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

Original Research Article

# Agrifood systems and food literacy: Insights from two high schools' programs in Ontario

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## Abstract

Following the increased industrialization and globalization of the prevailing agrifood system, researchers and practitioners have highlighted the detrimental impacts of this model on human health, food security, and the environment. As such, experts and citizens are calling for an increased awareness, through food literacy (FL), to improve health and justice and to transition towards sustainable agrifood systems. Building on field research, critical pedagogy, and existing FL analyses, we argue for incorporating both health and well-being, and agrifood systems dimensions into FL programming. By doing so, FL can contribute to promote individual health, as well as more sustainable agrifood systems policies and practices based on the principles of food sovereignty. Through qualitative research with students and teachers in two Ontario high schools, we explore the content and approaches taken in food-related programming. Aspects of FL among students are also explored in order to highlight their strengths and limitations. Further, we point to the challenges faced by teachers in delivering food-related courses. We propose a conceptual framework that highlights the benefits of including the multiple dimensions of FL as a way to test and improve existing FL programs, and eventually train future generations of teachers, students, and citizens.

Keywords: Food literacy; sustainable agrifood systems; Ontario high school students; food sovereignty; critical pedagogy

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DOI: 10.15353/cfs-rcea.v8i4.461
ISSN: 2292-3071

## Introduction

Numerous studies have demonstrated that agriculture and agrifood systems[1] are key contributors to environmental protection or degradation and anthropogenic climate change (Gliessman, 2018; Anderson et al., 2021). This is especially evident since the late 1980s, with the globalizing corporate food regime that spread from Europe and the United States to most parts of the world (Andrée et al., 2014; Friedman & McMichael, 1989; Rose & Lourival, 2019). This corporate regime has the set of norms and rules that govern today's dominant agrifood system, which is based on the expansion of large-scale, capital, and energy intensive agricultural production (i.e., fertilizers, pesticides, water). During this period, we have witnessed the concentration of corporate control over food discourses (Kimura, 2011) and the food supply chain (Clapp & Purugganan, 2020). These changes led to heightened inequalities, health problems, ecological harm, and social malpractices, such as soil and water contamination, hunger, food price volatility, farm crisis, food insecurity, and labour exploitation (Magnan, 2016; Willett et al., 2019). The Nutrition Transition, resulting from changes in food environments, also contributed to an impoverished diet, based on an increasing intake of processed and ultra-processed food items, which are often sweeter, saltier, and more energy dense (Popkin, 2001). Studies have also highlighted a considerable degree of "deskilling" for consumers (Slater, 2013), farmers, and those who traditionally engage in hunting, fishing, and gathering practices. This "deskilling" particularly affects low-income households, including small-scale farmers and peasants, as well as Indigenous communities, in many regions of the world (Morrison, 2011).

In Canada and globally, a growing number of citizens and social movements are questioning the consequences of today's prevailing agrifood system, which are especially alarming considering the crucial role of food for social reproduction and for the wellness of human and non-human beings. Food literacy (FL) is therefore more essential now than ever to equip citizens to critically assess the systemic barriers to actualization of personal, community, and ecological health at micro- (individual, household, community) and macro-levels (global food governance, environmental and cultural change, national and international trade, and health policies) (Rose & Lourival, 2019; Weiler et al., 2014, p. 1082; Sumner, 2013). With increased awareness, people are calling for socio-ecological alternatives by "voting with their dollars" (Bloomfield, 2014), or are engaging in collective action, advocating for institutional and policy changes, and food sovereignty (Blay-Palmer et al., 2015).

In this context, a comprehensive conceptualization of FL, incorporating health and agrifood systems dimensions, can develop the critical skills of learners to think about food and

[1]Agrifood systems, as defined by Lamine (2015) are "socio-technical systems composed of the main social actors and institutions involved in food production, transformation, distribution, consumption [and waste] (farmers, intermediaries, processors, CSOs, agricultural institutions, public policies, etc.) and of the rules and modes of coordination which link them. They can be considered on a local scale (such as in the case of alternative food systems) or on a larger scale" (Lamine, 2015, p. 56).

agrifood systems more broadly. It can allow individuals and citizens' organizations to participate in transforming today's agrifood systems (Sumner, 2013; Classens & Sytsma, 2020). Interdisciplinary approaches to food-related education, incorporating critical pedagogy, can contribute to demystifying the functioning and consequences of the globalizing corporate food regime. In a similar way, Sumner (2013) argues that conceptualizations of FL "must move beyond individualized prescriptions and notions of blame to become a concept that can analyze current foodscapes and model sustainable alternatives" (p. 84). Furthermore, the EAT Lancet report on *Food in the Anthropocene* emphasizes the interdependent nature of human and planetary health, while also highlighting that most agrifood systems today are not promoting food security or human health (Willett et al., 2019). This is not resulting from individuals' decision making, but structural problems within national and global agrifood systems. To address such problems, we argue that FL incorporating an agrifood systems dimension could deepen the understanding and engagement of citizens to call for alternative policies and practices that are just, healthier, and more sustainable. Starting from these broad assessments, this article draws from field research exploring grade nine (G9) and grade ten (G10) students' FL through semi-structured interviews in two Ontario high schools. We explore the following questions: How do teachers approach food-related education programs in Ontario high schools, especially as it relates to the health, well-being, and agrifood systems dimensions of FL? Second, where is the food literacy of Ontario high school students situated (i.e., does it reflect the health and well-being dimension and/or agrifood systems)? Third, what are the main challenges to improve students' FL in these multiple dimensions?

The article begins with a review of the literature on food literacies, providing a broad picture of the status of FL in Canada and Ontario and fostering connections between FL, critical pedagogy, and the food sovereignty movement in Canada. This is followed by describing a conceptual framework which offers a comprehensive explanation of FL, incorporating dimensions of agrifood systems and health and well-being. The third section presents the methods used for examining the two food programs and students' FL, ending with a discussion of the results and lessons that emerged from this exploratory research. Therefore, the objectives of this paper are twofold: 1) to contribute to the debate on the comprehensiveness of FL, and 2) to provide empirical insights in order to address the questions outlined above.

## A growing interest for food literacies

Food literacy (FL), as a concept and field of study, has gained significant momentum throughout the last decade. It is also increasingly accepted that this concept consists of multiple dimensions, which is why some authors refer to multiple literacies for overall food literacy (Hernandez, 2019). A scoping review and conceptual analysis by Cullen et al. (2015) found that definitions of FL mostly included food skills or nutrition but often lacked a social or ecological context.

Meanwhile in a more recent review, Truman and colleagues (2017) noted that the socio-ecological aspect was increasingly emphasized, but a common definition of the concept is still lacking. Cullen et al. (2015) offer a broad conceptualization of FL which incorporates elements of community food security, while insisting on the central role of pedagogy and knowledge production toward sustainable agrifood systems and personal health. They define FL as:

> the ability of an individual to understand food in a way that they develop a positive relationship with it, including food skills and practices across the lifespan in order to navigate, engage, and participate within a complex food system. It's the ability to make decisions to support the achievement of personal health and a sustainable food system considering environmental, social, economic, cultural, and political components (Cullen et al., 2015, p. 143).

Regardless of the broadness in scope, most scholars still tend to emphasize aspects of FL related to their expertise or areas where they would like to see improvements, rather than looking at it from a multidimensional and interdisciplinary perspective (Hernandez, 2019). For example, dietitians and health experts tend to focus on nutrition literacy and individuals' food skills (Poelman et al., 2018; Thomas & Irwin, 2011; Vidgen & Gallegos, 2014). Social scientists and agronomists favour an agricultural (Frick et al., 1992; Judd-Murray, 2019), ecological (Cullen et al., 2015), or critical literacy approach with a focus on agrifood systems change, often incorporating principles associated with food sovereignty (Anderson et al., 2018; Meek & Tarlau, 2016; Sumner, 2013; Valley et al., 2017). To date, the evaluation of food-related literacies has fallen into this siloed pattern. Meanwhile, health-related guidance for policies and practitioners increasingly recognizes the interconnectedness of systems and their impact on health, which calls for more policy coherent approaches (Hawkes et al., 2013; Ingram et al., 2020).

## The status of food literacy (FL) in Canada and Ontario

In recent years, governments and organizations have also shown increasing interest in FL and Canadian's food-related knowledge more broadly. In 2013, the Conference Board of Canada released a report called *What's to eat? Improving Food Literacy in Canada*, which highlighted that Canadians "have a good general understanding of food, nutrition, and health, but may lack a thorough understanding of the details of how they are connected" (Brichta & Howard, 2013, p. ii) and some of their weaknesses are in terms of food systems and farming practices (pp. 12-13). The Canadian Centre for Food Integrity (CCFI) noted that 91 percent of Canadians self-identified that they know little, very little or nothing about modern farming practices (2019, p. 8). Since 2016, these results have been practically unchanged. However, 60 percent of Canadians indicated that they are interested in learning more about agriculture (CCFI, 2019, p. 8).

Countless academics, non-governmental, and governmental organizations have sounded the alarm regarding "unhealthy" food-related behaviours and health outcomes, some of which can be attributed to decaying FL and skills. Slater (2013) argues that food skills are not being transferred in the household as much as they were in the past. This is especially concerning since the home is the main place for children and youth to learn about food and food preparation (Desjardins et al., 2013). Moreover, young people are a population that has concerningly low FL levels, especially in regard to practical skills and knowledge of "the broader socioecological and political aspects of their food systems" (Ronto et al., 2016, p. 13).

The government of Ontario has responded to these concerns with policies that touch directly on FL. In 2013, they released the Local Food Act, which aims to "Improve food literacy in respect of local food" and to build resilience in food systems (Local Food Act, 2013, p. 3). In the fall of 2020, a private member's bill was proposed: *Food Literacy for Students Act, 2020*. If ratified as written, this bill would require amendments to the Education Act to make experiential FL mandatory in curriculum guidelines, from grades one to twelve (Food Literacy for Students Act, 2020).

The Ontario Ministry of Education also released the *Policy Framework for Environmental Education* in 2009 that aims to instill critical thinking and awareness. The Ministry of Education insisted on the importance of developing students' "knowledge, skills, perspectives and practices that they need to be environmentally responsible citizens" and that they "will understand our fundamental connections to each other and the world around us through our relationship to food, water, energy, air, and land, and our interaction with all living things" (Ontario Ministry of Education, 2009, p. 6). The report further emphasized that "schools have a vital role to play in preparing our young people to take their place as informed, engaged, and empowered citizens, who will be pivotal in shaping the future of our communities…and our global environment" (Ontario Ministry of Education, 2009, p. 2). The above reports and policies show that think tanks and governments seek to address the concerns raised by academics and other stakeholders, such as Food Secure Canada and Farm to School Canada. However, when it comes to implementing FL programs, the federal and provincial governments are still lacking a broad policy coherent approach, and evidence-based evaluation of their effectiveness (Martin, 2018).

## Critical pedagogy and food literacy towards food sovereignty

As critical pedagogy scholars such as Henry Giroux (2020), Paulo Freire (1972), and bell hooks (1994) have emphasized, knowledge is power. Knowledge allows domination and resistance. Knowledge is crucial to understanding but also challenging dominant power dynamics, and in turn, to envisioning strategies to create a better world. According to Sumner (2013), "food literacy aims for individual and social change by encouraging people to read the world in terms of food" (p. 87).

Recognizing the power inequalities within historical and contemporary agrifood regimes, FL is a form of knowledge that can "help dismantle the limits placed on the practice of the possible and move beyond neoliberal subjectivities to more holistic ones" (Sumner, 2013, p. 87). As such, in this study, agrifood systems literacy (AFSL) is the desired outcome of a pedagogical project which promotes the development of knowledge and skills to participate within complex agrifood systems. As a critical pedagogy, it acknowledges that education is always political. AFSL is a foundation for critical conscious raising among citizens, enabling them to demand sustainable agrifood systems that respond to peoples' needs in specific contexts, fight injustices, and respect ecosystems.

The above definition of AFSL aligns well with the principles and objectives of food sovereignty advocates. Indeed, since the early 2000s, there has been a growing sense of urgency for improving FL to understand the multiple political, economic, and socioecological dimensions of the corporate agrifood system, its problems, and potential alternatives (Meek & Tarlau, 2016, p. 237). The pressure for AFSL comes from concerns for human and environmental health, but also from increasingly active and thriving food justice movements. These movements are building local and transnational networks and promoting food sovereignty,[2] that is, a set of policies and practices promoting just and sustainable agrifood systems, away from the detrimental effects of the neoliberal agrifood system on the health and well-being of households, food producers, and ecosystems alike (Edelman et al., 2014). Neoliberal advocates count on "the market as the final arbiter of efficient economic policy...walling off powerful economic actors and industrial forces from popular accountability and local responsibility" (Andrée et al., 2014, p. 11). Meanwhile, food sovereignty advocates call for a reorganizing of food production, distribution, and consumption patterns that contests the common understanding that large-scale agriculture is better and more efficient than small-scale farming (Massicotte, 2014; Meek & Tarlau, 2016; Rose & Lourival, 2019). In Canada, food sovereignty activists, including members of the National Farmers Union, emphasize the productive and reproductive roles of food producers who contribute and seek innovative methods to maintain and/or promote agroecological practices. They insist on their capacity and responsibility to provide healthy food and participate in governing agrifood systems, as experts of the soil and ecosystems in which they live (Desmarais & Wittman, 2014).

Through a food sovereignty lens, and building on Rose and Lourival (2019), we contend that a more comprehensive FL allows for the integration of individual health and food skills with a vision of empowered communities working to transform agrifood systems. As such, AFSL becomes a foundation for students to work in partnership with food sovereignty movements and governmental institutions to promote healthy food choices and sustainable agrifood systems.

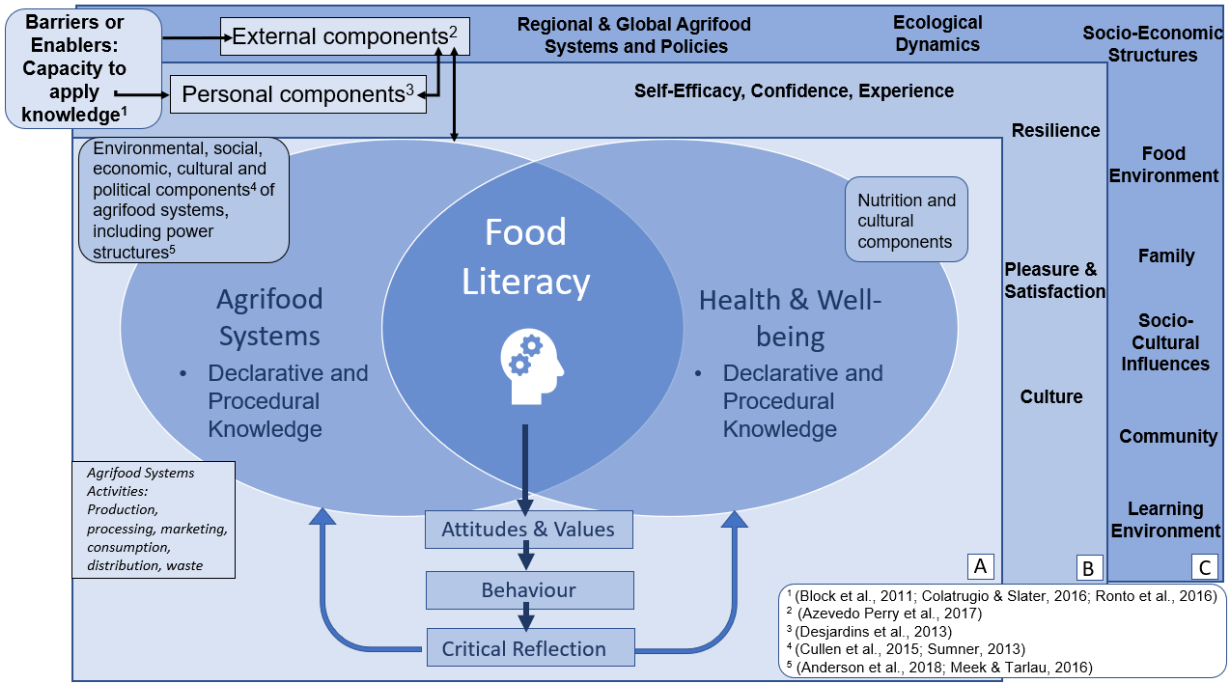
[2] Depending on the context and analytical lens, the notions of food justice or food democracy are preferred to food sovereignty. The latter generally includes the democratization of food systems to foster greater social, environmental, and gender justice as key principles, and it contests the corporate, or neoliberal, agrifood system (Andrée et al., 2014).

This is especially relevant for youth who will play a central role in shaping and improving tomorrow's agrifood systems and public policies.

## Conceptual framework

Figure 1 helps to illustrate the multiple and interrelated elements of FL through a conceptual framework. Here we refer to two core dimensions of FL: agrifood systems and health and well-being. It is organized into layers with key concepts and components for an individual's FL in the main layer A (as labelled in the bottom right corner of the framework). Layers B and C respectively represent the barriers or enablers (personal and external components) that affect citizens' capacity to apply knowledge. This framework builds on recent work and developments in the field (Classens & Sytsma, 2020; Cullen et al., 2015; Hernandez, 2019; Palumbo, 2016), by insisting on the idea that FL must go beyond food skills and nutritional knowledge to incorporate socioeconomic, environmental, and other dimensions.

**Figure 1:** Conceptual framework of food literacy from a systems-based perspective




Source: (modified from Martin, 2018)

Food literacy includes two types of knowledge—procedural and declarative—in line with Block and colleagues (2011). Procedural knowledge refers to the "know-how," or practical and hands-on skills, whereas declarative, or factual knowledge is "knowing of/about" something. For example, procedural knowledge could include food skills like shopping for groceries, cooking, preparing meals, and gardening, or how to collectively organize and advocate for change.

Meanwhile, declarative knowledge could include facts about nutrition or the functioning of global agrifood systems.

With this framework, FL is action-oriented; it consists of applying declarative and procedural knowledge, thus inviting citizens/students to act on and adopt behaviours based on their knowledge, if they are able. Furthermore, food-related behaviours are often shaped by "one's class position, gender stereotypes, social infrastructure, and the macrostructure of food and agricultural systems" (Kimura, 2011, p. 479-480). These points are especially salient given that choice and health equity are not simply enabled by individual decision making but also by institutional norms and policies (Weiler et al., 2014). Hence, our proposed framework recognizes the importance of individual knowledge and behaviours, as well as the key role of institutional and structural barriers/enablers reflected in layers B and C. The external components are extrinsic or "beyond self" and can include sociocultural influences (i.e., emotional support), food environment and facilities (e.g., a kitchen), agrifood and other systems (Azevedo Perry et al., 2017), and the learning environment (Desjardins et al., 2013). These elements influence the psychosocial factors, which primarily make up the personal components such as self-efficacy, confidence, and pleasure, (Desjardins et al., 2013) and feed into the "motivation to use that knowledge" (Block et al., 2011, p. 7).

Motivation is essential to FL behaviours and aligns with the theory of planned behaviour, which emphasizes that attitudes and values connect knowledge to behaviour (Vermeir & Verbeke, 2008). From a critical pedagogy perspective, self-reflection follows behaviour which then feeds back into FL (see arrows in Figure 1) and can in turn lead to changing behaviours. This understanding of knowledge aligns with Freire's concept of "praxis" that links theory and practice for transforming society (1972). It invites individuals to think critically about their food practices and their impact in a constant loop of self-reflection-action-self-reflection.

Our framework also aligns with the work of food sovereignty (Anderson et al., 2018; Meek & Tarlau, 2016) and critical pedagogy scholars who insist on the need to start from the experience of participants to nurture social justice and change. The incorporation of the AFSL dimension highlights the central role of non-farming and farming people, through individual participation (i.e., purchasing behaviours) and collective action for broader systemic change. By promoting food sovereignty through AFSL, students would be better equipped to "analyze their world of food production and access and take actions to change these systems" (Meek & Tarlau, 2016, p. 243). This conceptual framework demonstrates the multifaceted aspects of food and AFSL, which consists of knowledge and action. The actualization of personal health and well-being depends on structural factors and the capacity to implement sustainable and just practices, which derives from a deeper understanding of the multiple dimensions and diversity of agrifood systems. The framework thus highlights the importance of active participation of food literate citizens, as learners, teachers, farmers, and eaters, in shaping and improving agrifood systems and people's well-being. This opens up space for the principles of food sovereignty to be acted upon, if the knowledge, capacity, and desire to engage in agrifood systems are there in the first place.

## Methods

This exploratory study draws from fieldwork that took place between January and March 2017 in two Ontario high schools including one suburban neighbourhood school (SNS) outlying a large city, and one rural school (RS), approximately fifteen kilometers from the nearest small city. These schools represent a convenience sample as a result of preexisting relationships that helped to gain access and complete the research in a timely manner. These choices allowed for a comparison of community settings and the different types of food-related courses in Ontario: Hospitality and Tourism (Technical Education Curriculum), Exploring Family Studies, and Food and Nutrition (Social Sciences and Humanities Curriculum). These were elective courses with a mix of students from academic (university bound) and applied (college bound) streams.

The research is based on qualitative data analysis from twelve semi-structured interviews, including eight interviews with randomly selected students from grade nine (G9) and ten (G10), and the four teachers of the food-related courses in the two schools (see Appendix A and B for a sample of interview questions). The qualitative data were analyzed to draw out the main themes around our research questions. The interviews allowed for a better understanding of the content and main objectives of the courses as well as the general situation (i.e., health and well-being, or agrifood systems) of students' food literacy through both teacher and student responses. Student interviews varied from 15 to 45 minutes, while teachers' interviews varied from one to two hours in length. All interviews were recorded and transcribed verbatim to help with coding for common themes as presented in the results. The University of Ottawa Research Board of Ethics and two Ontario School Boards approved this research; consent was obtained from high school principals, teachers, parents/guardians, and students.

As Table 1 shows, four of the students interviewed completed a food-related course (S1-S4, intervention group) and another four students (S5-S8, control group) did not since they opted for non-food related elective courses. The students were from grades nine and ten (ages fourteen to fifteen), four from each school (SNS and RS). In total, two teachers from each school participated (see Table 2). All of the teachers had a Bachelor of Arts or Science degree and Bachelor of Education degrees. Teacher 3 (T3) and Teacher 4 (T4) also had formal training and extensive experience as chefs, which allowed them to work within the Technical Education stream. Teacher 1 (T1) and Teacher 2 (T2) had an Honours Specialist in Families Studies, an additional qualification course, to be able to teach food-related courses from the Family Studies curriculum.

**Table 1:** Student demographics

| Group | Student | Self-identified gender | Grade | School | Course | Country where student grew up |
|---|---|---|---|---|---|---|
| **Intervention (food-related course)** | Student 1 (S1) | Male | 10 | SNS | Hospitality and Tourism | USA |
| | Student 2 (S2) | Female | 9 | SNS | Hospitality and Tourism | Canada |
| | Student 3 (S3) | Female | 9 | RS | Exploring Family Studies | Canada |
| | Student 4 (S4) | Female | 10 | RS | Food and Nutrition | Canada |
| **Control (no food-related course)** | Student 5 (S5) | Female | 10 | SNS | Computer Studies | China |
| | Student 6 (S6) | Female | 10 | RS | Music | Canada |
| | Student 7 (S7) | Male | 9 | RS | Computer Studies | Canada |
| | Student 8 (S8) | Female | 9 | SNS | Visual Arts | Canada |

**Table 2*:*** Teacher demographics

| Teacher | Self-identified gender | School | Course in study |
|---|---|---|---|
| Teacher 1 (T1) | Male | RS | Food and Nutrition |
| Teacher 2 (T2) | Female | RS | Exploring Family Studies |
| Teacher 3 (T3) | Male | SNS | Hospitality and Tourism |
| Teacher 4 (T4) | Male | SNS | Hospitality and Tourism |

## Results

To address the research questions, the interview findings are organized to highlight the content and focus of the courses. We also explore the dimensions of students' FL through their own and teachers' discourses. This section concludes with teachers' accounts of key obstacles and challenges they encounter. The sample in this study was insufficient to identify differences between SNS and RS students' FL, but we keep this distinction as an interesting element to investigate further.

## Teachers' descriptions of food-related courses

At the rural town school (RS), the food-related programming was based on the Social Sciences and Humanities, and Family Studies curriculum, with courses offered from grades nine to twelve. The G10 Food and Nutrition course focused on nutrition, while the G9 Exploring Family Studies course was an introduction to "cooking and life skills" (T2). The Food and Nutrition course addressed "micro- and macronutrients, reading labels, basic marketing, and advertising techniques" (T1). T1 noted that food marketing was important since he wanted his students "to have a very healthy dose of skepticism, and they need to understand basic nutrition and how to read labels in order to cut through the crap". In the Exploring Family Studies course, the students worked on "cooking techniques and preparing foods and…meals and just basic baking," in addition to learning about "skills like laundry and shopping and meals on a budget" (T2). Students cooked once every week or week and a half at this school.

At the SNS, the programming was mostly based on the Technical Education curriculum with Hospitality and Tourism courses from grades nine to twelve. Some Family Studies courses were also offered. In this school, teachers used "benchmarks" with "basic [food] skills" in mind in case the students "never [take] another cooking class" so that they will "at least be able to… put some food on the table" (T3). The teachers at SNS designed the G9 course using the G10 Hospitality and Tourism curriculum as a foundation for ministry expectations. These courses had similar expectations across grades with knowledge and skill levels advancing each year. Furthermore, teachers insisted on integrating elements of sustainability in their programming through food procurement, "local, organic and ethical where possible," (T3, SNS) and teaching students about gardening and preserving.

## General discussions of food in school

All students, from intervention and control groups, indicated that food was discussed at some point in school, mostly in terms of nutrition and health. A participant in the SNS explicitly noted that these discussions were very "general," introducing "healthy eating" principles usually learned as a child (S8). Student 2 (SNS) echoed this, mentioning "the food guide" and "portions" but added that she read an article in Geography about "food systems" and "how the stuff they use aren't good for the environment". Another student (S6, RS) highlighted that health classes were not compulsory courses like "language or math", implying food was not discussed often. Most significantly for this study, with the exception of S2 (SNS), the students did not refer to agrifood systems, production, or agriculture as subjects of discussion in school, even in food-related courses.

## Students' key takeaways from food-related courses

The students involved in a food-related course highlighted the benefits of the practical skills they acquired, such as hands-on cooking and safe handling of food, especially if such skills were not developed at home. Teachers echoed this outcome, as T3 (SNS) emphasized the importance of "practical skill building" and "demystifying" foods in their programming that are commonly available in households (i.e., eggs, meats, flour for breads and baking, etc.) to build resilience to cook, while T1 (RS) argued that the most important outcomes of the course were "just getting them to cook" and build "self-confidence to get into the kitchen". T2 (RS) also explained "they definitely walk away with more cooking experience than they came in with".

In addition to the practical skills, T3 and T4 (SNS) also recognized the importance of teaching about food systems and how citizens participate in shaping these systems. For example, T3 attended an international food symposium where attendees were asked whether one can "be food literate without having any cooking skills". During his interview he reflected on this experience and explained that students should have both "food" and "kitchen" literacies:

> You know all the right things to do...to compost and to shop locally and to buy organically wherever possible and to get your ingredients from the best suppliers.... But [if] you don't actually know how to put the food together, are you still food literate?.... We would like our students to leave with…a *little bit* of FL and the understanding of consciously thinking about the foods that they're buying, where they're getting them from, where they're sourcing them, who's producing them, and on what scale…. We want them to have *solid*, basic cooking knowledge, and…*moderate* food literate understanding of how to make good food choices (SNS; emphasis added).

Hence, based on student and teacher responses, the pedagogical emphasis is mostly on individual, hands-on skills (i.e., procedural knowledge), with some declarative (factual) knowledge aspects of FL, with a predominant focus on the health and well-being dimension. Nonetheless, teachers from SNS also emphasized the importance of the agrifood systems dimension. T2 (RS) also noted that her optional grade eleven and twelve courses cover more of the agrifood systems aspects, such as global food supply, food insecurity, genetically modified foods, and sustainable agriculture, but these students did not participate in this study.

## Students' food literacy

To explore the knowledge and key dimensions of students' FL, interview discussions touched on topics such as "the most important factors" when purchasing foods (intervention and control), and their explanation of what "better food choices" (intervention only) and food systems signify (see Appendix A). When students' knowledge could have touched on one or the

other key dimension of FL, responses tended toward health and well-being, although some also addressed elements related to agrifood systems. Students mentioned factors such as quality or freshness, price, nutritional value, organic, size, and food staples when reflecting on what was "most important" in purchasing foods. S4 (RS, intervention) also noted that her mother prefers to buy local products when possible. When elaborating further in a conversation about where food comes from and whether this is something we should consider, a student stated: "I don't know where it's coming from and I don't really care" (S8, SNS, control). A student who grew up and worked on a farm (S7, RS, control) noted the "size" or quantity of food, given that he comes from a family of nine. When being probed further, he could not think of other important factors in purchasing food, apart from avoiding "too much junk."

Furthermore, students who completed a food-related course (intervention group) were asked if they felt prepared to make "better food choices" and were asked to define what this meant. Their responses mostly focused on individual health and well-being, mentioning for instance, "healthier diet" (S1, SNS), "healthy" food (S2, SNS; S4, RS), and "food habits" in relation to cooking from scratch rather than ready-made foods (S3, RS). Only one student noted "the process behind [foods] and what they go through" and elaborated to say, "in the future when I could buy my own food, I would like healthier choices and also like again buy from local sources" (S2, SNS).

Teachers' thoughts on students' overall FL showed that knowledge and skillsets were "widely diverse" with "some kids who are making dinner every day" and others who are "lucky if they can make Cheerios" (T1, RS). T4 (SNS) echoed this sentiment, noting that some students "cook for their home, three, four, five days a week and [others] don't know how to hold a spoon". All of the teachers agreed that the students' home environment contributed to nurturing (or not) their knowledge and skills. For example, T2 (RS) noted that students "know what their parents teach them". T3 (SNS) also mentioned that some students have "families [that] are big foodies…whose parents cook all the time" while others "come in with absolutely no sense of…where [food] comes from and how it should be cooked". By the end of the classes however, all of the teachers mentioned that students' procedural or hands-on FL improved. T3 (SNS) noted that some students struggled at first "because they're not comfortable in the kitchen, and then, by the end [they] can make that plate of food...some of them...are really keen and enthusiastic and very skilled".

To explore students' AFSL, they were also asked to define agrifood systems, and discuss their sustainability and related food issues. Students were able to identify some of the basic activities of agrifood systems, yet their knowledge in this dimension was rather limited and lacked critical awareness. Indeed, considerable prompting from the interviewer was required, and even after the concept was defined for them, they were often unable to elaborate on these topics. For example, some students' responses included the "life cycle" of a cow eating grass before going "to the slaughterhouse where it becomes meat" (S1, SNS, intervention), or "how food is made" and the process behind meat production before it reaches "the shelf" (S4, RS, intervention). One student thought mainly of food production as "agriculture" or "growing" with

"big farming operations" and "giant machinery" (S3, RS, intervention). Others mentioned agrifood systems activities including growing, picking, transporting, and selling food (S5, SNS, control; S8, SNS, control) with one adding "picking" to this list (S2, SNS, intervention) and another adding consumption or "to table" (S6, RS, control). One student who lived and worked on a farm failed to come up with a response at all related to defining agrifood systems, even after a lot of prompting, stating "the food table thing" (S7, RS, control) meaning Canada's Food Guide. Later on, in iterating whether or not food issues or troubles on the farm were discussed at home, S7 (RS, control) stated his parents "don't talk about any of that stuff".

The majority of students also claimed that the dominant food system was sustainable and able to meet food demands. The exception to this was S2 (SNS, intervention) and S6 (RS, control) who explained that there were environmental issues (i.e., use of pesticides) and concerns for future food production because of practices which degrade soil. In their words, "I think that some things should be changed like how much pesticides we need because that doesn't work well with our environment and stuff around it" (S2, SNS, intervention) and "I feel like our system isn't sustainable…we're not really thinking about how long-term our soil might not be as good as it is now…I don't know a lot on this topic, but I feel like we're not so focused on the future and how we're going to keep the soil good" (S6, RS, control).

Even after taking a food-related course, most students had difficulty discussing agrifood systems and associated ecological issues, except one who was well-informed. She indirectly acknowledged the importance of knowledge and awareness about agrifood systems and industries, noting, "I think we'd have to talk about it more 'cause food industries and stuff are not…a big thing we talk about in the news. We'd have to get some people to actually start talking about it and then people will probably notice the problem and then we'd start fixing it" (S2, SNS, intervention). Generally, those who never took a food-related course seemed to have a less developed AFSL, with the exception of one student who regularly discussed food issues like viruses in banana plantations with her parents during "car rides [and] dinner conversations" (S6, RS, control).

Teachers' perception of students' AFSL was rather negative, arguing that most students' lack knowledge in this area. Nonetheless, T1 (RS) noted students living in a rural area "have an idea of where food comes from". T4 (SNS) was very skeptical about the AFSL of his suburban students and of citizens in general stating "most people don't have a clue [about agrifood systems]…these are really complex questions." However, he felt that food-related courses contributed to increasing students' awareness about agrifood systems and that such learning continues across the lifespan. T4 (SNS) also insisted that FL should integrate health, well-being and an agrifood system-based understanding of food. He noted the "political role" of food and individuals in society:

> You can't intersect in the world without eating…how are people supposed to make informed, interesting, and relevant choices that are meaningful for them and the world if they don't have any grounding in

> it?…everything that you intersect with, in an economical way, is a political act…if you're not informed, you're just going through life blindly! I'm not saying that the students need my political agenda, but they need to have their own political agenda. They need to make up their own value system…. And how do you do that without having some sort of understanding of the cycle and being able to engage in the cycle. Skills, right? To feed yourself...*that is empowering if you know about it, and you make that choice*…. If you're going to engage in this world meaningfully you need to be armed…and that's not happening…. Teachers don't wanna go there. (T4, SNS; emphasis added).

### Barriers and challenges to teaching food-related courses

The teachers' backgrounds, values, and knowledge influenced their choices about what to emphasize from the curricula in their course delivery. The teachers argued that, because of time limitations and/or inadequate training, it is difficult to cover all of the curriculum expectations. In this respect, T1 (RS) mentioned that "local versus global" is "not the emphasis of the course" although "there are a few [curriculum] expectations that deal with it". Therefore, "different teachers accentuate different aspects" (T1, RS); and ultimately, teachers decide how they allot time (T2, RS). T2 (RS) further explains:

> You can take a whole lot of time with one thing, or a little bit…. So, if I decide "Oh! The kids need to learn about Canada's Food Guide," then I'm gunna take…a week. They're gunna look at other food guides, compare them, and then they're gunna do a food guide assignment to do with their own meal planning. If I want to teach them about…sustainable agriculture, I could take half a period and be done with it…but I've touched on that. So, the breadth and depth of the curriculum is based on the teacher who has developed the course.

T4 (SNS) also highlighted challenges around time management stating that "there's only so much you can do." He further said that "the culinary tech program is a little bit too wide" in regard to expectations which often leads to "paying lip service to some aspects to fulfill the ministry requirements" (T4, SNS).

T3 (SNS) identified teachers' professional development (PD) days as an opportunity to consolidate teachers' skills and knowledge. However, there were very few opportunities to "meet and discuss things...with colleagues who all teach the same subject" (T3, SNS). As a result, T3 and T4 (SNS) were trying to coordinate a PD-day to bring together Family Studies, and Hospitality and Tourism teachers to foster connections across curricula. Furthermore, when discussing the additional qualifications necessary to teach Family Studies courses (Honours Specialist in Family Studies), T2 (RS) lamented that this course "doesn't teach you any practical skills about cooking".

Moreover, teachers from both schools noted that they have high enrolment in food-related courses. The program at the SNS, which had new kitchen facilities, had a waiting list but couldn't offer additional courses because of the limited equipment and space for practical skill building. The infrastructural challenges were even more acute in the RS, where the kitchens desperately needed renovations. Throughout the interviews, it became clear that for these courses to be run in a meaningful way, it required teachers who are champions for their program. This meant that the teachers (SNS) were volunteering on evenings and weekends to raise funds in order to purchase high quality ingredients, while T2 (RS) promoted the program to incoming high school students and lobbied the principal for funds. Additional time was also allotted for purchasing food, cleaning, and careful budgeting of resources to ensure that they last throughout the semester.

When teachers were asked about the changes that they would make to the curriculum and food-related programming, they highlighted training for teachers (T1, RS; T3 and T4, SNS) and the inclusion of "more hands-on" skills, as well as "food systems and food security" components (T3, SNS). T3 (SNS) further explained, "The nature of our world is changing...and the impact that food and food production have on the environment has changed dramatically even in the last however many years. As far as an expectation, and how you do that…I'm not exactly sure, but I think it's important that the kids…demonstrate an understanding of really where food comes from, its environmental impact." Sustainable funding to run these programs, especially when they have practical skill building components, was also emphasized.

## Discussion and recommendations

Despite the context-specific and exploratory nature of this study, the interview findings show that the high school students who took a food-related course had enhanced their food skills or hands-on, procedural knowledge, which was the main objective identified by teachers. The findings further highlight that, in these two schools, students' FL was more developed in the health and well-being than in the agrifood systems dimension. By exploring the content of the courses and the capacity of students to discuss the different dimensions of FL, our findings also underline that teachers' training, knowledge, and priorities shape the focus (i.e., hands-on skills/procedural knowledge, or agrifood systems or health and well-being/declarative knowledge) of the courses, and in turn, the FL dimensions that students develop, or not. The results also inevitably stress that the content depends on the curriculum from which the course was taught (i.e., Hospitality and Tourism, or Family Studies). Hence, at the rural school (RS), students' learning focused mostly on nutrition, health, and practical skills. AFSL was barely covered at the RS, although more extensive research is necessary since these themes are explored in G11 to G12 courses, if students opt for more food-related courses. At the SNS, teachers explained that they made explicit efforts to cover some aspects of agrifood systems and sustainability. Moreover, teachers had different perceptions on how best to prepare students to

apply critical thinking skills in their own lives. The SNS teachers for instance insisted on going beyond health, nutrition, and the practical skills, by encouraging students to think critically about food sourcing and agrifood systems. This objective was seen as an outcome in S2's (SNS, intervention) food literacy, as she demonstrated the beginnings of critical AFSL in her interview.

Although T1 (RS) noted that he believed his rural students were more informed about agrifood systems resulting from their exposure and proximity to farming and food production, there is not enough evidence in our results to prove this. In fact, our research shows that the home environment may be more influential than the surrounding environment in developing critical awareness of agrifood systems. This was seen with the student who lived on a farm (S7, RS, control group) but was unable to define or explain agrifood systems during the interview, claiming that such discussions don't occur at home. By contrast, another student from the RS (S6, control) was very informed about agrifood systems and issues, noting that these discussions were a part of regular conversations in her household. The influence of the home environment is important to highlight since students who are more exposed to food and farming because of their rural location may still lack a critical awareness of the broader agrifood systems when these issues are not discussed at home. This points to a need to consider mandatory multidimensional FL education in both urban and rural areas.

In this context, and although this research cannot make conclusions about the FL levels of high school students, nor make distinctions between rural and suburban students, this study points to an important research gap—the comprehensive evaluation of FL. Recent studies have highlighted a need for tools to measure food literacy (Krause et al., 2018b; Thomas et al., 2019). Some have made strides to develop short FL questionnaires (Krause et al., 2018a) or scales for self-perceived FL (Poelman et al., 2018). These tools, however, are being developed based on frameworks (Slater, 2013; Vidgen & Gallegoes, 2014) that would benefit from a stronger incorporation of the AFSL dimension. Indeed, based on our interviews, the absence of references to agrifood systems dimensions and a general difficulty to expand on the subject, when prompted and defined for them, reinforces this claim. We thus argue that measurement tools and a comprehensive framework should develop a more balanced approach by incorporating elements for sustainable agrifood systems, in addition to nutrition and healthy eating, in all levels of FL. This is especially important given that sustainable agrifood systems are essential to health outcomes (Willett et al., 2019). As this research demonstrates, this also requires citizens to deepen their systems thinking and challenge structural barriers, as highlighted by critical pedagogy scholars and food sovereignty advocates.

Our exploratory study therefore supports the development and adoption of a broader, multidimensional FL framework (see Figure 1). This framework highlights the potential power of cultivating a more comprehensive and critical FL in an increasingly globalizing and complex agrifood environment. As such, we call for practitioners and researchers from various disciplines to collaborate and expand their FL approach and measurement tools to thoroughly incorporate the AFSL dimension. Slater (2013) proposes a FL framework, anchored in health literacy, which is widely adopted. It identifies three FL levels, which are functional, interactive, and critical.

Nonetheless, Slater's framework still focuses primarily on health outcomes, including in the critical FL level, where she notes that changes to personal and family health can occur through advocating for community changes to improve nutritional health. Given the uptake and use of Slater's framework, we therefore suggest, in Table 3, a modified framework to equally emphasize health and sustainable agrifood systems, oriented towards achieving planetary and human health and well-being. This is crucial given that even with the best intentions, a good understanding of healthy eating patterns and sustainable agriculture, many households face extreme difficulties to feed and care for themselves. It is in this sense that a critical level of FL, including an agrifood systems dimension, is crucial to empower students. This would help to give them the capacity to become active and informed citizens who are able to organize collectively and shape tomorrow's agrifood systems in Canada and beyond.

**Table 3:** A framework toward measuring FL

| | |
|---|---|
| Functional food literacy | Basic knowledge and communication of credible, evidence-based nutrition, food, and agrifood systems information, involving accessing, understanding, and evaluating information. |
| Interactive food literacy | Development of personal skills (i.e., cooking, farming/growing, harvesting, etc.) regarding food and nutrition issues, and agrifood systems, involving informed decision making, goal setting and practices to enhance nutritional health and well-being and agrifood systems sustainability. |
| Critical food literacy | Respect for different cultural, family, and religious beliefs in terms of food and nutrition. Understanding the wider context of agrifood systems (production, processing, distribution, consumption, and waste) and nutritional health, and advocating for individual, community and institutional changes that enhance nutritional and agrifood systems health at the local, regional, national and global scales. |

Source: Adapted from Slater (2013, p. 623)

The interviews with teachers demonstrate that the key challenges they face are related to a lack of time, resources, and training. Indeed, when teachers do not have sufficient time, they tend to "pay lip service" (T3, SNS) to some aspects of the curriculum because it was nearly impossible to meet all of the expectations in a single course. Hence, regardless of the comprehensiveness of the curriculum, course objectives and content will depend largely on the teachers' particular knowledge, capacity, and interests. Limited and inadequate infrastructure was also noted as a barrier, given that a relatively small number of students can be in a kitchen/classroom at a time, yet this space is essential to develop procedural knowledge (i.e., experiential learning such as cooking and gardening skills). These infrastructural resources will be crucial moving forward to be able to reach more students. Furthermore, our study highlights a lack of training for teachers in the Family Studies stream, especially in regard to their procedural knowledge. T2 (RS) and T4 (SNS) stressed that currently, teachers are not learning food skills in their additional qualification courses which enable them to teach from the Family Studies curriculum. Professional development would also contribute to expanding teachers' declarative knowledge to help them to feel confident in delivering key curriculum expectations. Such knowledge would contribute to better covering both the health and well-being, and agrifood

systems dimensions. These challenges are therefore essential to consider providing a well-rounded and effective development of students' FL.

This is a timely moment to rethink the pedagogical approach of FL and to develop new measurement tools since the Government of Ontario is considering the adoption of a *Food Literacy for Students Act*, *2020*. With this proposed Bill, there is acknowledgement of the need for mandatory food literacy from grades one to twelve, "including experiential or hands-on skills learned in gardens and kitchens" as it is "critical for making healthy food choices that enable self-reliance and improve human health" (Food Literacy for Students Act, 2020). If passed, this initiative could provide essential life skills to all students in Ontario, and future generations of leaders. We believe that mandatory courses would be especially beneficial for students whose families are not "foodies" and thus do not get hands-on/procedural training, nor exposure to discussions about agrifood systems at home. If the *Food Literacy for Students Act* is to be effective, it will require sufficient funding and updates to infrastructure, likely including pop-up kitchen facilities to accommodate experiential learning. As many of the details of the Act have yet to be finalized, it is important that the Ministry of Education also consider how changes to the curricula could help to facilitate expectations to be met over years, rather than a singular course. This would address the concerns raised by teachers in this study about the lack of time to effectively teach students about key topics in each dimension of FL. Curricula updates are also needed since "a learning-by-doing approach by itself does not necessarily guarantee the development of critical thinking about food systems" (Yamashita & Robinson, 2016, p. 271). Hence, a multidimensional FL approach integrating declarative and procedural knowledge would support the most comprehensive FL outcomes. In this context, every student would acquire essential skills and knowledge to be healthy and become engaged citizens.

## Conclusion

This research explored what is presently offered in food-related programs in two Ontario high schools and pointed to difficulties in providing students with a comprehensive food literacy, especially the difficulties faced by the teachers of these courses. We therefore propose a conceptual framework for FL programs and evaluations which can guide future policy recommendations and initiatives. FL is an excellent pedagogical field to encourage critical thinking and hands-on, experiential learning. Indeed, food is central to our daily routines and essential to sustain ourselves, which reminds us that every human being is connected to land and dependent on ecosystems. A growing number of food activists and scientists from various disciplines stress the fact that the dominant agrifood system is not sustainable, nor providing food security. Hence, based on our findings and existing literature, we argue for a broader conceptualization of FL, incorporating its multiple and interconnected dimensions, which cuts across ecological, sociopolitical, and economic aspects of our collective livelihood. FL incorporating an agrifood systems dimension can help in developing policy coherence and

strategies that work horizontally across governmental departments, addressing objectives such as health, agricultural production, education, and environmental sustainability. Interdisciplinary collaboration between scholars, community organizations, the agrifood industry, and food sovereignty activists is crucial to effectively implement this broader, multidimensional understanding of FL.

Based on this study, we propose that a comprehensive FL has the potential to empower citizens, enabling them to create new opportunities to increase the overall sustainability and diversity of agrifood systems, while actualizing their personal health and well-being. By consolidating FL among high school students, we would enhance their essential life skills and knowledge just before they enter postsecondary education or the workforce. Governmental initiatives to improve FL seem especially urgent and strategic in these times of interconnected crises, including food, health, climate, and energy, which became more acute and visible during the COVID-19 pandemic.

Despite the exploratory nature and context-specific aspect of this research, the findings nonetheless provide significant insights calling for more extensive and in-depth analyses. Further qualitative and quantitative research is necessary to develop benchmarks for FL, including the agrifood systems dimension, to orient future program development and evaluation. We hope that this contribution will nurture more extensive research regarding high school students' FL levels and the content and outcomes of existing programs. This is crucial in order to equip students to make informed choices and become engaged citizens to promote not only individual health and well-being, but also just and sustainable agrifood systems. Given the possibility of a *Food Literacy for Students Act, 2020* in Ontario*,* it is excellent timing to expand on the findings in this study and to proceed to more in-depth research. Such studies could contribute to revising current and future policies and learning objectives, as well as reimagining the role of pedagogy, environmental and food policy initiatives.

Acknowledgements: This research was funded by the Social Sciences and Humanities Research Council.

## References

Anderson, C. R., Maughan, C., & Pimbert, M. P. (2018). Transformative agroecology learning in Europe: Building consciousness, skills and collective capacity for food sovereignty. *Agriculture and Human Values*, *36*(3), 531–547. https://doi.org/10.1007/s10460-018-9894-0

Anderson, C. R., Bruil, J., Chappell, M. J., Kiss, C., & Pimbert, M. P. (2021). *Agroecology now!: Transformations towards more just and sustainable food systems*. Springer Nature. http://dx.doi.org/10.1007/978-3-030-61315-0

Andrée, P., Bosia, M. J., Ayres, J. M., & Massicotte, M-J. (Eds.). (2014). *Globalization and food sovereignty: Global and local change in the new politics of food*. University of Toronto Press. https://doi.org/10.15353/cfs-rcea.v2i1.75

Azevedo Perry, E., Thomas, H., Samra, H. R., Edmonstone, S., Davidson, L., Faulkner, A., Petermann, L., Manafo, 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

Blay-Palmer, A., Sonnino, R., & Custot, J. (2015). A food politics of the possible? Growing sustainable food systems through networks of knowledge. *Agriculture and Human Values*, *33*(1), 27–43. https://doi.org/10.1007/s10460-015-9592-0

Block, L. G., Grier, S. A., Childers, T. L., Davis, B., Ebert, J. E. J., Kumanyika, S., Laczniak, R. N, Machin, J. E., Motley, C. M., Peracchio, L., Pettigrew, S., Scott, M., & van Ginkel Bieshaar, M. N. 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

Bloomfield, M. J. (2014). Shame campaigns and environmental justice: Corporate shaming as activist strategy. *Environmental Politics*, *23*(2), 263–281. https://doi.org/10.1080/09644016.2013.821824

Brichta, J., & Howard, A. (2013) *What's to eat? Improving food literacy in Canada.* The Conference Board of Canada.https://appetite4change.files.wordpress.com/2013/12/cbofc-food-literacy.pdf

Canadian Centre for Food Integrity (CCFI). (2019). *2019 Public trust research: Connecting with Canadians*. https://www.foodintegrity.ca/wp-content/uploads/2019/11/ENG2019Summit-Researchsingle-LR.pdf

Clapp, J. & Purugganan, J. (2020). Contextualizing corporate control in the agrifood and extractive sectors. *Globalizations 17*(7), 1265-1275. https://doi.org/10.1080/14747731.2020.1783814

Classens, J. & 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

Colatruglio, S., & Slater, J. (2016). Challenges to acquiring and utilizing food literacy: Perceptions of young Canadian adults. *Canadian Food Studies, 3*(1), 96–118. https://doi.org/10.15353/cfs-rcea.v3i1.72

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

Desjardins, E., Davidson, L., Samra, R., MacDonald, A., Dunbar, J., Thomas, H., Munoz, M., King, B., Maxwell, T., Wong-McGraw, P., Shukla, R., & Traynor, M. (2013). Making something out of nothing: Food literacy among youth, young pregnant women and young parents who are at risk for poor health. *Food Literacy for Life: Technical Report.* https://foodsecurecanada.org/sites/foodsecurecanada.org/files/food_literacy_study_technical_report_web_final.pdf

Desmarais, A. A., & Wittman, H. (2014). Farmers, foodies and First Nations: getting to food sovereignty in Canada. Journal of Peasant Studies, 41(6), 1153-1173.

Edelman, M., Weis, T., Baviskar, A., Borras, S., Holt-Giménez, E., Kandiyoti, D., & Wolford, W. (2014). Introduction: Critical perspectives on food sovereignty. *The Journal of Peasant Studies*, *41*(6), 911–931. https://doi.org/10.1080/03066150.2014.963568

*Food Literacy for Students Act 2020, Bill 216.* (2020). https://www.ola.org/en/legislative-business/bills/parliament-42/session-1/bill-216

Freire, P. (1972). *Pedagogy of the oppressed*. Herder.

Friedman, H., & McMichael, P. (1989). The rise and decline of national agricultures, 1870 to the present. *Sociologia Ruralis, 29*(2), 93-117. https://doi.org/10.1111/j.1467-9523.1989.tb00360.x

Frick, M. J., Kahler, A. A., & Miller, W. W. (1992). Agricultural literacy: Providing a framework for agricultural curriculum reform. *NACTA Journal*, *36*(1), 34–37. http://dx.doi.org/10.5032/jae.2008.01085

Giroux, H. A. (2020) *On critical pedagogy* (2nd ed.). Bloomsbury Academic.

Gliessman, S. (2018). *Breaking away from industrial food and farming systems: Seven case studies of agroecological transition*. International Panel of Experts on Sustainable Food Systems (IPES-Food). http://www.ipes-food.org/_img/upload/files/CS2_web.pdf

Hawkes, C., Thow, A. M., Downs, S., Ghosh-Jerath, S., Snowdon, W., Morgan, E., Thiam, I., & Jewell, J. (Eds.). (2013). Leveraging agriculture and food systems for healthier diets and noncommunicable disease prevention: The need for policy coherence. *Expert paper for the 2nd international conference on nutrition.* http://www.fao.org/fileadmin/user_upload/agn/pdf/HawkesICN2paper_Jul1.pdf

Hernandez, K. (2019). *Exploring Food Literacy in Nova Scotia Public Schools: A Critical Analysis* [Unpublished doctoral dissertation]. Dalhousie University.

hooks, b. (1994). *Teaching to transgress*. Routledge. https://doi-org.proxy.bib.uottawa.ca/10.4324/9780203700280.

Ingram, J., Ajates, R., Arnall, A., Blake, L., Borrelli, R., Collier, R., de Frece, A., Häsler, B., Lang, T., Pope, H., Reed, K., Sykes, R., Wells, R., & White, R. (2020). A future workforce of food-system analysts. *Nature Food*, *1*(1), 9-10. http://dx.doi.org/10.1038/s43016-019-0003-3

Judd-Murray, M. R. (2019). *Development and validation of an agricultural literacy instrument using the national agricultural literacy outcomes* [Unpublished doctoral dissertation]. Utah State University.

Kimura, A. H. (2011). 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

Krause, C. G., Beer-Borst, S., Sommerhalder, K., Hayoz, S., & Abel, T. (2018a). A short food literacy questionnaire (SFLQ) for adults: Findings from a Swiss validation study. *Appetite*, *120*, 275-280. https://doi.org/10.1016/j.appet.2017.08.039

Krause, C. G., Sommerhalder, K., Beer-Borst, S., & Abel, T. (2018b). 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

Lamine, C. (2015). Sustainability and resilience in agrifood systems: Reconnecting agriculture, food and the environment. *Sociologia Ruralis*, *55*(1), 41–61. https://doi.org/10.1111/soru.12061

*Local Food Act 2013, Bill 36* (2013). https://www.ola.org/en/legislative-business/bills/parliament-40/session-2/bill-36

Magnan, A. (2016). *When wheat was King: The rise and fall of the Canadian-UK grain trade*. UBC Press.

Martin, A. (2018). *The Socio-Environmental Aspects of Students' Food Literacy: An Exploratory Case Study of Two Ontarian High Schools* [Thesis, Université d'Ottawa / University of Ottawa]. https://doi.org/http://dx.doi.org/10.20381/ruor-21592

Massicotte, M. J. (2014). Solidarity economy and agricultural cooperatives: The experience of the Brazilian Landless Rural Workers Movement. *Journal of Agriculture, Food Systems, and Community Development*, *4*(3), 155-176.

Meek, D., & Tarlau, R. (2016). Critical food systems education (CFSE): Educating for food sovereignty. *Agroecology and Sustainable Food Systems*, *40*(3), 237–260. https://doi.org/10.1080/21683565.2015.1130764

Morrison, D. (2011). Indigenous food sovereignty: A model for social learning. In H. Wittman, A. A, Desmarais & N. Wiebe (Eds.), *Food sovereignty in Canada: Creating just and sustainable food systems* (pp. 97-113). Fernwood Publishing.

Ontario Ministry of Education. (2009). *Acting today, shaping tomorrow: A policy framework for environmental education in Ontario schools*. http://www.edu.gov.on.ca/eng/teachers/enviroed/shapetomorrow.pdf

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. http://dx.doi.org/10.1016/j.aaspro.2016.02.013

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. *The International Journal of Behavioral Nutrition and Physical Activity, 15*(1), 54-54. doi:10.1186/s12966-018-0687-z

Popkin, B. M. (2001). Nutrition in transition: The changing global nutrition challenge. *Asia Pacific Journal of Clinical Nutrition*, *10*(s1), S13–S18. https://doi.org/10.1046/j.1440-6047.2001.0100s1S13.x

Ronto, R., Ball, L., Pendergast, D., & Harris, N. (2016). Adolescents' perspectives on food literacy and its impact on their dietary behaviours. *Appetite*, *107*(1), 549–557. https://doi.org/10.1016/j.appet.2016.09.006

Rose, N., & Lourival, I. (2019). Hegemony, counter-hegemony and food systems literacy: Transforming the global industrial foods. *Australian Journal of Environmental Education, 35*(2), 1-13. https://doi.org/10.1017/aee.2019.9

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

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

Thomas, H. M., & Irwin, J. D. (2011). Cook it up! A community-based cooking program for at-risk youth: Overview of a food literacy intervention. *BMC Research Notes*, *4*(495), 1-7. https://doi.org/10.1186/1756-0500-4-495

Thomas, H., Perry, E. A., Slack, J., Samra, H. R., Manowiec, E., Petermann, L., Manafo, E., & Kirkpatrick, S. I. (2019). Complexities in conceptualizing and measuring food literacy. *Journal of the Academy of Nutrition and Dietetics*, *119*(4), 563-573. https://doi.org/10.1016/j.jand.2018.10.015

Truman, E., Lane, D., & Elliott, C. (2017). Defining food literacy: A scoping review. *Appetite*, *116*(1), 365–371. https://doi.org/10.1016/j.appet.2017.05.007

Valley, W., Wittman, H., Jordan, N., Ahmed, S., & Galt, R. (2017). An emerging signature pedagogy for sustainable food systems education. *Renewable Agriculture and Food Systems*, *33*(5), 467–480. https://doi.org/10.1017/S1742170517000199

Vermeir, I., & Verbeke, W. (2008). Sustainable food consumption among young adults in Belgium: Theory of planned behaviour and the role of confidence and values. *Ecological Economics*, 64(3), 542–553. https://doi.org/10.1016/j.ecolecon.2007.03.007

Vidgen, H. A., & Gallegos, D. (2014). Defining food literacy and its components. *Appetite*, *76*(1), 50–59. https://doi.org/10.1016/j.appet.2014.01.010

Weiler, A. M., Hergesheimer, C., Brisbois, B., Wittman, H., Yassi, A., & Spiegel, J. M. (2014). Food sovereignty, food security and health equity: A meta-narrative mapping exercise. *Health Policy and Planning*, *30*(8), 1078–1092. https://doi.org/10.1093/heapol/czu109

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L.J., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J.A., De Vries, W., Sibanda, L.M., … Murray, C. J. L. (2019). Food in the Anthropocene: The EAT-lancet commission on healthy diets from sustainable food systems. *The Lancet Commissions*, *393*(10170), 447-492. https://doi.org/10.1016/S0140-6736(18)31788-4

Yamashita, L., & Robinson, D. (2016). Making visible the people who feed us: Educating for critical food literacy through multicultural texts. *Journal of Agriculture, Food Systems, and Community Development, 6(*2), 269-281. https://doi.org/10.5304/jafscd.2016.062.011

## **Appendix A:** Sample of student interview questions

| Question theme | Group | Example questions |
|---|---|---|
| Discussions of food in school | Intervention and control | ● Have any of your (other) classes talked about food or been related to food? |
| Values related to food | Intervention and control | ● What do you think is the most important factor when you are purchasing foods or eventually when you will do so? |
| Question about agrifood systems | Intervention and control | ● If I say "food systems" or "agrifood systems" what comes to your mind?<br>● Can you define it in your own words?<br>[Interviewer provided a basic agrifood systems definition]<br>● Do you think that the food systems that we have here are generally sustainable? |
| Impacts from food-related course | Intervention only | ● Do you believe that this course has changed your food habits and/or your knowledge about food and food systems? |
| Making better food choices—agrifood systems or health and well-being | Intervention and control | ● Do you think that this course has contributed to preparing you to make "better food choices" now and in the future, when possible? Please explain what you think I mean by "better food choices." |
| Agrifood systems issues | Intervention and control | ● Can you give me an example of a food issue, or issues related to agrifood systems that you know of and that you find interesting or problematic? |

## **Appendix B:** Sample of teacher interview questions

| |
|---|
| ● What are the topics covered in your food-related courses and overall program? |
| ● What are the topics covered in your overall program? |
| ● What do students know about food and nutrition? |
| ● What do students know about food and food systems? |
| ● Do you talk about food systems or agrifood systems in your classes? If so, please explain. |
| ● Do you believe that a food-related course should be mandatory? |
| ● What are some challenges in teaching food-related courses? |
| ● Do you have any recommendations for changes to food-related courses going forward? |