowledges benefits to the individual as well as the positive impact on health and environmental outcomes (Howard & Brichta, 2013) leading to a "viable improvement of the various determinants of individual and social well-being" defined as

'enhanced well-being sustainability' (Palumbo, 2016, p. 104). Vetorri et al (2019) suggest FL "could be described as a multidimensional concept that implies an individual dimension (knowledge, motivation, competences, and awareness) as well as the relationship between individuals and their context, aimed at consuming foods assuring nutritional health and a sustainable food system" (p. 13). Rosas et al (2019) outlines many influences that may enhance or hinder FL "within a larger scope, by including hierarchical relations among diverse aspects integrating the food system" (p. 25) to illustrate there are individual level factors as well as additional factor's that limit one's FL. As such, it is our responsibility to directly expose various learners to the importance of gaining individual food and nutrition skills (ie., knowledge, access, values, beliefs, culture) as well as provide supportive environments (ie., food environment, food and nutrition programs, access, availability, and affordability) to "enable individuals to implement their food literacy" (Poelman et al., 2018, p. 10). Doing so may support learners to interact with a critical FL perspective, considering the structural, social, environmental, and economic inequities and injustices.

Mapping and integrating multiple dimensions of food literacy

Recent research, including qualitative studies, systematic, and scoping reviews, have documented, analyzed and, in some cases, categorized different definitions, themes, domains, attributes, and concepts of FL to interpret its representation, introduce a new or integrated definition of FL, develop a new FL framework, or create evaluation measures (Amin et al., 2018; Azevedo Perry et al., 2017; Begley et al., 2018; Cullen et al., 2015; Krause et al., 2018; Palumbo et al., 2017; Poelman et al., 2018; Rosas et al., 2019; Slater et al., 2018; Truman et al., 2017; Velardo, 2015; Vetorri et al., 2019; Yuen et al., 2018). This timely body of research and theory has informed the development of the *Food Literacy Conceptual Model*.

The current literature on FL reveals the foundation of a conceptual model by illuminating many interconnections and overlapping dimensions. Through a comprehensive literature search and mapping exercise, the multiple dimensions of FL incorporated into the *Food Literacy Conceptual Model* have been summarized (Table 2). With a goal of uniting the multiple perspectives within FL, the initial step was informal interviews with practitioners, specialists, and scholars in various disciplines (i.e., public health, education, nutrition, political science, and agriculture) to bring in their unique perspectives. Next, a literature search, drawing on health, nutrition, agriculture, sociology, environment, economics, political science and education, was conducted. A search strategy was developed based on key concepts derived from the qualitative process and using relevant search terms for electronic bibliographic databases of peer-reviewed literature, supplemented by grey literature. Key FL concepts were extracted and mapped through populating a table that included the various theories, models, components, attributes, domains, pillars, and themes and were categorized by discipline, alongside a description and references. The goal of mapping these concepts was to integrate and group similar concepts into dimensions. Finally, an iterative process was used by the authors to synthesize the dimensions into the

conceptual model. The following multiple literacies were captured within the umbrella of FL: health literacy, nutrition literacy, agri-food literacy, food media literacy, civics literacy, cultural literacy, and eco-literacy.

Table 2: Multiple Dimensions of Food Literacy Conceptual Model

Author/Year	Type of Literacy	Definition
Sorenson et al., 2012	Health Literacy	Linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise, and apply health information in order to make judgments and decisions in everyday life concerning healthcare, disease prevention, and health promotion to maintain or improve quality of life during the life course.
Zoellner, Connell, Bounds, Crook, & Yadrick, 2009	Nutrition Literacy	The degree to which individuals have the capacity to obtain, process, and understand nutrition information and skills needed in order to make appropriate nutrition decisions.
	Agri-Food Literacy	**No formal definition as of yet; a combination of agricultural and agroecology literacy*
	Agricultural Literacy	
American Farm Bureau Foundation for Agriculture, n.d.		To understand the relationship between agriculture and the environment, food, fiber and energy, animals, lifestyle, the economy, and technology.
	Agroecology	
Francis et al., 2003		To understand the entire food system, encompassing ecological, economic, and social dimensions.
Peterson, 2012	Food Media Literacy	The ability to critically respond to food-oriented media [written, verbal, visual] that might empower people to pursue healthier choices in a commercially driven food landscape.
Zarcadoolas, Pleasant, & Greer, 2005	Civics Literacy	The abilities that enable citizens to become aware of public issues and to become involved in the decision-making process related to food [and food systems].
Zarcadoolas, Pleasant, & Greer, 2005	Cultural Literacy	The ability to recognize and use collective beliefs, customs, worldview, and social identity in order to interpret and act on health [and food related] information.
Puk, 2009	Eco-literacy	The capacity, based on a comprehensive understanding of the interconnections between natural systems and human systems, to make informed decisions about the future of life in relation to food [and food systems].

Health literacy is foundational to FL as it "frames literacy as a continuum of proficiency that benefits not only the individual but society more broadly" (Truman, et al., 2019, p. 9), as such, it may be a mechanism that leads to empowerment. In order to achieve critical health literacy with the aim of benefiting society more broadly through empowerment, it is necessary to focus on "an ability to question and reflect on the prevailing power relations and societal conditions; increased senses of power, self-esteem, and self-efficacy; and an ability to utilize these resources to engage in social and political action for change" (Crondahl & Karlsson, 2016, p.1). Nutrition literacy is "conceptualized as a specific form of FL" (Krause et al., 2018; Vetorri et al., 2019) and may "be considered as an independent concept" (Vetorri et al., 2019). Nutrition literacy is therefore considered one dimension within the more inclusive and applied concept of FL and has been

referred to as a "prerequisite" for individual FL (Schlüter, et al., 2020, p. 4). Although no formal definition appears yet in the literature, the emergent term 'agri-food literacy' captures the essence of agricultural literacy and agroecology. As a key element of FL, agri-food literacy represents the intersection between agriculture and food systems. The following definition for agri-food literacy is offered for consideration:

> The ability of an individual to understand the interrelationship between agriculture and food systems, including ecological, economic, social/historical, political, and cultural components in ways that contribute to personal and environmental health and well-being.

Moreover, food media literacy, civics literacy, cultural literacy, and eco-literacy are interrelated, yet distinct concepts, and highly overlap with the other literacies within the inclusive and applied FL approach. Food media literacy is "preoccupied with producing educated citizens able not only to engage with, but also to challenge and change broader social conditions" (Truman, et al., 2019, p. 10) such as inequities and injustices. Civics literacy, cultural literacy, and eco-literacy include making individual decisions while embracing the interests of the broader public and ecological health targets (Zarcadoolas et al., 2005). In doing so, environmental, economic, cultural, social, and political considerations are taken into account in the *Food Literacy Conceptual Model*, thereby comprising the critical literacy domain of FL with a goal of food citizenship. Food citizenship has been defined as "the practice of engaging in food-related behaviors that support, rather than threaten, the development of a democratic, socially, and economically just, and environmentally sustainable food system" (Wilkens, 2005, p. 271). Therefore, how FL is conceptualized is important for social change. Furthermore, integrating these considerations into the multiple dimensions of the more inclusive and applied FL construct removes the false dichotomy of an individualistic notion of FL contradicting that of the broader societal context. Rather, the individualistic notion of FL is a component within this construct of FL. As such, it is important to note that the *Food Literacy Conceptual Model,* which encapsulates these dimensions, does not comprise a simple progression.

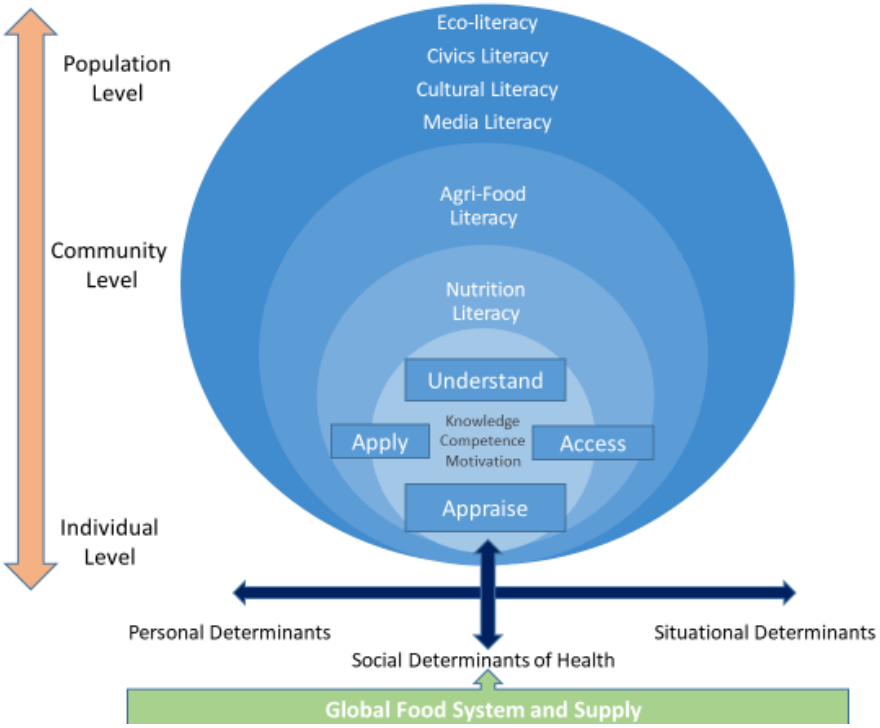
Food literacy conceptual model

Given that food and health are synergistic, there is a need to bridge health literacy and FL. Both health literacy and FL are multidimensional, consist of diverse components and have no unanimously accepted definitions in the literature. Both literacies consider an individualistic approach while acknowledging the many system-level factors and forces that influence and/or impact an individual's extent of health literacy or FL. Understanding the intersection of health literacy and FL is essential in order to advance FL education, interventions, policy, programs, and practice. Hence, we saw the need to incorporate the various domains of literacy into a conceptual model in order to demonstrate the integrated and interdisciplinary nature of this construct and to inspire development of a shared understanding of FL.

The *Food Literacy Conceptual Model* (Figure 1) includes an interpretive approach and a deeper understanding of FL through an interdisciplinary lens by building upon Cullen et al.

(2015) *Food Literacy Framework for Action* conceding that "individual behaviours and skills cannot be separated from their environmental or social context" (p. 144) and adapting Sørensen et al. (2012) *Integrated Model of Health Literacy* while taking into consideration the various themes, attributes, domains, competencies and concepts of FL described in the literature (Amin et al., 2018; Azevedo Perry et al., 2017; Begley et al., 2018; Cullen et al., 2015; Krause et al., 2018; Palumbo et al., 2017; Poelman et al., 2018; Slater et al., 2018; Truman et al., 2017; Velardo, 2015; Vetorri et al., 2019; Yuen et al., 2018). As previously stated, the broader ecological public health perspective was included in Cullen et al.'s (2015) FL definition and framework; this was foundational for framing this conceptual model with a strong focus on critical literacy and engagement in order to lay the "groundwork for engaging with food systems' power structures" (Renwick & Powell, 2019, p. 29). The *Food Literacy Conceptual Model* also builds upon the framing that Renwick and Powell (2019) shared as situating FL as "developing the knowledge, critical thinking, analytical, and communication skills necessary to join communities surrounding food systems and the social relations in which they are embedded" (p. 29). Fundamentally, this *Food Literacy Conceptual Model* provides a starting point to evolve our thinking about FL and to highlight the need for a shared understanding building on the multiple and interdisciplinary perspectives and worldviews in the literature. This approach sets it apart from existing conceptual models and frameworks examining key domains, attributes, and competencies specific to FL to an expanded model that highlights the interdisciplinary approach while putting more emphasis on the "literacy" aspect coalesced from the various perspectives in the literature. This model has been academically recognized and integrated into the recently published "Conceptual Model Map on Health and Nutrition Behavior", which aims to demonstrate "the connections between different theories and constructs in the field of health and nutrition" (Schlüter et al., 2020, p. 8).

Figure 1. Food literacy conceptual model



Reminiscent of health literacy, the *Food Literacy Conceptual Model* integrates the characteristics of a conceptual model delineating the main dimensions of FL, and a logical model illustrating the proximal and distal factors that impact on health literacy (Sørensen et al., 2012), and ultimately FL. Furthermore, the core of the model illustrates the concepts that relate to individual influences such as "knowledge, skills, access, values, and beliefs, which interact with community factors including policies, programs, availability, and culture. This leads to a comprehensive understanding of food systems and food within culture and society, all culminating in how food choices impact health and wellbeing" (Cullen et al., 2015, p. 143). Likewise, the center of the model captures the essence of Sørensen et al. (2012) competencies of understanding, accessing, appraising, and applying health and food-related information:

(1) *Understand* refers to self-awareness and the agency to comprehend and make meaning of food-related information that is accessed;
(2) *Access* refers to the ability to seek, find and obtain relevant food-related information;
(3) *Appraise* describes the ability to interpret, filter, judge and evaluate the food- related information that has been accessed for credibility of information as well as relevance to one's food related needs and goals; and
(4) *Apply* refers to the ability to communicate and use food-related information to make a decision to maintain, improve, and promote health (in the larger context of self, community, and

environment) (Sørensen et al., 2012, p. 9) through practical hands-on food skills and critical thinking. The above named competencies also align with Nutbeam's (2000) and Slater's (2013) typology for health (food) literacy: functional, communicative/interactive and critical health (food) literacy as well as Habermas' (1978) three domains of knowledge: empirical/analytic knowledge (reflects knowledge and skills adopted through individualistic approaches to food), historical/hermeneutic knowledge (understanding culture, history, and meaning associated with food experience), and critical/emancipatory knowledge (critical reflection; exposing the hidden power within food system structures for social transformation).

Moving away from the core of the model, each of the FL concepts embodies a fundamental dimension represented as nested circles, akin to Bronfenbrenner's ecological model of human development (1979), two demonstrate the complex and interrelated construct of FL. Each dimension of FL integrates the features of functional (basic knowledge), interactive (hands-on, practical food skills) and critical FL (critically analyzing and appraising information to engage in food related actions to overcome challenges related to personal, structural, social and economic barriers to accessing food for health and well-being); though not visually depicted in the model. Furthermore, this *Food Literacy Conceptual Model* acknowledges that in order to foster the critical/emancipatory aspects of food, the knowledge and skills in each of the knowledge domains should be realized; each of these knowledge domains may develop at different paces and through varying experiences, which aligns with Bronfenbrenner's thinking around human development.

Given the challenges related to accessing food for health and the "growing concerns about social inequities and health inequalities" (Gillis, 2016, p. 98), the need to identify other factors and forces influencing health, social equity, and FL is recognized. The foundation of the model identifies the more distal factors, including the global food system and supply leading up to "the societal and environmental determinants (i.e., demographics, culture, language, political forces, societal systems), proximal factors, which are more concerned with personal determinants (i.e. age, gender, race, socioeconomic status, education, occupation, employment, income, literacy) and the situational determinants (i.e. social support, family and peer influences, media use and physical environment)" (Sørensen et al., 2012, p. 10). Furthermore, as individuals engage with food on a daily basis, the context related to food is temporal and thus requires development of their knowledge, skills, and competencies to navigate and challenge the food system and environment in which we live as the context changes and demands for FL evolve.

Conclusion

Many diverse disciplines can contribute to improving FL. Although FL often focuses on individuals, it also embraces the public health lens placing importance on other aspects of food such as a sustainable food supply (agriculture) and the environment. Not all disciplines focus on the core elements of public health; nevertheless, they can still contribute to the more inclusive

and applied context of FL through teaching, education, and learning as well as population-based programs, practices, initiatives, and policies. Thus, FL truly has an interdisciplinary scope and must be interpreted as such.

This *Food Literacy Conceptual Model* can serve as a basis for developing FL pedagogy, policies, programs, practices, and initiatives and can provide a conceptual basis for the development and validation of evaluation tools. For example, this Food Literacy Conceptual Model may be used in developing food and nutrition related curriculum, standards for professionals, and the basis for creating and evaluating FL programs. Based on these analyses that ground this *Food Literacy Conceptual Model* and integrate the individual and public health perspectives, we call for the appreciation, application and adoption of the concepts intertwined in the *Food Literacy Conceptual Model*. This will lend itself to aligning pedagogical aims, content, vision, strategies, and priorities within and across teaching, education, and learning, as well as within and across academia, government, and non-government organizations locally, nationally, and internationally.

References

American Farm Bureau Foundation for Agriculture. (2017). *What is agricultural literacy?* Retrieved from https://www.agfoundation.org/what-is-ag-literacy

Amin, S. A., Panzarella, C., Lehnerd, M., Cash, S. B., Economos, C. D., & Sacheck, J. M. (2018). Identifying food literacy educational opportunities for youth. *Health Education & Behaviour*, *45*(6), 918–925. https://doi.org/10.1177/1090198118775485

Azevedo Perry, E., Thomas, H., Samra, H. R., Edmonstone, S., Davidson, L., Faulkner, A., Petermann, L., Manafò, E., & Kirkpatrick, S. I. (2017). Identifying attributes of food literacy: a scoping review. *Public Health Nutrition*, *20*(13), 2406–2415. https://doi.org/10.1017/S1368980017001276

Baker, D. W. (2006). The meaning and the measure of health literacy. *Journal of General Internal Medicine,* 21(8), 878–883. https://doi.org/10.1111/j.1525-1497.2006.00540.x

Barton, D. (2007). *Literacy: An introduction to the ecology of written language* (2nd ed). Routledge.

Barton, D, & Hamilton, M. (1998). *Local literacies: Reading and writing in one community.* London: Routledge.

Begley, A., Paynter, E., & Dhaliwal, S. S. (2018). Evaluation tool development for food literacy programs. *Nutrients*, *10*(11). 1617. https://doi.org/10.1111/j.1525-1497.2006.00540.x

Belotti, B. (2010). Food literacy: Reconnecting the city with the country. *Agricultural Science*, *22*(3), 29–34. https://doi.org/10.1016/j.aaspro.2016.02.013

Benn, J. (2014). Food nutrition or cooking Literacy - a review of concepts and competencies regarding food education. *International Journal of Home Economics*, *7*(1), 13–35. https://doi.org/10.1111/ijcs.12471

Berkowitz, A. R., Ford, M. E., & Brewer, C. A. (2004). A framework for integrating ecological literacy, civics literacy, and environmental citizenship in environmental education. *Environmental Education and Advocacy: Changing Perspectives of Ecology and Education*, *227*, 66.

Block, L. G., Grier, S. A., Childers, T. L., Davis, B., Ebert, J. E. J., Kumanyika, S., Lackzniak, R.N., Machin, J.E., Motley, C.M., Peracchio, L., Pettigrew, S., Scott, M., & Bieshaar, M.N.G.G. (2011). From nutrients to nurturance: A conceptual introduction to food well-being. *Journal of Public Policy & Marketing*, *30*(1), 5–13. https://doi.org/10.1509/jppm.30.1.5

Bublitz, M. G., Peracchio, L. A., Andreasen, A. R., Kees, J., Kidwell, B., Miller, E. G., Motley, C.M., Peter, P.C., Rajagopal, P., Scott, M.L., & Vallen, B. (2011). The quest for eating right: Advancing food well-being. *Journal of Research for Consumers*, 19(1), 1-12.

Bronfenbrenner, U. (1979). The ecology of human development: Experiments by nature and design. Cambridge, MA: Harvard University Press.

Canadian Public Health Association. (2008). *A vision for a health literate Canada: Report of the expert panel on health literacy*. Retrieved from https://www.cpha.ca/sites/default/files/uploads/resources/healthlit/report_e.pdf

Carbone, E. T., & Zoellner, J. M. (2012). Nutrition and health literacy: A systematic review to inform nutrition research and practice. *Journal of the Academy of Nutrition and Dietetics*, *112*(2), 254–265. https://doi.org/10.1016/j.jada.2011.08.042

Cardwell, V. B. (2005). Literacy: What level for food, land, natural resources, and environment? *Journal of Natural Resources and Life Sciences Education*, *34*, 112. https://doi.org/10.2134/JNRLSE.2005.0112

Classens, M., & Sytsma, E. (2020). Student food literacy, critical food systems pedagogy, and the responsibility of postsecondary institutions. *Canadian Food Studies*, *7*(1), 8-19. https://doi.org/10.15353/cfs-rcea.v7i1.370

Cope, B., & Kalantzis, M. (2000). *Multiliteracies: Literacy learning and the design of social futures*. Routledge.

Crondahl, K., & Karlsson, L.E. (2016). The nexus between health literacy and empowerment: A scoping review. *SAGE Open*, 1-7. https://doi.org/10.1177/2158244016646410

Cullen, T., Hatch, J., Martin, W., Higgins, J. W., & Sheppard, R. (2015). Food literacy: Definition and framework for action. *Canadian Journal of Dietetic Practice and Research*, 76(3), 140–145. https://doi.org/10.3148/cjdpr-2015-010

Cullerton, K., Vigden, H. A., & Gallegos, D. (2012). *A review of food literacy interventions targeting disadvantaged young people.* Retrieved from http://eprints.qut.edu.au/53753/1/food_literacy_interventions_review_final.pdf

Desjardins, E., & Azevedo, E. (2013). Making something out of nothing. Food literacy among youth, young pregnant women and young parents who are at risk of poor health. *Food Secure Canada*. Retrieved from http://foodsecurecanada.org/sites/default/files/report_ldcp_foodskills_dec2013.final5_.pdf

Dyg, P. M. (2014). *Fostering food literacy and food citizenship through farm-school cooperation and beyond - Theoretical perspectives and case studies on farm-school cooperation and food and agriculture education.* [Doctoral dissertation, Aalborg University, Copenhagen, Denmark]. Retrieved from https://www.researchgate.net/publication/265090948_Dyg_PM_2014_Fostering_Food_Literacy_and_Food_Citizenship_through_Farm-School_Cooperation_and_beyond_-_Theoretical_perspectives_and_case_studies_on_farm-school_cooperation_and_food_and_agriculture_educ

Finley, J. W., Dimick, D., Marshall, E., Nelson, G. C., Mein, J. R., & Gustafson, D. I. (2017). Nutritional sustainability: Aligning priorities in nutrition and public health with agricultural production. *Advances in Nutrition: An International Review Journal*, *8*(5), 780–788. https://doi.org/10.3945/an.116.013995

Fordyce-Voorham, S. (2011). Identification of essential food skills for skill-based healthful eating programs in secondary schools. *Journal of Nutrition Education and Behaviour*, *43*(2), 116–122. https://doi.org/10.1016/j.jneb.2009.12.002

Francis, C., Lieblein, G., Gliessman, S., Breland, T. A., Creamer, N., Harwood, R., Salomonsson, L., Helenius, J., Rickerl, D., Salvador, R., Wiedenhoeft, M., Simmons, S., Allen, P., Altieri, M.A., Flora, C., & Poincelot, R. (2003). Agroecology: The ecology of food systems. *Journal of Sustainable Agriculture*, *22*(3), 99–118. https://doi.org/10.1300/J064v22n03_10

Freedman, D.A., Bess, K.D., Tucker, H.A., Boyd, D.L., Tuchman, A.M., & Wallston, K.A. (2009). Public health literacy defined. *American Journal of Preventative Medicine*, *36*(5): 446-51. https://doi.org/10.1016/j.amepre.2009.02.001

Gibbs, H., & Chapman-Novakofski, K. (2012). Exploring nutrition literacy: Attention to assessment and the skills clients need. *Health*, *4*(3), 120–124. https://doi.org/10.4236/health.2012.43019

Gillis, D.E. (2016). Using a health literacy frame to conceptualize food literacy. In H. Vigden (Eds.). *Food literacy: Key concepts for health and education* (pp. 85-101). Routledge.

Guttersrud, Ø., Dalane, J. Ø., & Pettersen, S. (2014). Improving measurement in nutrition literacy research using Rasch modelling: examining construct validity of stage-specific "critical nutrition literacy" scales. *Public Health Nutrition*, *17*(04), 877–883. https://doi.org/10.1017/S1368980013000530

Higgins, C., Lavin, T., & Metcalfe, O. (2008). *Health impacts of education: a review.* Institute of Public Health in Ireland.

Howard, A., & Brichta, J. (2013). *What's to eat? Improving food literacy in Canada.* Health Canada. Retrieved from http://europepmc.org/abstract/med/1768995

Kickbusch, I. S. (2001). Health literacy: Addressing the health and education divide, *Health Promotion International*, 16(3), 289-297. https://doi.org/10.1093/heapro/16.3.289

Kimura, A. H. (2010). Food education as food literacy: privatized and gendered food knowledge in contemporary Japan. *Agriculture and Human Values*, 28(4), 465–482. https://doi.org/10.1007/s10460-010-9286-6

Kolasa, K. M., Peery, A., Harris, N. G., & Shovelin, K. (2001). Food literacy partners program: A strategy to increase community food literacy. *Topics in Clinical Nutrition*, *16*(4), 1-10. https://doi.org/ 10.1097/00008486-200116040-00002

Krause, C., Sommerhalder, K., Beer-Borst, S., & Abel, T. (2018). Just a subtle difference? Findings from a systematic review on definitions of nutrition literacy and food literacy. *Health Promotion International*, *33*(3), 378–389. https://doi.org/10.1093/heapro/daw084.

Malloy-weir, L. J., Charles, C., Gafni, A., & Entwistle, V. (2016). A review of health literacy: Definitions, interpretations, and implications for policy initiatives. *Journal of Public Health Policy*, *37*(3), 334–352. https://doi.org/10.1057/jphp.2016.18

Martin, A. (2018). *The socio-environmental aspects of students' food literacy: An exploratory case study of two Ontarian high schools*. [Doctoral dissertation, University of Ottawa, Ottawa, Canada]. Retrieved from https://ruor.uottawa.ca/bitstream/10393/37320/1/Martin_Alicia_2018_thesis.pdf

Murimi, M. W. (2013). Healthy literacy, nutrition education, and food literacy. *Journal of Nutrition Education and Behavior*, *45*(3), 195. https://doi.org/10.1016/j.jneb.2013.03.014.

National Council of Teachers of English (NCTE). (2008). *The NCTE definition of 21st century literacies*. Retrieved from http://www.ncte.org/positions/statements/21stcentdefinition

New London Group. (1996). Pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, *66*(1), 60–92. https://doi.org/10.17763/haer.66.1.17370n67v22j160u

Nutbeam, D. (2000). Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International*, *15*(3), 259–267. https://doi.org/10.1093/heapro/15.3.259.

Nutbeam, D. (2008). The evolving concept of health literacy. *Social Science & Medicine*, *67*(12), 2072–2078. https://doi.org/10.1016/j.socscimed.2008.09.050.

Pace, C. R. (1982). *Achievement and the quality of student effort*. National Commission on Excellence in Education. Retrieved from http://eric.ed.gov/?id=ED227101

Pahl, D. K., & Rowsell, D. J. (2005). *Literacy and education: Understanding the new literacy studies in the classroom*. Thousand Islands, California: SAGE Publications Inc.

Palumbo, R. (2016). Sustainability of well-being through literacy. The effects of food literacy on sustainability of well-being. *Agriculture and Agricultural Science Procedia*, *8*, 99–106. https://doi.org/10.1016/j.aaspro.2016.02.013.

Pendergast, D., Garvis, S., & Kanasa, H. (2011). Insight from the public on home economics and formal food literacy. *Family and Consumer Sciences Research Journal*, *39*(4), 415–430. https://doi.org/10.1111/j.1552-3934.2011.02079.x.

Peterson, T.L. (2012). Exploring baseline food media literacy of adult women. *Journal of Media Literacy Education*, 4(1), 3-11.

Pleasant, A., Rudd, R. E., O'Leary, C., Paasche-Orlow, M. K., Allen, M. P., Alvarado-Little, W., … Rosen, S. (2016). *Considerations for a new definition of health literacy*. National Academy of Medicine Washington, DC.

Poelman, M. P., Dijkstra, S. C., Sponselee, H., Kamphuis, C. B. M., Battjes-Fries, M. C. E., Gillebaart, M., & Seidell, J. C. (2018). Towards the measurement of food literacy with respect to healthy eating: the development and validation of the self perceived food literacy scale among an adult sample in the Netherlands. *International Journal of Behavioural Nutrition and Physical Activity*, *15*(1), 54. https://doi.org/10.1186/s12966-018-0687-z.

Puk, T., & Stibbards, A. (2010). Ecological concept development of preservice teacher candidates: opaque empty shells. *International Journal of Environmental and Science Education*, 5(4), 461–476.

Renwick, K., & Powell, L. (2019). Focusing on the literacy in food literacy: practice, community, and food sovereignty. *Journal of Family and Consumer* Studies, *111*(1), 24-30. https://doi.org/10.14307/JFCS111.1.24.

Rosas, R., Pimenta, F., Leal, I., & Schwarzer, R. (2019). FOODLIT-PRO: Food literacy domains, influential factors and determinants—A qualitative study. *Nutrients*, *12*, 88. https://doi.org/10.3390/nu12010088.

Schlüter, K., Vamos, S., Wacker, C., & Welter, V.D.E. (2020). A conceptual model map on health and nutrition behavior (CMMHB/NB). *International Journal of Environmental Research and Public Health*, *17*, 7829. https://doi.org/10.3390/ijerph17217829.

Slater, J. (2013). Is cooking dead? The state of home economics food and nutrition education in a Canadian province. *International Journal of Consumer Studies*, *37*(6), 617–624. https://doi.org/10.1111/ijcs.12042.

Slater, J, Falkenberg, T, Rutherford, J, & Colatrgulio, S. (2018). Food literacy competencies: A conceptual framework for youth transitioning to Adulthood. *International Journal of Consumer Studies*, *42*, 547–556. https://doi.org/10.1111/ijcs.12471

Sørensen, K., Van den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., & Brand, H. (2012). Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health*, *12*(1), 1.

Stinson, E. (2010). *Eating the world: Food literacy and its place in secondary school classrooms* [Masters thesis, University of Victoria, Victoria, Canada]. Retrieved from http://dspace.library.uvic.ca:8080/handle/1828/2841

Sumner, J. (2013). Food literacy and adult education: learning to read the world by eating. *Canadian Journal for the Study of Adult Education*, *25*(2): 79-92.

Thomas, H. C., & Irwin, J. D. (2013). Using photovoice with at-risk youth in a community-based cooking program. *Canadian Journal of Dietetic Practice and Research: A Publication of Dietitians of Canada*, *74*(1), 14–20. https://doi.org/10.3148/74.1.2013.14

Truman, E., Bischoff, M., & Elliott, C. (2019). Which literacy for health promotion: health, food, nutrition or media? *Health Promotion International*, *35*(2): 432-444. https://doi.org/10.1093/heapro/daz007

Truman, E., Lane, D., & Elliott, C. (2017). Defining food literacy: A scoping review. *Appetite*, *116*, 365–371. https://doi.org/10.1016/j.appet.2017.05.007

United Nations Educational, Scientific and Cultural Organization. (2006). *Education for all global monitoring report: Chapter 6: Understanding the origins of literacy*. UNESCO. Retrieved from http://www.unesco.org/education/GMR2006/full/chapt6_eng.pdf

Velardo, S. (2015). The nuances of health literacy, nutrition literacy, and food literacy. *Journal of Nutrition Education and Behaviour*, *47*(4), 385-389. https://doi.org/10.1016/j.jneb.2015.04.328

Vetorri, V., Lorini, C., Milani, C., & Bonaccorsi, G. (2019). Towards the Implementation of a Conceptual Framework of Food and Nutrition Literacy: Providing Healthy Eating for the Population. *International Journal of Environmental Research and Public Health*, *16*, 5041. https://doi.org/10.3390/ijerph16245041

Vidgen, H. (Ed.). (2016). *Food Literacy: Key concepts for health and education*. Routledge.

Vidgen, H. A., & Gallegos, D. (2014). Defining food literacy and its components. *Appetite*, *76*, 50-59. https://doi.org/10.1016/j.appet.2014.01.010

Vigden, H. A., & Gallegos, D. (2012). *Defining food literacy, its components, development and relationship to food intake: A case study of young people and disadvantage*. Brisbane, Australia: Queensland University of Technology. Retrieved from http://eprints.qut.edu.au/53786/1/Food_literacy_and_young_people_report.pdf

Widener, P., & Karides, M. (2014). Food system literacy: Empowering citizens and consumers beyond farm-to-fork pathways. *Food, Culture & Society*, *17*(4), 665–687. https://doi.org/10.2752/175174414X14006746101916

Wilkins, J.L. (2005). Eating right here: Moving from consumer to food citizen. *Agriculture and Human Values*, *22*, 269-273. https://doi.org/10.1007/s10460-005-6042-4

Yeatman, H. (2016). Developing food literacy through production. In H. Vigden (Ed.). *Food literacy: Key concepts for health and education* (pp. 203-220). Routledge.

Yuen, E. Y. N., Thomson, M., & Gardiner, H. (2018). Measuring nutrition and food literacy in adults: A systematic review and appraisal of existing measurement tools. *Health Literacy Research and Practice*, *2*(3), e134–e160. https://doi.org/10.3928/24748307-20180625-01

Zarcadoolas, C., Pleasant, A., & Greer, D. S. (2005). Understanding health literacy: an expanded model. *Health Promotion International*, *20*(2), 195-203. https://doi.org/10.1093/heapro/dah609

Zoellner, J., You, W., Connell, C., Smith-Ray, R. L., Allen, K., Tucker, K. L., Davy, B.M., & Estabrooks, P. (2011). Health literacy is associated with healthy eating index scores and sugar-sweetened beverage intake: Findings from the rural lower Mississippi Delta. *Journal of the American Dietetic Association, 111*(7), 1012–1020. https://doi.org/10.1016/j.jada.2011.04.010