

CHAPTER TWO

Critical Examination of Environmental Education Through the Pedagogy of Indigenous Food Cultures

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Abstract

Recent global climatic events such as severe flooding in Asia, extreme drought and water shortages in parts of Africa, and rampant wildfires in the Americas and in Europe have caused even intransigent critics to recognize the reality of climate change. While the food sector in particular will experience the devastating effects of climate change, industrial agriculture ironically has been identified as one of the leading causes of climate change on a global scale. This paper responds to such environmental concerns by exploring the potential of Indigenous food cultures as a pedagogical tool to augment Western scientific approaches to climate change. Using document analysis as its methodology, the paper traces three knowledge traditions (Indigenous knowledge, Islamic science, and Western science) and argues for the validity of each within its own cultural context. The paper identifies four areas—spirituality, food diversity, harvesting regulations/restrictions, and reliance on local material—through which Indigenous knowledges related to food production can enhance Western science in addressing environmental challenges.

Keywords: Indigenous Knowledge, Food Cultures, Pedagogy, Environmental Education.

Introduction

Climate change is an existential threat to world populations and life on earth (Fletcher et al., 2024). Recent global climatic events such as severe flooding in Asia, extreme drought and water shortages in parts of Africa, and rampant wildfires in the Americas and in Europe have caused even intransigent critics to recognize the reality of climate change. Such developments include an initial agreement reached in 2014 between China and the United States, which together contribute 39% of global greenhouse gas emissions (Olivier and Peters 2020), and overwhelming endorsement of emission cuts by the nearly 200 member nations that took part in the 2015 United Nations Climate Change Conference (COP 21) held in Paris, France. While the food sector in particular will experience the devastating effects of climate change, industrial agriculture ironically has been identified as one of the leading causes of climate change on a global scale, with atmospheric increases of methane and nitrous oxide being caused primarily by agriculture (Grossi et al. 2019; Jantke et al. 2020; Sokal, K & Kachel, 2025). Factors contributing to climate change include carbon dioxide (CO₂) emissions resulting from mechanized agriculture that depends

heavily on fossil fuel for tillage practices, irrigation, mechanized feeding, fertilizer production and application, transportation, and other farm operations. Overall, industrial agriculture is unsustainable for four main reasons, including its: (a) overreliance on fossil fuel, an exhaustible and non-renewable resource; (b) overreliance on chemicals (both fertilizers and pesticides) that eventually render most soils obsolete, providing plants mere anchorage rather than nourishment; (c) overconcentration of selected crop varieties grown intensively, which reduces diversity of human food bases; and (d) overconcentration of animal species reared with antibiotics. Individual and organized groups of critics have raised concerns about the environmental and health impacts of our current food system (Clark et al. 2019; Mejia et al. 2018; Nichifor & Zait, & Timiras, 2025; White et al. 2020). One area worth critical analysis in addressing such concerns is the current model of environmental education premised on Western science with all its limitations. Orr (2004) argues that higher education and technology have sought over time to entrench human domination of the earth, and in the process of solving one problem, another is created. In short, our quest to dominate the earth has made us “vandals of the earth” (Orr 2004, 6). Hence, this chapter explores the potential of Indigenous food cultures as a pedagogical tool to augment Western science in order to address current environmental problems. The main research question guiding this chapter is: What can we learn from Indigenous food cultures as a knowledge base for the education of young learners?

Indigenous food culture comprises the mode of food production, distribution, consumption and re-use of by-products of foods by Indigenous peoples. It also emphasizes food as an ethnic marker that underpins the construction of identities and cultures. As people learn to eat their (indigenous) foods, they learn their culture, who they are, and who they are not. Indigenous food culture is derived from Indigenous knowledge (IK) grounded in Indigenous worldviews. Berkes et al. (2000, 1252) define IK as a “cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment”. Knowledge of traditional food gathering, preparation, preservation, and consumption helps create a wealth of unique cultural knowledge and identities among ethnic groups and individuals. As a result, Indigenous foods and food systems are closely linked with IK and often extend to belief systems, spirituality, and indeed the holistic well-being of Indigenous people (Demi 2019b; Kuhnlein et al. 2009). Yet, Indigenous knowledges lack adequate recognition within the mainstream academy. Martin (2012), for instance, found that nutritional programs for Indigenous communities in Canada are designed with little to no input from the Aboriginal peoples (Gillies et al. 2020). As result, few of the programs are effective or in tune with Aboriginal peoples’ cultures and traditions.

Theoretical Framework: Knowledge Production and Worldviews

Berkes et al. (2000, 1259) define worldview or cosmology as “basic beliefs pertaining to religion or ethics, and structures of observations that produce knowledge and understanding”. Worldviews influence knowledge production in all knowledge traditions. Tracing the historical knowledge traditions, IK has existed for millennia and is grounded in Indigenous worldviews that emerged before the advent of Islamic science, the latter having dominated the areas of mathematics and science from the mid-8th to the mid-13th centuries (Alghamdi, Ziermann and Diogo, 2017;

Falagas et al., 2006), until the rise of Western science. Western science, founded on Ancient Greek worldviews (Mazzocchi, 2006), replaced and subsumed aspects of Islamic science. The expansion of the European empire through colonization spread Western science across the world, which has since become universally accepted knowledge. Still, as Feyerabend (1987) argues, any form of knowledge makes sense only within its own cultural context.

This chapter, therefore, operates on the theoretical prism of Indigenous knowledge, which according to Wane (2008) provides an alternative to the dominant Western scientific discourse, functioning as a form of resistance against colonialism and imperialism (Dei et al. 2000). IK is experiential and subjective in nature, because it is engrained in personal and direct human experience (Dei 2000) and is holistic and implicit (Dei 2004; Obomsawin 2001; Simpson 2000). It forms the basis of a livelihood that embraces every facet of human life from agriculture, food preparation, eating habits, health care, education and training, and environmental conservation (Agrawal 1995; Demi 2014; Kuhnlein et al. 2009; Warren et al. 1991). However, IK could be understood through an Indigenous worldview, which according to Simpson (2000) operates on the following seven principles: (a) knowledge is holistic, cyclic, and dependent upon relationships and connections to both animate and inanimate beings; (b) there are many truths, all based on individuals' lived experience; (c) everything has life; (d) all things are equal; (e) the land is sacred; (f) the relationship between humans and the spiritual world is relevant; and (g) humans are the least significant creatures in the world. These principles are understood within an Indigenous framework; hence, using other worldviews to assess IK may pose a challenge, making them seem "irrational," "unscientific," and "accidental." Thus, from an Indigenous point of view, humans are an integral part of nature, and their relationship with other forms of creation, both animate and inanimate, is one of mutual respect. Trask (1991) explained this when she echoed the beliefs of Native Hawaiians, who maintain that "nature was not objectified, but personified, resulting in an extraordinary respect (when compared to Western ideas of nature) for life of the sea, the forest and the earth" (p. 1199).

IK, therefore, forms the basis of Indigenous food systems. According to the FAO (2009, 1), Indigenous farming practices encompassing "fishing, pastoralism/herding, foraging and forestry are grounded on long proven knowledge and practices that help to ensure food and agricultural diversity, valuable landscape and seascape features, livelihoods and food security". Based on this view, Indigenous foods and food systems are closely linked with IK which is also vital for the livelihood of Indigenous people. As Kuhnlein et al. (2009, 3) observe,

The dimensions of nature and culture that define a food system of an Indigenous culture contribute to the whole health picture of the individual and the community—not only physical health but also the emotional, mental and spiritual aspects of health, healing and protection from disease.

It is therefore evident that Indigenous food systems not only are vital for human sustenance but also constitute a treasure of knowledge that contributes to well-being and health, environmental sustainability, and cosmic balance of the ecosystem that could be harnessed to benefit humankind (Kuhnlein et al. 2010). However, Indigenous technologies of food processing and distribution are disappearing as more and more Indigenous peoples are displaced from their traditional lands, local foods, and cultural knowledge (Sacco et al. 2021). The decline in Indigenous food practices and consumption have been linked to increasing cases of chronic illness among Indigenous communities in sub-Saharan Africa (Raschke and Cheema 2007), Australia (Rowley et al. 2000),

and North America (Fazzino 2008). Indigenous communities seldom separate food from medicine; hence, the associated health benefits of food, especially plant-based food, extend their value into the realm of traditional medicine (Akinola et al. 2020; Messer 1984). The next section compares and contrasts Indigenous and industrial food production practices.

Indigenous Versus Industrial Food Production

Food production is one of the oldest occupations engrained in IK since humans realized that living in the wild was not sustainable. Historical accounts have shown that long experimentation with what was in humans' immediate surroundings, as well as intuition and revelations from God(s) and ancestors, determined what could be regarded as food (Demi 2014; Logan 2012). Classification of plants into food and medicine is attributed to human ancestors' experience and survival—ancestral knowledge passed on to each new generation. Throughout these struggles, Indigenous people never separated food from medicine; depending on which part of the plant is used, the season of the year, and physiological condition of the person using the crop, the same plant can be consumed as food or medicine (Kuhnlein et al. 2009). Again, Indigenous people never separated crops from weeds—all plants are either food or medicine. Indeed, the definition of “weed” as a plant growing in an unwanted place likely derived from the European system of mono-cropping; for instance, a corn plant found in a tomato mono-crop farm can be deemed a weed and hence destroyed. An Indigenous woman farmer in India challenged the classification of plants into weeds and crops by questioning: “What do you mean by weeds? There is nothing like weed in our agriculture” (Mazhar et al. 2007, 18). Despite complexities in defining weeds, most Indigenous plants unfamiliar to Western agronomists were classified as such and massive investment in agrochemicals to destroy them was initiated when capitalism seized agriculture as a viable business (Demi 2019b). The next paragraphs situate food production in this general context and look at key considerations in Indigenous and industrial agricultures.

Historically, the process of acquiring food in Indigenous communities is cloaked in spirituality and physical considerations that ensured the continuous existence of peace, harmony, and sanctity in nature. Environmental sustainability was a critical aspect of food acquisition and consumption, connected to the belief that humans are linked to the earth, hence their continued existence depended on the reverence accorded the earth. As such, members of Indigenous communities are encouraged to make peace with all plants, animals (both domesticated and wild), as well as all other matter in aquatic and terrestrial ecosystems. Good neighborliness was therefore extended to the earth: The soil was assumed to be a deposit account from which account holders (humans) drew only part of the accrued interest without ever touching the principal (Demi 2019a; Wangoola 2000). All creatures on Earth were considered as partners playing key roles in sustaining the environment's cosmic balance.

As Wangoola (2000) puts it, “humans are the most vulnerable and weakest link in the vast chain of nature. The earth is not for them to conquer and subdue, but their mother to live with in peace, harmony and reverence” (p. 265). Indigenous farmers thus do not produce food mainly for profit but rather to sustain nature, of which humans are a key component. Gliessman (1998) outlined five fundamental principles of Indigenous food production, which: (a) combines several species and structural diversity in time and place; (b) explores the full range of the microclimate (which differs in terms of soil, water, temperature, altitude, slope, fertility, and topography) within

a field or region; (c) ensures a close cycle of local readily available resources and by-products through effective recycling practices (e.g., crop waste is used to feed livestock); (d) depends on complex biological independencies, culminating in high levels of biological pest suppression; (e) relies on local readily available resources in addition to human and animal energy, thereby using low levels of input technology and exhibiting positive energy efficiency ratios.

Industrial agriculture, on the other hand, is based on a business model premised on neoliberal policies. Until a few decades ago, agriculture did not attract the interest of capitalist economies harkening back to earlier stages of capitalism dating as far back as the 17th century in England (Albritton 2012), some of the reasons being: high risks and uncertainties associated with agriculture due to its (over)dependency on nature; long gestation periods that make it difficult to meet immediate consumer demand; perishability of most agricultural products; and bulkiness of agriculture products relative to value (Demi 2019a, b).

Starting with the so-called green revolution that occurred after the Second World War, massive investments were made to address the aforementioned challenges associated with agriculture, which laid the foundation for neoliberal agricultural policies. The problems of risk and uncertainty were addressed using technology such as mechanized irrigation to address drought conditions; climate-controlled transportation to move produce from place to place without spoilage to address perishability; and the use of “improved varieties” of plants with shorter seed-to-harvest life spans to deal with long gestation periods (Demi, 2019a). These developments paved the way for capitalism to manipulate food systems to the disadvantage of the poor people. Corporate interest in agriculture has driven smallholder farmers in the Global South and family farms in other countries into oblivion (e.g., Canada lost 22% of its family-run farms between 1986 and 2006; Statistics Canada, 2007). The World Trade Organization’s (WTO’s 1995) *Agreement on Agriculture* policy has worsened the plight of smallholder farmers, creating backlogs of unemployment in the Global South and widening the poverty gap between the rich and poor in most Global North countries. The implementation of WTO policies has compelled smallholder farmers to fold into larger corporate farms and essentially provide cheap labour to business magnates. Hence, the green revolution was criticized by environmentalists and critical scholars alike as the beginning of the degeneracy of human health, social cohesion, economies, and the cultural lives of people, particularly those in the Global South (Grenier 1998; Nelson et al. 2019; Shiva 2016). As Grenier (1998, 8) affirms, “the green revolution resulted in ecological deterioration, economic decline (at the local level), poorer diets and nutritional losses resulting from the eradication of traditional foods or from their substitution by non-traditional foods”. Murphy (2008, 696) adds that:

The intensification of production and consumption in recent decades has yielded a chemically recomposed planetary atmosphere to alarming future effect, while it has penetrated the air, water, and soil to accumulate into the very flesh of organisms, from plankton to humans. Not only are we experiencing new forms of chemical embodiments that molecularly tie us to local and transnational economies, but so too processed food, hormonally altered meat, and pesticide-dependent crops become the material sustenance of humanity’s molecular composition.

Murphy indicts both industrial agriculture and government agencies that regulate our food systems, including those that allow pseudo foods to dominate supermarket shelves in a “spatial colonization” (Winson 2012, 186). Murphy’s view that current industrial food production ties people to transnational companies reveals an uneven relationship of control discussed decades ago by Susan George (1976) when she wrote, “this is what food has become: A source of profit. A tool of economic and political control; a means to ensure effective dominance over the world at large and especially over the wretched of the earth” (as cited in Raschke and Cheema, 2007, 663).

In sharp contrast to an Indigenous, cyclical food system, the corporate food system is linear—a system that “encompasses a chain of activities that begins with the production of food and moves on to include the processing, distribution wholesaling, retailing and consumption of food and eventually to the disposal of waste” (Kaufman 2004, as cited in Sumner 2012, 326). In Kaufman’s conceptualization of a food system, it ends when food waste is disposed of. Conversely, from an Indigenous perspective, every part of the plant or animal that constitutes food is valuable. Even crop by-products are further utilized as medicine, feeds for farm animals, compost, energy to heat homes, textiles to make clothing, and to some extent materials to provide shelter (see Truong et al. 2019). Sumner (2012, 237) defines a food system as “an interdependent web of activities that include the production, processing, distribution and disposal of food” . Although Sumner’s definition accurately emphasizes the interrelated chain of activities in the food system, the Indigenous food system does however stress the reuse of food waste to continue the cycle. Hence, the notion of food disposal is not part of the Indigenous food system; in fact, food wastage is abhorred. Simpson (2008) narrates a centuries’ old story of the people of Nishnaabeg who no longer found moose, deer, and caribou during hunting expeditions after the animals left their territory because their meat was being wasted. The animal nation later met in council and the chief deer presented the conditions upon which they would return to the Nishnaabeg territory as follows:

Honour and respect our lives and our beings, in life and in death. Cease doing what offends our spirits. Do not waste our flesh. Preserve fields and forests for our homes. To show your commitments to these things and as a remembrance of the anguish you have brought upon us, always leave tobacco leaf from where you take us. Gifts are important to build our relationship once again. (Simpson, 2008, p. 34)

The Nishnaabeg people agreed to the conditions set out by the animals, and the animals returned to their territory to offer themselves as sacrifices to provide food for the people (Simpson 2008). Consequently, contemporary Nishnaabeg hunters go through the rituals each time they kill deer or moose. This oral tradition illustrates how the wastage of food is not condoned among Indigenous people.

Pedagogical Implications

According to the *Oxford English Dictionary* (n.d.), pedagogy is “the art, occupation, or practice of teaching,” and encompasses “the theory or principles of education” (para. 3). In this sense, pedagogy should empower individuals to become conscious of themselves and their surroundings and improve their relationship with others (both animate and inanimate). However, critical analysis of current educational systems, particularly environmental education, shows some

limitations. Consequently, Orr (2004) calls for an overhaul of environmental education in particular and education in general. A paradigm shift is needed in environmental education—from the romantic notion of saving the earth to a more critical perspective of saving ourselves. Although Sobel’s (1996, 36) conditional statement of “if we want our children to flourish, to become truly empowered, then let us allow them to love the earth before we ask them to save it” is good-hearted, the notion of saving the earth implies that children and the environment are separate entities and arrogates to individuals the power to either destroy or save the earth.

An Indigenous perspective on the other hand positions humans as an integral part of earth; in other words, whatever we do to the earth, we do to ourselves (Martin 2012, Sanderson et al. 2020). This perspective instills in younger generation the importance of becoming more environmentally conscious and to shift their mindset from that of imperial saviours of the earth to one that seeks to save their own lives, and those of their families and friends, communities, and all other living organisms with whom they share the earth. This reminds us of Orr’s (2004) earlier argument that every education must be environmental education. Indigenous peoples’ connection and belonging to their natural surroundings is not premised on romantic notions of “living close to nature” but instead is predicated on a reciprocal relationship in which the earth provides resources for human survival as long as the people do not exhaust such resources in their surroundings (Bedriñana, Umaña and Martín, 2020; Turner 2005). For example, although Canada is the 20th richest nation on earth (Suneson 2019), the country’s Indigenous peoples still practice their traditional hunting, trapping, fishing, and farming despite the struggles in accessing and using their traditional territories for food procurement activities (Martin 2012). Yet, instead of finding out what can be learned from Indigenous practices, critics often consider such practices to be an indication of Indigenous peoples’ inability to put the land to so-called good use.

The other myth of environmental education identified by Orr (2004) is the assumption that knowledge is increasing; by extension, we live in an information world. Orr argues that people are confusing data with knowledge and that equating knowledge with the availability of information is a narrow way of understanding knowledge. Such a partial understanding of complex social issues beguiles people into believing that development leads to well-being and happiness (Albritton 2012; Jain, Sharma and Mahendru 2019). Sadly, as Orr (2004) puts it, “the earth does not need more successful people, what it desperately needs are more peacemakers, healers, restorers, story tellers and lovers of every kind” (p. 12). Sahlins (1972) argued that if leisure is the measure of affluent societies, then ironically, our predecessors were more affluent compared with contemporary societies because they had little to worry about in terms of accumulation of food and acquisition of material resources. Coming back to the myth of environmental education, Orr (2004, 6) argues that “what can be said truthfully is that some knowledge is increasing while others kinds of knowledge are a being lost”. Lopez (1989) warned about the pervasive loss of local knowledge for human survival:

[I am] forced to the realization that something strange, if not dangerous, is afoot. Year by year the number of people with firsthand experience in the land dwindles. Rural populations continue to shift to cities. ... In the wake of this loss of personal and local knowledge, the knowledge from a real geography is derived, the knowledge on which a country must

ultimately stand, has come something hard to define but I think sinister and unsettling. (p. 55)

Although the number of graduates increases annually, many of them lack firsthand knowledge of the ecology (Orr 2004). The environmental problem we now face is multifaceted; hence, more than scientific knowledge is required to address these challenges. Indigenous food culture and by extension IK is needed to augment Western science. At the center of Indigenous food culture is the emphasis on spirituality, the absence of which may portend for modern societies what Chinua Achebe (1958/1994) best described as “things fall apart, the center cannot hold.” By spirituality, I do not mean religion or fetishism but rather how individuals perceive themselves in relation to other beings, either animate or inanimate, in way that ensures reciprocity and mutual respect rather than a relationship of domination and subjugation. Demi (2016a) in highlighting the role of spirituality in environmental education asserts that

Spirituality is our innate feeling that pricks our individual consciousness to decipher good from evil, living in relationship devoid of domination and aggrandizement while respecting authorities. The inner consciousness that makes humans recognize that they are a part of the environment and not superior being provided with accoutrement to exploit and subdue nature. Spirituality is, therefore, sound knowledge of and interaction with the environment or nature. (p. 154)

The quote above emphasizes the role of spirituality in environmental management, human-to-human relationships, and human relationships with other beings that show peaceful co-existence in the ecology.

What We Can Learn from Indigenous Food Cultures

From the above discussions, Indigenous food cultures clearly provide a wide range of lessons that can be used to address poor health, environmental crises, and natural resources management. This chapter focuses on four lessons from Indigenous food cultures: spirituality, food diversity, harvesting regulations/restrictions, and reliance on local available materials. The following sections discuss each of these lessons in detail.

Spirituality

Spirituality connects people to their food. For instance, Indigenous people believe that if a hunter catches game (i.e., bush meat), it is considered a sacrificial act on the part of the animal rather than a result of the hunter’s dexterity; the animal sacrifices its life for the hunter, enabling him to feed himself and his family (see Simpson 2008; Wangoola 2000). Such a belief system mandates Indigenous people to accord great respect to the food they eat, to moderate their food consumption, and to show respect for the lives of the animals slaughtered. This belief also encourages Indigenous communities to rely largely on plant-based food (especially indigenous crops) instead of animal flesh, the exception being nomadic families who depend mainly on animal products. Furthermore, Indigenous food cultures make use of every part of the crop or animal, thus greatly reducing food wastage, which is restricted even further through cultural norms and values that forbid individuals from taking more than is required and emphasize the use of crop or animal

by-products (Demi 2019b; Simpson 2008; Wangoola 2000). In Indigenous animal husbandry, for example, livestock are mainly fed with crop by-products while substantive foods are strictly reserved for human consumption. These practices provide some advantages: humans avoid competition with farm animals for food, which fosters food self-sufficiency; and leaner, more healthful meat for human consumption, thus reducing incidences of chronic noncommunicable diseases (Wolk 2017; Zhang et al. 2019).

In contrast, industrial agriculture contributes to food insecurity through the use of whole grains and cereals as key components of animal feed. In 2007, for example, 58.6% of corn (maize) produced in the United States was used as animal feed by the meat industry, 28.6% was converted to ethanol for agro-fuel, and 4.77% was used to produce high-fructose corn syrup for the confectionary industries (United States Department of Agriculture 2008). The typical diet in the U.S. essentially is industry produced meat with periphery carbohydrates (Dietler, 2007), in contrast to Indigenous food cultures that depend largely on plant-based foods. It is estimated that an average of 9 billion chickens are slaughtered annually in the U.S., representing approximately 2.5 million chickens killed daily—a figure that exceeds the number of chickens killed in an entire year just 8 decades ago (Food and Agriculture Organization of the United Nations Statistics Division 2009; National Agricultural Statistics Service 2008; Weis 2009). The transformation of U.S. diets from high-calorie crop products to low-calorie meat has been described as the “meatification of diets” (Albritton 2012, 108) and has greater environmental consequences. Meat production contributes immensely to greenhouse emissions (Dopelt et al. 2019; González, Marquès, Nadal and Domingo 2020). Although spirituality is, therefore, a key component of Indigenous food cultures, it is missing in current environmental education. Hence, emphasizing spirituality in environmental education will help reduce food wastage and keep our environment safe(r).

Food diversity

Global crop diversity has declined significantly since the introduction of industrial agriculture. The quest for profit in industrial agriculture has resulted in the selection of a few energy-dense but nutrient-poor higher-yielding crops grown on a large scale for commercial purposes. According to the FAO (2009), about 7,000 species of plants have been cultivated since humans adopted farming; today, a mere 30 crops provide an estimated 90% of the world population’s dietary needs, with wheat, rice, and maize alone representing almost half of the caloric energy consumed globally (United Nations Environmental Programme [UNEP], 2008). Out of an estimated 15,000 species of mammals and birds that have been identified, only 30 to 40 have been domesticated for food production and less than 14 species (including cattle, goat, sheep, buffalo, and chickens) account for 90% of global livestock production (UNEP, 2008). Introduction of genetically modified (GM) crops and animals—mainly in the Americas, and with steady growth in Africa and other continents (Demi 2021; Rock 2019)—is likely to further dwindle the human food base. One of the Indigenous food system’s strengths is its emphasis on crop diversity. From the Indigenous point of view, there is nothing like authentic human foods, and what constitutes food to one Indigenous ethnic group could be taboo to another ethnic group, or could be used as a pet for some or an object of worship to others (Demi, 2014). In some parts of Africa where people practice a system of totems, people are forbidden to eat or harm plants or animals that symbolize their totem (Dostin 2019). The system of totem has been found to help environmental conservation

(Sinthumule and Mashau, 2020). For instance, a tribe whose totem is a deer, antelope, snake etcetera, neither eat the meat of the animal or harms the animal in any way (Dostin 2019; Wangoola 2000). The animal is also expected to reciprocate this kind gesture by not destroying the crops of people belonging to such ethnic groups or harming them (Dostin 2019; Wangoola 2000). The system of totem ensures that most plants or animals species are protected by one ethnic group or the other, hence reducing the chances of plant or animal species becoming extinct. This serves as a very effective mechanism of sustainability that Indigenous people employ to maintain cosmic balance in the ecosystem, which can serve as great pedagogy for young learners.

Harvesting regulations/restrictions

Certain rules and norms in some Indigenous communities govern how people harvest farm produce and seafood or hunt animals to avoid depleting the existing stock. Such norms are meant to protect vulnerable life stages of animal, aquatic, and plant species (Sinthumule and Mashau 2020; Westwood et al. 2019). A clear example is the prohibition against the catching of lobsters with eggs in the marine fisheries (Saputra 2020); prohibition against hunting during breeding season of most species in Africa (Demi, 2019b); and taboos regarding hunting and killing pregnant animals (Adom & Boamah 2020). In most farming and fishing communities in Ghana, West Africa, for example, days are set aside each week when fishing or engaging in farming activity is prohibited. These reserved days give people an opportunity to rest and also provide breathing space for sea or forest lives (Demi 2016a). Also, the harvest of certain farm products is timed to coincide with festivals in order to ensure that everyone can partake during such festive occasions. For instance, among the Guan ethnic groups in Ghana, a chief traditionally is the first person to eat fresh yam to commence the harvesting of yam (Demi 2016a). This practice (a) prevents people from hastily harvesting immature yams; (b) ensures yam harvesting begins when a majority of farmers have their crops fully matured, thus preventing theft from the farms of early planters; and (c) allows the chief and elders to ascertain the quality of the yam in the season to prevent any likelihood of food poisoning (Demi 2016a). These practices not only ensure sustainability but also control human desires, which, according to Orr (2004), are lacking in current environmental education. Hence, Indigenous food cultures could help young learners control their desires.

Reliance on local material

Indigenous food systems make good use of local, readily available materials. The reliance on local inputs and avoidance of synthetic chemicals ensures that safe organic foods are produced for human consumption. These practices, in turn, help improve human health and also preserve the environment for future generations. Avoidance of synthetic chemicals by Indigenous people is based on their belief that the soil/land gives back what humans put into it; when humans put chemicals into the soil, crops will ingest the chemicals and return them to us. Another area of concern is the emission of greenhouse gases (GHG) during the transportation of food from place to place, which increases industrial food systems' carbon footprint. Some critics argue that when we juxtapose the energy used to convey food to certain places with the total energy that the food is supposed to provide, we will realize that the former far exceeds the latter (Demi 2019b;

Suschnigg 2012), ultimately resulting in accelerated climate change. Ultimately, Indigenous food systems' use of locally available farming materials helps to conserve the environment. With the above considerations in mind, IK regarding food, spirituality, and diversity practices can serve as a highly useful pedagogical tool in environmental education.

Conclusion

This chapter explored the potential of Indigenous food cultures as a pedagogical tool to augment Western science to address climate change. The chapter identifies four areas—spirituality, food diversity, harvesting regulations/restrictions, and reliance on local material—in which IK related to food production and practices can augment Western science in addressing environmental challenges. The chapter argued that every knowledge makes sense within its own cultural context (Feyerabend 1987) so Indigenous food culture must be understood within the principles of IK. Borrowing from Orr (2004), the paper argued for the promotion of land-based knowledge founded on Indigenous principles. Education must be based on the environment, and environmental education must emphasize spirituality; that is, the relationship with the creator, human-to-human relationships, and the relationship between humans and other creations, all underpinned by mutual respect and reciprocity.

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