AVENUES OF AGRICULTURAL LITERACY: A GROUNDED THEORY MODEL TO INCREASE AGRICULTURAL LITERACY EFFECTIVENESS

by

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A thesis submitted to the Faculty of Education
in conformity with the requirements for
the degree of Doctor of Philosophy

Queen's University
Kingston, Ontario, Canada
January 2023

Abstract

Agricultural literacy was a notion developed over 30 years ago to increase awareness of agriculture and cultivate an interest in agri-careers, ultimately to garner citizen support of the industry and secure a future workforce. However, awareness of agriculture and its importance is at an all-time low and vacancies in the agriculture industry are alarmingly high. While there are a number of reasons for this scenario, such as a departure from agrarian societies and a number of individual decisions that affect agri-career-uptake, opportunity exists for agricultural literacy efforts to have a more profound impact on these areas. The purpose of this study was to use a grounded theory approach to explore and identify themes, trends, gaps, and barriers that are helping or hindering the impact of agricultural literacy efforts and to offer theory that can inform and improve agricultural literacy program effectiveness. Initial data were collected from peer-reviewed published empirical and conceptual literature on agricultural literacy using the keyword searches "agricultural literacy," "agricultural curriculum," and "agricultural knowledge" in the Education Resources Information Center (ERIC) database. Additional literature was collected through concurrent data collection and theoretical sampling to situate findings in a Canadian context by filling in gaps and address arising questions. Initial, intermediate, and advanced coding were applied to 40 articles retrieved through initial data collection and 9 articles collected through theoretical sampling. Four thematic areas were identified as having potential to make agricultural literacy more effective. These four areas include definitions, goals, teaching and research approaches, and outreach confines. The avenues of agricultural literacy model is the resulting pragmatic product of this study, which serves to address the barriers identified in these areas. It offers revised definitions, identifies and links the goals to learning outcomes, curriculum, and research, and suggests agricultural literacy pair with a multiliteracies pedagogy. The final theme is addressed by suggesting advocacy for mandatory agricultural literacy courses in secondary schools with knowledgeable and experienced agriculture teachers. The avenues of agricultural literacy model can be used as a framework to guide current and future agricultural literacy programs.

Dedication

To my ancestors, to the family I know and love, and to my relations still to come.

Acknowledgements

I first want to thank Dr. Kathleen Kevany and Dr. Kristen Lowitt for offering invaluable feedback as external examiners for my dissertation. Their fresh eyes and expertise helped strengthened my work in important ways before publication. I am also grateful to my committee members, Dr. Claire Ahn for her committed attention to detail on various drafts of my work, and Dr. Owen Roberts for his encouragement and perspective on the agriculture industry. I am grateful to my supervisor, Dr. Ted Christou, who made this accomplishment possible through his belief in me — a belief that never wavered — the value of which should not be understated. It is important for me to also acknowledge my friends and peers from the graduate lounge who shaped my work by sharing ideas and engaging in curious and thoughtful conversation. Together, we formed a community that was supportive, compassionate, dependable, and so much fun. I am also blessed to have friends outside of my doctoral program whose encouragement helped keep me going, but more so, their companionship and the wonderful distractions they offered me along the way. I thank my extended family for being the inspiration for this work, and my parents, Dan and Judy, who have unconditionally supported me in everything I've ever done. I am grateful to my children, Hudson and Ethan, who patiently walked with me on this journey, and sometimes even slept in my office while I worked; this accomplishment belongs to them, too. I also want to acknowledge that I could not have completed this work had I not felt divinely inspired by God to start it and see it through to completion. A dissertation can be a long, sometimes lonely path, but mine — though long — was certainly not lonely. Thank you, all.

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Chapter 1: Introduction

"The farmer has to be an optimist or he wouldn't still be a farmer"

~ Will Rogers ~

Researcher Prelude

I have always known and understood agriculture. It is genuinely a part of my heritage. Although I am not a farmer, I grew up on a farm, and as far back as I can trace my family has been involved in farming. My great, great paternal grandfather immigrated from Ireland because he was granted farmland in Ontario for fighting in the Crimean War (1853 - 1856) for Britain. My maternal grandfather still operates a farm in Ontario that has been in the family for nearly 200 years. I grew up eating vegetables from our garden, steaks from our beef cattle, and guzzling delectable maple syrup I helped make.

Although I never had a desire to operate my own farm, I am passionate about all things agricultural: the land, soil, plants and trees, nature, and animals. My passion extends to the stewards, too: farmers. I know farmers as hard workers, rising early and working long into the evening. They endure extreme weather, physically strenuous tasks, and make difficult decisions on the farms — "tough as sole leather," as my grandmother would say. I also know farmers to be gentle and nurturing with unrivaled patience. I can recall many times when a farmer I know missed a scheduled event to stay home to bottle feed a kid goat or assist with the birth of a calf. I have witnessed, more than once, a farmer reroute machinery to avoid a nesting killdeer and her eggs. I know farmers to be problem-solvers and inventors, mechanics, carpenters, and life-long learners.

My respect and admiration for farmers have been cultivated from growing up in a farming family, with farming neighbours, and farming community members. This scenario, however, is not the norm for most people in this day and age, nor has it been for some time. In 1921 agriculture was the single most common occupation in Canada, accounting for one-third of all jobs (Statistics Canada, 2018). Today, only 1.32% of Canadians are primarily employed in natural resources, agriculture, and related production occupations (Statistics Canada, 2019). In 1951 Ontario had 150,000 farms. In 2015 that number was down to 50,000 farms (Government of Canada, 1953; Ontario Ministry of Agriculture, Food and Rural Affairs [OMAFRA], 2017).

Powell and Agnew (2011) estimate that Americans are “two to four generations removed from the farm” (p. 155). This means most people have very little connection to farms, daily agricultural practices, and agrarian culture or heritage (Powell & Agnew, 2011). This same gap exists in Canada and is in all likelihood even wider, as the population is lower and there are fewer numbers of farmers in Canada than in the United States. There are many barriers to starting a farm today, such as land acquisition, but also many challenges to being a farmer. One of these challenges is dealing with a growing lack of understanding and respect for the profession. Farmers’ safety, their product value, their business operations, and their private land are just a few areas they are routinely affronted in.

For example, a lack of respect and understanding for farming and the amount of work it takes to produce food, is subtly revealed in consumer purchasing behavior. I have had many conversations with customers surprised, and sometimes unhappy, about the price of real maple syrup. They have often referenced the price of pseudo-syrup found in most grocery stores for comparison. In these cases, it was not a matter of affordability, but a lack of understanding of food, food systems, and production methods, often influenced by product promotion by companies and the downplay of production processes through media. The cost of authentic syrup is much higher than the brands found in stores for several reasons. Most syrup found in stores is artificially flavoured high fructose corn syrup, produced through highly mechanized procedures, and with government subsidized crops. Real maple syrup is produced by drilling holes in maple trees, collecting the sap, and boiling it over a wood-burning fire. There is a difference in price because the two are different substances and require very different types of inputs and labour. Many examples like this can be given to highlight an existing gap in general knowledge of food products, their production, and pricing, all of which leave the farmer and their work misunderstood and taken for granted.

Farmers also have to deal with a more serious issue: a lack of regard for their personal safety. Recently, a friend of mine was driving his tractor on a highway, traveling to one of his fields. A car attempted to pass the tractor at the exact moment he was turning into his property, and they crashed. The car's driver admitted to rushing past the tractor because she was late for an appointment. She ignored his signal and ultimately disregarded his right to be on the highway. According to an article by Colvin (2022), slow-moving vehicles are 3.8 to 4.8 times more likely to be involved in a fatal collision per kilometer on the road than any other vehicle, often because slow-moving machinery on public roads are treated as a nuisance and sometimes drivers are quick to pass even when it is not safe. Tolerance is even lacking for farmers attempting to cross a road on foot. It is not uncommon for a road to separate a farmhouse from a barn, meaning farmers must cross the road on foot several times a day for chores. This can be a deadly part of their work. Farmers have lost their lives crossing such roads. This tragically happened to my classmate's sister while we were in university together. Disregard for farmer safety is a serious issue.

Trespassing and destruction of property are exposing an intensifying lack of respect and understanding for farming. In November of 2019, I attended the annual conference for the Ontario Federation of Agriculture and was disheartened to see that so many of the session topics were about farm security and farm terrorism. Farmers attended training on security systems and listened to lectures on how to deal with trespassers and difficult people who might accost them — people who believe farmers are doing something wrong or who claim that on-farm practices are unethical. This has become such a problem that in 2020, new laws to protect farmers from trespassers and activist were introduced in Ontario (Lynch, 2020). The new norm for farmers is that they must become experts in security and terrorism just to feel safe in their occupation and on their farms.

Respect and understanding of the farming profession is not just a modern issue, it is an historical one as well, though criticism was more specifically focused on the individual farmer. In the late 1800s there was a push to educate farmers to elevate their status. Ryerson (1870), Ontario's first superintendent of education, wrote an introductory book on agriculture to be used in Ontario schools. He believed that an uneducated farmer would cause agriculture to be "looked down upon, instead of being looked up to" and that an educated farmer would lead agriculture to "hold a rank equal to, if not above, that of law or medicine" (p. v). James Cappon, from Queen's University, thought farming through a scientific lens would "put its labours on a level with those of the engineer and the doctor, making the farmer the same elevated man they are" (Stamp, 1968, p.129). The Ontario Agricultural College opened in Guelph in 1874 intending to offer "an avenue to social respectability" to farmers through education (Nesmith, 1984, p. 96).

Today, Canadian farmers are more formally educated than ever before (Tran & Shumsky, 2019) and it has indeed benefitted them. A 2016 Census found that an increase in education directly correlates with an increase in the use of technology on the farm and an increase in gross farm revenue. It is also more likely that educated farmers will work off the farm for additional revenue, which helps to stabilize the financial volatility of running a farm (Tran & Shumsky, 2019). Formal education for farmers, however, has failed to do what was predicated — esteem and elevate farmers to receive the same level of respect experienced by lawyers and doctors. This overall lack of consideration towards farmers and agriculture has always left me unsettled and wanting to do something to change the climate towards both. That is why I pursued a degree in agriculture after high school and began my career in the industry. It is also what eventually lead me to this doctoral research.

I have reasoned that if others understand that agriculture is what produces our food, and they learn about how it contributes to our personal lives, our economy, our society, and the environment, then respect will increase for the farming profession. But equally important, if the general population learns about agriculture, agri-food systems, and the careers included, the industry can advance in innovative, just, and sustainable ways through an increased number of people who understand the industry, who are interested, and who contribute to it in a number of ways. In the second year of my doctoral program, I discovered that the field of agricultural literacy research is dedicated to educating the general public about farming and the larger agriculture industry. It is why this study centers on agricultural literacy teaching and research efforts.

Introduction to Agricultural Literacy

Agricultural literacy was preceded by agricultural education, a much older and much broader field of research. Agricultural education is learning that occurs *within* the field of agriculture; it is learning to *do* agriculture (Braverman & Rilla, 1991; Mercier, 2015; National Research Council [NRC], 1988; Spielmaker, 2019; Vallera & Bodzin, 2016). Education focused on specific agricultural concepts, whether within a school system or through community initiatives, is considered agricultural education. For example, learning practices to improve yields through a local agricultural organization is considered agricultural education, as is completing a university degree to become an agronomist.

Agricultural education has formally existed in Canada since 1789. That year a booklet was published for new settler farmers to learn and apply the latest agricultural methods and techniques coming out of Britain and Ireland. A few years later, Ontario's first agricultural society was formed where farmers came together to socialize and foster innovation in farming methods (Jarrell, 2016). By 1874, Ontario established its first agricultural college, which was dedicated to education meant to progress the industry of agriculture (Nesmith, 1984). Today, there are 34 universities and colleges in Canada that offer agriculture degrees and courses (IDP Connect, 2022).

Agricultural education can be specific to location, tradition, culture, crop, or animals. It can pertain to essentially anything within the field of agriculture. As a result, a mass amount of information is available under the heading of agricultural education. Canada's Public Archives had 800 meters of agricultural education records in their custody by the 1980s (Nesmith, 1984).

While discussed in more detail throughout this thesis, agricultural literacy can be introduced as learning *about* agriculture, rather than learning how to conduct specific agronomic practices (i.e., how to *do* agriculture) (Braverman & Rilla, 1991; NRC, 1988; Spielmaker, 2019; Vallera & Bodzin, 2016). It is when the general public, those who do not work in the agriculture industry, learn about farming, food production, and agricultural systems (Mercier, 2015). The notion of agricultural literacy is important throughout the world, with different regions having different histories, content, and challenges, however, the focus of this study is on agricultural literacy in Canada and the United States (though some examples of agricultural literacy are drawn from other nations). Canada is the home nation of this researcher, and the United States has an existing field of research that is applicable to Canadian agriculture due to it being a neighbouring developed nation with similar societies, technologies, and government policies and support. The examination of agricultural literacy throughout this thesis is done so through Canadian and American contexts.

Agricultural literacy is comparatively more limited in scope and appreciably newer than agricultural education. Today, there are several fields of study with similar concentrations, particularly under various "food studies" labels (food literacy, food systems literacy, agri-food literacy), but agricultural literacy, specifically, was coined in the United States in the 1970s (Mercier, 2015). In the previous decade, concern for the state of agriculture began to rise in America as rapid urbanization engulfed productive arable farmland and converted it to housing and transportation throughfares. During this time, agricultural advocates noticed a decrease in respect and understanding for the farming profession and reasoned that educating the non-farming population would increase respect for the industry, raise public awareness of its importance, and lead to improved conditions for agriculture by helping the public and stakeholders make informed voting and purchasing decisions (Hubert, et al, 2000; Mercier, 2015).

In 1981, a taskforce was gathered by the U.S. Department of Agriculture (USDA), with individuals from agriculture, business, education, and governmental agencies, to coordinate a national agricultural literacy program for classrooms across the nation. This effort resulted in the National Agriculture in the Classroom (2020a) program, which operates today to increase agricultural literacy for students in Kindergarten through grade 12. It was during this time that the National Research Council (NRC) also formed a committee to stimulate the development of agricultural literacy. The council was concerned about the continued diminished profitability of agriculture and decreased enrollment in school agriculture programs. It determined agriculture was "too important of a topic to be taught to only the relatively small percentage of students considering careers in agriculture" (NRC, 1988, p. 1).

Over the past three decades, the need for agricultural literacy has been well established (Hess & Trexler, 2011b). Technological advances along with increased urbanized societies and fewer people directly involved in production agriculture have created a disconnect and gap in knowledge between the general public and agriculture (Bradford et al., 2019; Kovar & Ball, 2013; Hubert, Frank, Igo, 2000; Spielmaker and Leising, 2013). It has resulted in a lack of awareness, understanding, and admiration of how agricultural systems meet our basic needs in way of food, fibre, and shelter and how these systems interact and relate with a sustainable environment and quality of life (Hubert, Frank, Igo, 2000; Mercier, 2015; Spielmaker and Leising, 2013).

Surveys conducted in Australia, the United Kingdom, the United States, and Canada demonstrate the gap in knowledge of agriculture that exits today, especially for youth. The Australian Council for Educational Research (ACER) conducted a baseline survey in 2011 to find out what students and teachers know about primary industries in Australia, such as agriculture, horticulture, forestry, and aquaculture. ACER noted difficulty finding schools to participate in its survey due to federal-level decisions not to include agriculture in the national curriculum. Many teachers did not see a connection to core curriculum and so they lacked motivation to participate (Hillman & Buckley, 2011). However, the survey had significant uptake: 213 grade six respondents, 687 grade 10 respondents, and 53 total primary and secondary teacher respondents. The results reinforced the need for better agricultural understanding. Key findings showed 75% percent of grade six students and 42% of grade 10 students incorrectly thought cotton comes from animals. Forty-six percent of students in grade six and 30% of students in grade 10 were incorrect in thinking raw materials for fabrics and fuels do not come from farms. Forty-five percent of primary students also did not recognize that bread, bananas, and cheese come from farms as well. The survey furthermore showed that only 15% of teacher participants studied primary industries in university, but nearly 100% thought it was somewhat important or very important for students to have knowledge and understanding of food and fibre production (Hillman & Buckley, 2011). Another survey in 2014, commissioned by Woolworths and celebrity chef Jamie Oliver, surveyed 1,600 Australian children between the ages of 6 and 17. The survey discovered that 92% did not know bananas grow on plants, 70%

did not know where sugar comes from, and 60% did not know herbs are grown in the ground (Koelma, 2014).

Similar results were found by a sustainable farming group in the United Kingdom. The organization Linking Environment and Farming (LEAF), conducted a survey in 2012 of 2,000 people ages 16 and older, in preparation for an Open Farms event where the public is invited to visit local farms. Prior to completing the survey, 52% of respondents agreed or strongly agreed that they were knowledgeable about food and where it comes from, but only 27% agreed or strongly agreed that they know a lot about farming methods. The portion of the survey that asked about origins of food required respondents to match a food item with one of nine photos: wheat, maize, oats, barley, oilseed rape, beef cattle, chicken, pig, or dairy cow. The survey revealed that 36% of respondents between the ages of 16 and 59 did not correctly link milk to a dairy cow, 48% did not link butter to a dairy cow, and 27% did not link eggs to hens. There were 116 respondents who did not even offer an answer as to where an egg comes from. The same survey also revealed that one in five of all respondents thought jam or marmalade comes from a cereal crop (LEAF, 2012).

In the United States, the U.S. Farmers and Ranchers Alliance (2011) conducted a national survey of over 2,400 participants. The survey revealed that 72% of respondents confessed to knowing nothing or very little about farming or ranching. Agricultural literacy researchers consistently reach the same conclusion about their study participants. Brandt et al. (2017) verified there are low levels of agricultural literacy in elementary students, even those in mid-western states. A study by Bradford et al. (2019) concluded there is an unacceptable level of agricultural knowledge among high school students. Hess and Trexler (2011a) described student answers to agricultural questions as guesses, underdeveloped, or contradictory to expert conceptions. Kovar and Ball (2013) synthesized 20 years of agricultural literacy studies and concluded that the United States population is generally not agriculturally literate (Kovar & Ball, 2013).

In 2017, the Ontario Federation of Agriculture asked 1,003 individuals aged 13 and up to rate their knowledge and understanding of the types of foods grown in Ontario, their corresponding growing seasons, and farming practices. It was found that there was no significant difference in self-perceived knowledge and understanding between rural (but non-farming), suburban, and urban respondents. According to the survey results between 15 – 20% of respondents said they had no understanding or knowledge of the time of year when local fruits and vegetables are harvested or picked, 29 – 36% had no knowledge or understanding of farming practices of fruit and vegetable growers in Ontario, 33 – 41% said they know nothing about farming practices on Ontario livestock and poultry farms, 34 – 42% said they know nothing about farming practices of grain growers in Ontario, 13 – 17 % answered that they did not know how to identify local foods in grocery stores, and 17 – 20% admitted they do not know what types of foods are grown, produced, or raised in Ontario (OFA, 2017). Another study by the Canadian Centre for Food Integrity (2019) indicated that 91 % of Canadians self-identified as knowing little, very little, or nothing about modern farming practices.

This disconnect between citizens and agriculture — though not solely responsible — has also contributed to the expanding gap between available agricultural positions and vacancies. In the United States, a deficit of more than 3,000 agricultural graduates per year was projected between 2010 and 2015 in science, technology, engineering, and math related positions (Thoron et al., 2016). It was also projected that nearly 58,000 job openings for individuals with degrees in food, renewable energy, and environmental specialties would become available each year between 2015 and 2020, with a 41% shortfall of graduates, particularly in positions such as plant geneticists, plant breeders, climate change analysts, and food and safety and security specialists (Mercier, 2015). In Ontario, the need for agricultural graduates for positions with food processors, growers, input suppliers, financial institutions, and government agencies is four times more than the number of students graduating from the province's primary agricultural post-secondary institution (University of Guelph, 2017). It was also found that 67% of agriculture companies and 51% of food sector companies have difficulties finding appropriate and qualified candidates, especially for sales jobs, land resource positions, agronomists, and policy specialists, which are percentages that have severely increased since 2012 when only 40% of agriculture companies and 28% of food companies had difficulty finding new hires (University of Guelph, 2012; 2017).

Also, in recent years, the general public has voiced greater concern about agri-food system impacts and sustainability, as agriculture has been identified as a key contributor "to environmental protection and degradation" and to other pressing concerns like climate change (Hess & Trexler, 2011a; Martin & Massicotte, 2021, p. 136). Enns et al. (2016) confirm that while on-farm participation has been decreasing, public interest in agricultural systems has been increasing. A survey in the United States noted that 69% of its respondents spend time thinking about food production (U.S. Farmers and Ranchers Alliance, 2011), and the Canadian Centre for Food Integrity (CCFI) indicated that 60% of Canadians are interested in learning more about agriculture (CCFI, 2019). Roberts (2010) informs that this interest stems from agriculture becoming "increasingly relevant to more people, as a realization emerges that the sector encompasses the likes of natural resources, environmental and economic sustainability, nutrition and health, energy, and rural affairs" (p. 1). Sandlin and Perez (2017) also identify increased public interest in areas related to "specific food movements, nutrition, and the integration of school/community gardens" (p. 294).

Media has also put "food, and those who produce it…on the public's radar screen like never before" (Roberts, 2010, p. 2). Documentaries, too, have created a lot of awareness of issues concerning food and the environment (Ahn, 2018). However, media often drives public misconceptions about agriculture through slander campaigns from special interest groups and through social media and its uninformed influencers and citizen journalists who lack professional training, such as understanding how to balance a story (Andenoro et. al, 2016; Hubert et al., 2000; Kovar & Ball, 2013; Roberts, 2010; Vallera & Bodzin, 2016). According to Mars and Ball (2016) "without a reliable knowledge base to work from" public knowledge and decision-making is "based on incomplete and/or inaccurate information gleaned from the media and other biased outlets" (p. 57).

To maintain a secure food supply, and to face issues at the social, economic, and political interface of agriculture, basic literacy of agriculture and agri-food systems is needed among civic leaders and the general public (Hess and Trexler, 2011b; Mercier, 2015). Citizens with an understanding and knowledge of agriculture can decipher fact from fiction in regard to media and more knowledgeably participate in discourse on agri-food system reform and engage in democratic decision-making processes (Hess and Trexler, 2011a; Kovar & Ball, 2013). Agricultural literacy is also needed to meet the public's desire to learn about agricultural production, processes, and intersections with other aspects of society and the environment. Formal education (such as elementary and high school) is a logical means "by which to help people develop agri-food system understandings" that would prepare them for discourse and well reasoned debate on agricultural topics (Hess and Trexler, 2011a, p. 151).

Agricultural Curriculum in Ontario

While agricultural curriculum has found its way into Ontario schools over the past century, there is currently such a small amount in secondary schools that the majority of students never encounter it. Since Ontario is no longer a primarily agrarian society where knowledge of agriculture is common, agriculture must intentionally be taught to future generations. Agricultural curriculum in Ontario schools, however, is limited to voluntary programs, restricted and optional courses, or brief mentions in core curriculum, providing little education about agricultural systems and their importance.

Historically, agriculture was introduced in Ontario schools in the late 1800s. It became a compulsory subject in rural schools in 1899 and an optional subject for urban schools, with much of the curriculum offered through nature study and school gardens (Jarrell, 2016; Ontario Ministry of Education [OMOE], 1899). According to Stamp (1968), garden programs showed students "the value of seed selection, the rotation of crops, and the protection of crops against weeds, insects, and disease" (p. 130). While these programs found success for a period of time, World War I had detrimental effects on rural school attendance, making it difficult to deliver curriculum and continue garden programs. By 1924, agriculture was still not taken seriously as a school subject, and the Minister's Report from that year admitted "missionary work" was necessary to convince people of the worth of agricultural curriculum in a child's education (OMOE, 1924).

Decades later, during the "green revolution" when technology in agriculture rapidly advanced agricultural production, agriculture courses achieved popularity in Ontario schools. During the 1960s, 1970s, and 1980s agriculture courses were offered in gardening, crops, horticulture, animal science, aquatic ecosystems, agribusiness, and agricultural mechanics (OMOE, 1961; 1973; 1974; 1988b; 1989). A general agriculture course was also offered between 1962 and 1976 that covered the history of agriculture, plant science, soil, animal science, agriculture mathematics and engineering, forestry, genetics, nutrition, and economics (OMOE, 1976). However, in the 1980s distinct agriculture courses began to fade and agricultural content was instead integrated into environmental science curriculum (OMOE, 1988a; 1988b; 1988c).

In 2015, the Legislative Assembly of Ontario voted to include agriculture and agri-food careers in the grades nine and 10 guidance and career curriculum, but by 2017 it was still not implemented (Thompson, 2017). In a 2019 amendment to the grade 10 career curriculum, the agri-food industry was listed twice, but on both counts it was limited to a question concerning technology (OMOE, 2022). The Ministry of Education's only in-house agriculture program is offered through the Specialist High Skills Major (SHSM) program, which was established in 2003 as an alternative means to achieve a high school diploma. Senior-level students choose from 19 sub-programs that tailor their education to a specific industry. Some examples include Hospitality and Tourism, Transportation, Construction, Health and Wellness, and Agriculture. Agriculture SHSM offers paths towards apprenticeship training, a college diploma, a university degree, or workplace training (OMOE, 2020c).

This is a great option for students to learn about different industries, but only a small portion of students enroll in SHSM, and only a small portion of them are interested in agriculture. Ontario has 340,000 senior level secondary students (OMOE, 2020a); in the 2016/2017 school year, 48,000 (or 14% of those students) enrolled in SHSM (OMOE, 2017). Unless students are certain they want to work in a specific industry, they are unlikely to commit their entire high school diploma to it. This means even students who are interested in agriculture are unlikely to sign up for Agriculture SHSM so that they can keep their options open, should they change their minds. The Agriculture SHSM program is offered at only 44 of Ontario's 880 secondary schools and 24 of its 72 school boards. Out of the 19 sub-programs, Agriculture SHSM ranks 13th in availability, leading to the assumption that it sees very few of the 48,000 SHSM students (OMOE, 2020).

Another way curriculum is included in schools is through partnerships between the Ministry of Education and other institutions or organizations. For example, the University of Guelph has a program through the Ontario Agricultural College that showcases the "educational and professional opportunities that exist within the areas of agriculture, food, environmental sciences, and community development" for high school students, and it also provides "in-class workshops, on-campus experiences, online teaching resources, and participation in professional development days and conferences" for educators (University of Guelph, n.d., para. 1.) The Ministry also partners with AgScape, an Ontario-based non-profit agricultural literacy organization that is part of Agriculture in the Classroom Canada. AgScape creates and provides agricultural curricula for grades one to 12 that teachers can download and use in their classrooms. AgScape also provides Teacher Ambassadors — Ontario-certified teachers knowledgeable in agricultural content — to give presentations on agricultural matters. In 2019, AgScape's initiatives reached over 750,000 students and 3,836 teachers requested resources, programs, or workshops (AgScape, 2019). Moreover, the Ministry sometimes partners with different industry groups interested in sharing sector-specific curriculum with students. For example, the Dairy Farmers of Ontario have been running an elementary school program since 1986 that provides milk for lunches and educational information on the benefits of drinking milk (Dairy Farmers of Ontario, 2020). However, these types of sector-specific programs are sometimes critiqued for their industry influence.

The combination of these agricultural outreaches and programs may seem like a fair amount of agricultural content to which Ontario students are exposed, however, these programs are intermittent, voluntary, and do not reach the majority of students. None are compulsory, standard, or long-term, and the bulk of Ontario's two million students receive very little, if any, instruction in agriculture (OMOE, 2020a).

The Statement of Problem

The need for agricultural literacy is greater today than it was at its inception. There is currently a dwindling number of farmers, an insufficient number of people working in the agriculture industry, and citizens who lack understanding of agricultural systems and their own influence on agriculture through purchasing and voting decisions. Our urbanized society has left no direct link to agricultural production for most of the population, including those living in rural areas (Meischen & Trexler, 2003; Powell & Agnew, 2011), and an insufficient amount of agricultural content in secondary schools has left generations of students without knowledge of agriculture, the importance of the industry, or the careers that are available. The majority of Canada's population does not understand agriculture and cannot intelligently participate in policy decisions that affect the industry. This is having a negative impact on production, land use, resource allocation, food safety, ethical standards, and the environment (Hess & Trexler, 2011b; Powell et al., 2008). New strategies need to be implemented to improve and advance agricultural literacy in Ontario and across the globe to address the negative effects created by this lack of participation and knowledge, and to support, secure, and improve current and future agricultural practices and systems.

Purpose and Objectives of Study

The purpose of this study was to conduct an investigation on the field of agricultural literacy to gain insight that can: 1) inform and improve existing and future agricultural literacy programs, and 2) help determine strategies for raising agricultural literacy for students in Ontario. This was accomplished by:

1) Examining and comparing published peer-reviewed articles that include both empirical and conceptual literature on agricultural literacy to identify theories, trends, gaps, and barriers that impact agricultural literacy efforts.
2) Synthesizing data and offering a framework or model that can be used specifically in Ontario secondary schools and with other agricultural literacy programs.

Significance of Study

The world population is expected to reach 9 billion by 2050 (Government of Canada, 2020). To feed a population of this magnitude, future generations will need to be knowledgeable about agriculture and food systems, and their interconnectedness with other industries and various aspects of society

(Brandt et al., 2017, Enns et al., 2016). They will need to understand how individual decision-making, purchasing, and voting affects public policy and food production, and be interested in contributing to innovation, improvements, and sustainability within the industry. The existing disconnect from agriculture and limited agricultural curriculum in schools, calls for strategies and initiatives that re-connect society to agriculture (Graham et al., 2016). Proponents of agricultural literacy agree that schools should be a primary source for learning about agriculture to start this re-connecting process (Bradford et al., 2019; Braverman & Rilla, 1991; Edgar et al., 2016, Hess and Trexler, 2011a). Schools have a vital role to help develop generations of students equipped to confront the challenges of their time, to take their place as informed, engaged, and empowered citizens, to shape a better world, and to participate fully in public, community, and economic life (Deluca & Christou, 2016; OMOE, 2009; New London Group, 1996). Christou (2014) insists engaging students in school activities that address authentic life challenges is a powerful way to cultivate civic engagement. As such, schools need to intentionally teach agricultural literacy to prepare students to address the challenges associated with agricultural systems in Canada and abroad, now and in the future. Analyzing and evaluating agricultural literacy to suggest ways that it can be improved, implemented, and delivered in secondary schools is an initial step towards prioritizing this curriculum and raising societal agricultural literacy levels.

Imagining Our Future

It is important to imagine what an agriculturally literate society could be like. What would change, and what would improve if every child learned about agriculture in school? What could society look like if all citizens were more aware of agriculture and its importance and if more of them pursued careers in the industry? One approach is to look to the research of Maxine Greene, who developed the idea of social imagination through her work in aesthetic education. She defines social imagination as “the capacity to invent visions of what should be and what might be in our deficient society, on the streets where we live, in our schools” (Greene, 1995, p. 5). She describes it as a way of thinking that “refuses mere compliance, that looks down roads not yet taken” (Greene, 1995, p. 5). Without imaging what can be changed and improved about agricultural systems, inefficiencies and strife will be overlooked, but so will the innovations and discoveries in agriculture that have positively impacted the world. Greene (1995) reminds us that we will only acknowledge the harshness of our situation when we conceive a new state of affairs.

Social imagination raises several possible scenarios. For example, can a society that is knowledgeable in agriculture be imagined? Would land-use policies change so fertile ground was preserved for food? Would political and economic decisions concerning agriculture be centered on feeding hungry people? How would things change if the public better understood how consumer demands, food production subsidies, and government policies shape food production? Would crops be grown that are best suited to the locale? What if different cultural perspectives and ways of being and knowing were incorporated into our production methods? What if farmers were valued? According to Greene (2001) "our history can be frozen and our inquiries crippled without the release of imagination" (p. 66). To have a better future, one that does not take our food systems, agricultural systems, our land, and our farmers for granted, we need to imagine what can be changed and what can be accomplished.

If social imagination and agricultural literacy intersect, "ordinary limits may be overcome; landscapes may be altered; windows may be open to what might be, what ought to be" (Greene, 2001, p. 65). Today, young people are demanding "the right to help shape their own futures, in Canada and around the world" (UNICEF Canada, 2019). Youth have deep concerns about the state of our planet and world systems and many of them are motivated to actively engage in making change. Youth desire the knowledge needed to change processes they do not agree with, to challenge policies that do not support their beliefs, and to create systems that uphold their ideals. Roberts (2005) encourages student to start dialogue about agriculture and discuss critical agricultural topics because coming up with "plan B" to what already exists is harder than some anticipate (p. 66). Greene (1995) says dialogue can release ideas and imaginations that can change and evolve our environment, our health, our societies, and our future. She says when dialogue "is activated in classrooms, even the young are stirred to reach out on their own initiatives" (p. 5). Agriculture in school curriculum is "uniquely positioned to respond to students' interest in making the world a better place" (NRC, 2009, p. 99) by addressing their concerns and linking educational content to real world events, which is especially important at the secondary school level (Shoulders & Myers, 2013a). Agricultural literacy in schools can foster the conversations and critical engagement necessary for imagining and designing a more harmonious social future.

Christou and Deluca (2013) caution curriculum scholars not to distort the scale and scope of curriculum or “overextend its promise for resolving enduring challenges of humanity” (p. 16). Agricultural literacy can address some big challenges of humanity but should not be exaggerated and supposed that it can systematically ameliorate, emancipate, or even liberate us from our issues (Christou & Deluca, 2013). It is possible, however, that agricultural literacy in the classroom with “a sphere of influence that is manageable, realistic, and alterable” can lead to significant changes at systemic and global levels to address present-day situations and prepare us for future challenges with the production of food, fibre, and fuel (Christou & Deluca, 2013, p. 17).

Chapter Summary and Thesis Outline

Chapter 1 is an introduction to agricultural literacy and an introduction to this study. Chapter 2 divulges the methodology used in this study. Chapter 3 reveals the gaps and barriers to agricultural literacy that emerged from analysis. Chapters 4 and 5 address these gaps and barriers and unveil a theory in the form of a model to guide agricultural literacy work. Chapter 6 offers a conclusion that includes study limitations and future study suggestions.

Chapter 2: Methods

"What is the nature of this world that we wish to study? A world that is complex, often ambiguous, evincing change as well as periods of permanence; where action itself although routine today may be problematic tomorrow; where answers become questionable and questions ultimately produce answers" [1]

Introduction

This study was conducted using a grounded theory methodology. It was based on the philosophical framework of pragmatism and document analysis was used as its method. The objectives were to 1) examine and evaluate data to identify areas that may hindering or helping the impact of agricultural literacy, and 2) synthesize findings to offer practical suggestions that can improve and advance agricultural literacy in Ontario as well as agricultural literacy programs elsewhere. This chapter will explain in detail the methodology, philosophical framework, and methods used to meet these objectives.

Grounded Theory Introduction

Grounded theory is a methodology that aims to generate theory abstracted from or grounded in data that is gathered or collected by the researcher (Birks & Mills, 2015). It is a methodology that "sets out to discover or construct theory from data, [that is] systematically obtained and analyzed" (Chun Tie, et al., 2019, p. 1). Heath and Cowley (2004) clarify that "the aim is not to discover *the* theory, but *a* theory that aids in understanding an action in the area under investigation" (p. 149). In 1967, grounded theory was conceptualized when Glaser and Strauss observed that most research was designed to verify existing theories and not to generate new ones. Glaser and Strauss conceded that too much emphasis was placed on accurate evidence and verification. Further, they contended the researcher's job was not to "provide a perfect description of an area, but to develop a theory that accounts for much of the relevant

[1] (p. 5). Corbin, J., & Strauss, A. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3rd ed.), p. 13. Thousand Oaks, CA: Sage.

behavior” (p. 30). Glaser and Strauss claimed theories used in research were often inappropriate and ill-suited for participants under study. Their response was the development of a methodology that could provide clear and systematic methods for qualitative research to produce outcomes equivalent to the statistical-quantitative studies that were dominant during that time (Bryant & Charmaz, 2007a; Creswell & Poth, 2018, p. 82).

In the 50 years since its introduction, grounded theory has earned its place as a standard social research method (Charmaz, 2003). It is “currently the most widely used and popular qualitative research method across a wide range of disciplines and subject areas” (Bryant & Charmaz, 2007b, p. 4). Bryant and Charmaz (2007b) affirm that “innumerable doctoral students have successfully completed their degrees using [grounded theory]” (p. 4). Grounded theory was an appropriate methodology for this doctoral research because a standard agricultural literacy program in Ontario schools does not currently exist. Analyzing previous studies on existing programs in the United States would provide information on best practices, identify areas and relevant behaviours affecting the impact of agricultural literacy efforts, and formulate suggestions and theories for ways to advance agricultural literacy in Ontario.

Theory Building

In grounded theory work, researchers’ persistent interaction with their data is critical to theory development (Bryant & Charmaz, 2007b). Researchers need to constantly churn through the data, looking at it with creative and conceptual thinking (Hallberg, 2010). Chun Tie et al. (2019) explain that grounded theory research “is not linear” but repetitious and circular (p. 3). Corbin and Strauss (2008), leaders in grounded theory research, insist grounded theory work requires, above all, “an intuitive sense of what is going on in the data; trust in self and the research process; and the ability to remain creative, flexible, and true to the data all at the same time” (p. 14). Bowen (2009) emphasizes that the grounded theory researcher must rely on skill and intuition to filter data through an interpretive lens. The combination of these strategies is key to developing theory that is emergent from and grounded in the data.

Literature Review Debate

In grounded theory research, debate ensues over the need to include or exclude a literature review at the beginning of the study (Hussein et al., 2017). Conventional quantitative studies use a literature review to “refine the research question, determine gaps in earlier research and identify a suitable design,” and as a “data collection method for a planned study” (Hallberg, 2010, p. 1). However, the founders of grounded theory discourage literature reviews and a deep immersion in literature prior to conducting research. This is to avoid influencing emerging theories, and so emerging categories will not be “contaminated by concepts more suited to different areas” (Glaser & Strauss, 1967, p. 37). Glaser and Strauss (1967) assert that a more focused reading should occur only after completing analysis when the emergent theory is sufficiently developed. Some contemporary grounded theory researchers hold to this process, convinced that in place of spending time “reviewing the literature and planning details of all stages of the research process,” one should “start gathering data in order to formulate ongoing plans” (Heath & Cowley, 2004, p. 141). Some researchers even believe a different research method should be chosen if the researcher cannot delay the literature review process (Christiansen, 2011).

However, other prominent grounded theory scholars disagree with this stance and think a literature review prior to conducting research is essential. Bryant (2009) cautions that when skipping an initial literature review, one’s prior judgements and prejudices may unintentionally interfere with developing insights because “one can never enter a research area with an empty head” (p. 21). Hallberg (2010) and Husseing et al. (2017) contend that a preliminary literature review is important in grounded theory work to determine gaps in literature, to know if the planned study or something similar has been published before, and to justify reasons for conducting the study by demonstrating it is worthy of research. Bryant and Charmaz (2007b) also note the importance of situating work within the body of related literature and for planning subsequent sections or chapters in one’s study.

There was no initial literature review completed prior to conducting this study. Literature on agricultural literacy that provided background information was also used for data. As such, document analysis techniques and grounded theory processes such as coding and memoing, were implemented promptly upon first reading, therefore commencing the study.

Philosophical Framework

Corbin and Strauss (2008) claim that many researchers who use grounded theory often do not reflect on the philosophies on which the methodology is based on, eager to use only its procedures. However, understanding and relating to the epistemology of different grounded theory perspectives influences the approach and procedures of grounded theory work. Chun Tie et al. (2019) advise researchers reflect on their philosophical beliefs and interpretations of the world before commencing research.

Pragmatism can be seen in the philosophical underpinnings of the original work of Glaser and Strauss. Though Glaser and Strauss eventually parted ways, neither strayed far from pragmatic roots. Glaser later affirmed his methodology occupied a pragmatic position (Age, 2011), and Corbin and Strauss (2008) admit that pragmatism is easily recognizable as part of their epistemology and that it forms the framework for their methodology. Kathy Charmaz, a student of Strauss, in 1990 added a constructivist view to grounded theory (Charmaz, 1990). Constructivist grounded theory sits in the interpretive tradition of qualitative research and is less structured than the traditional approach. Creswell and Poth (2018) claim this grounded theory lens "incorporates the researcher's views; uncovers experiences with embedded, hidden networks, situations, and relationships; and makes visible hierarchies of power, communication and opportunity" (p. 316). Another popular perspective comes from Adele Clarke, which links grounded theory to symbolic interactionism. Carter and Fuller (2015) explain that this perspective is based on the idea that society is created by the subjective, repeated, and meaningful interactions between individuals. According to Creswell and Poth (2018), Clarke insists that social situations should form the units of analysis in grounded theory, reclaiming it from its positive underpinnings.

My philosophical views are pragmatic like those of Glaser, Corbin, and Strauss. Pragmatism shapes my perspective, influences analysis, and governs the nature of this study's outcome.

Pragmatism. Pragmatism is a very practical and applicable philosophy (Roberts, 2010). It is a word that means *action*, *affair*, or *thing* and from where the words *practice* and *practical* are derived (Harper, 2020; Thayer & Rosenthal, 2017). Throughout history, the word has been used to describe knowledge that is action-oriented and useful. The Greek historian Polybius (died 118 BCE) recorded history that he described as *pragmatike*; writing that was meant to be instructive and useful to his readers (Thayer & Rosenthal, 2017). Georg Hegel, in the 19th century, stated that his pragmatical approach to historical work was reflective. Charles S. Peirce, one of the American pioneers of pragmatism as philosophy, used the German term pragmatisch to refer to experimental, which is learning through experience or doing (Thayer & Rosenthal, 2017, para. 3). Whether instructive, reflective, or experimental, action is part of pragmatism and that action is intended to be useful or practical.

When it comes to pragmatism as a philosophy, the relationship between reflection and action must be acknowledged. Mead (1956) describes pragmatism as being birthed from reflecting on and relating to knowledge and action: "it is out of interest in the act itself and the relationship of thought to the act itself that…pragmatism arises" (p. 404). Corbin and Strauss (2008) further explain that knowledge and action feed into each other: "knowledge leads to useful action, and action sets problems to be thought about, resolved, and thus…converted into new knowledge" (p. 4). In summary, pragmatism is a theory of knowledge created through the relation of thought and action (Corbin & Strauss, 2008; Dewey, 1930).

According to Corbin and Strauss (2008), the classic pragmatics were interested in more than just "common sense." They addressed matters "like those of aesthetics and ethics, of language and meaning, and others equally abstract" (p. 5*).* Charles S. Peirce and William James, who defined, defended, and popularized the theory around 1870, focused significantly on inquiry, meaning, and truth. John Dewey and Jane Addams used pragmatic philosophy in the areas of "politics, education and other dimensions of social improvement" (Legg & Hookway, 2019, para. 2). Dewey started a Laboratory School in 1896, using practical activities such as gardening and food preparation as an introduction to traditional subject matter such as math and science (Ralston, 2014). Dewey viewed activities like gardening as a way to develop individual capacities and self-realization and also saw it as a way to build social communities that would ultimately benefit society (Durst, 2010; Ralston, 2014).

Addams established a social settlement in Chicago called Hull-House, in response to problems created by urbanization, industrialization, and immigration (University of Illinois Chicago, n.d.). It began as a kindergarten for immigrants but expanded to a day care and infancy care centre, and eventually provided secondary and college-level extensions classes. Over time additional buildings were purchased and the complex contained gymnasiums, clubs, shops, housing, and playgrounds (Britannica, 2020). Working with immigrant children, Addams recognized the importance of education that engaged students' experiences. She was committed to education that utilized the culture, history, and traditions of the students at Hull-House, creating a wealth of knowledge that other schools would envy (Addams, 1908; Hamington, 2018).

Constructivism, which is often used in grounded theory work (Creswell & Poth, 2018), and as a philosophy in agricultural literacy work (Hess & Trexler, 2011a; Stofer & Newberry, 2017; Trexler & Hess, 2004), is very similar to pragmatism in that it is also a theory of knowledge based on learners' interactive experience with the physical world (Siegesmund, 2019). However, pragmatism, unlike constructivism, advocates for outcomes that are not presupposed and do not attempt to replicate the present or the past (Siegesmund, 2019). The classic pragmatics hoped to create a new, unanticipated, more socially-just future. They did not rest at the reproduction of knowledge or encourage active learning for a single ideal understanding (Siegesmund, 2019). Rorty (2000) observes that the openness of pragmatic tradition leaves room for a better future, a future that leads us to be "richer, more complex, more interesting than we were." Rorty notes that when "possibilities open up that had previously been closed…our imagination is unleashed" (p. 820). The use of imagination and the idea of a better future that is found in pragmatism, circles back to Maxine Greene's (1995) social imagination mentioned in Chapter 1. Imagination inspires us to see and create a better social future, one that challenges the routines of today and embraces the complexities of our world. Pragmatism is a philosophy that encourages us to imagine possibilities through the blending of knowledge and action.

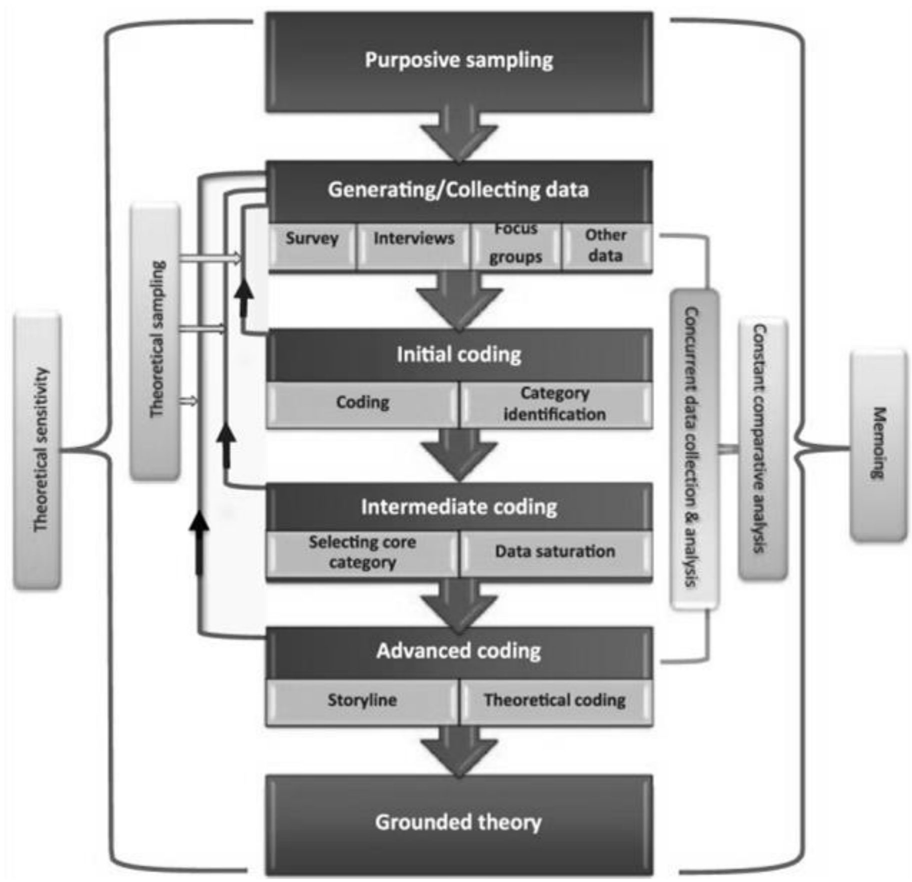
The outcome of a grounded theory study, regardless of philosophical framework, is often pragmatic. Charmaz (2003) states there is usually a *product* of this type of inquiry, which is itself, a very practical action or thing. Creswell and Poth (2018) describe a product as a process, action, or interaction, complete with diagrams and hypotheses. Some examples are the development of "a general education program" or a plan "supporting faculty to become good researchers" (p. 83). The product of this grounded theory study is the development of a model to guide both current and future agricultural literacy programs — a product complete with diagrams and suggestions for action and interaction — which further affirms the decision to situate this work in a pragmatic philosophy.

Research Design

The overall idea of grounded theory may seem simple — the generation of a theory grounded in the data — but grounded theory is and has been a complex, often misunderstood, and friction-filled research approach. Even creators, Glaser and Strauss, eventually parted ways, disagreeing about the meaning and procedures of the methodology (Creswell & Poth, 2018). Dey (1999) speculates there are probably as many versions of grounded theory as there are grounded theorists. This is partly because grounded theory is a flexible methodology, allowing each researcher to approach their work differently (Charmaz, 2003). Due to this flexibility, novice grounded theory researchers benefit from a research design, which Chun Tie et al. (2019) describe as the plan or strategy to answer the research question. Birks and Mills (2011) also suggest that novice researchers securely situate themselves in a research design because the inductive nature of the grounded theory process can easily distract from the research question and lead to being "totally overwhelmed by the data," interfering with one's ability to develop theory from it (p. 89). According to Birks and Mills (2011), following a research design can also reduce confusion over the different conceptual language used by seminal grounded theorists. Chun Tie, et al.'s (2019) grounded theory design framework for novice researchers closely aligned with this study, and as such, it was used as a guide for this research (see Figure 2.1).

Figure 2.1

Chun Tie, Birks, and Francis' (2019) Grounded Theory Design Framework for Novice Researchers



Note: This figure shows the interplay of methods and processes in grounded theory research. Reprinted from "Grounded Theory Research: A Design Framework for Novice Researchers" by Y. Chun Tie, M. Birks, and K. Francis, 2019, *SAGE Open Medicine*. 7, p. 3. CC BY-NC. Reprinted with permission.

Purposive Sampling

According to the framework developed by Chun Tie et al. (2019), the first step of a grounded theory study is to determine the data source. This is called purposive sampling, which occurs when the researcher purposively selects participants or data sources that are likely to be most helpful in answering the research question. Creswell and Poth (2018) indicate the primary form of data collection for grounded theory research is interviews, but Glaser (2007) reminds us "all is data" (p.1) and notes that data is what the researcher has collected, coded, and analyzed, whatever the source, including how it is delivered and received. Chun Tie et al. (2019) tell us data can come from "focus groups, questionnaires, surveys, transcripts, letters, government reports, documents, grey literature, music, artifacts, videos, blogs and memos" (p. 4). The data source used for this study were documents.

Documents are described as: a) public records such as press releases, mission statements, annual reports, policy manuals, handbooks, strategic plans, attendance registries, meeting minutes, transcripts, and syllabi, b) personal documents including first-person accounts, letters, calendars, emails, scrapbooks, blogs, incident reports, journals, and newspapers, and c) physical evidence like physical objects or artifacts likes, flyers, advertisements, posters, agendas, maps, charts, and training materials (Bowen, 2009; O'Leary, 2014). Documents can provide background information and context, prompt more questions to be asked, provide supplementary data, be used as a means to track change and developments, and also verify findings from other sources (Bowen, 2009).

Documents were the best source of data for this study for several reasons. While there was consideration for conducting a mix-method study that included gathering data from students, teachers, and other primary sources, agriculture programs in Ontario secondary schools are scarce, intermittent, or often offered as a one-time event. This increases the challenges of planning and conducting a study that interacts with participants, and the limited programming may also not have provided enough data to identify themes, trends, and gaps to offer suggestions and improvements for the field of agricultural literacy. Partnering with AgScape to gather data through their programming may have been a possible way to gather data, but the coronavirus pandemic temporarily closed schools and AgScape's Teacher Ambassador program during my period of study, making this a non-viable option. Documents, however, provided the opportunity to collect an adequate amount of data for analysis and evaluation through previous agricultural literacy research, over a span of time, and from various locations. Analyzing information and data gathered by previous research studies, which analyzed agricultural literacy in different contexts and from different perspectives, also provided an opportunity for trends and themes to emerge that could be useful for improving and advancing agricultural literacy work.

Bowen (2009) assures researchers that previous studies are a source of data, requiring the investigator to rely on description and interpretation of data rather than having the raw data for analysis.

Glaser and Strauss (1967) affirm that many types of primary and secondary documents can be interactively explored and coded, while Bryant (2009) insists there is no reason extant literature cannot be part of grounded theory data. Documents also provided an historical perspective to agricultural literacy, which was important for understanding the context and setting that may have affected past suggestions and strategies meant to increase agricultural literacy levels. Bowen (2009) attests that documents provide historical insight and background information that can help researchers understand the historical roots of specific issues and can help to indicate “the conditions that impinge upon the phenomena currently under investigation” (p. 29). Pinar (2008) argues that “without knowledge of its intellectual history, a field cannot advance” and that to advance a field intellectually, it is necessary to work through “disciplinary problems experienced by previous generations” (p. 6). Christou (2010) adds that “in order to discover where we are, it is essential that we consider where we came from, who came before us, and how our living, learning, and working environments were shaped” (para. 14). According to Merriam (1988), when it comes to historical research, relying on documents is sometimes the only realistic option, due to no living sources from which to access insights.

Document Analysis as Method. After determining the data source for this grounded theory study would be documents, document analysis was chosen as the method to ensure that data were approached in a credible way. Document analysis is a systematic procedure for reviewing and evaluating documents. This procedure entails “finding, selecting, appraising (making sense of), and synthesizing data contained in documents” (Bowen, 2009, p. 28). This “making sense of” is typical of qualitative research, in that the data needs to be examined and interpreted to elicit meaning, gain understanding, and develop empirical knowledge (Bowen, 2009; Corbin & Strauss, 2008). According to Bowen (2009), document analysis involves “skimming (superficial examination), reading (thorough examination), and interpretation” (p. 32). This process requires an initial document review with the purpose of identifying relevant passages of text or data and determining what is pertinent and what is not (Corbin & Strauss, 2008). It also includes analysis to recognize patterns within the data “where emerging themes become the categories for analysis” (Fereday & Muir-Cochrane, 2006, p.4). Part of this analysis involves coding and category construction to “uncover themes pertinent to a phenomenon” (Bowen, 2009, p. 32). According to Boyatzis (1998), coding and categorizing data in document analysis must “at minimum describe and organize the possible observations and at maximum interpret aspects of the phenomenon” (p. 161). In grounded theory studies, however, coding and categorizing data during analysis needs to go a step beyond interpretation, to look for new ideas, actions, and theories that emerge from the data.

Before engaging in document analysis work, researchers must have an understanding of how to approach a document. The authenticity, credibility, accuracy, and representativeness must be determined, as well as comprehensiveness, balance, purpose, and relevance to the research (Bowen, 2009). Background information should be explored, which includes aspects such as tone and style. Questions should be asked about who produced it, why, when, what type of data is it, and who the target audience is. It should also be known if the document was written as a result of first-hand experience or as a secondary source, and whether it was solicited or unsolicited (Bowen, 2009). For example, documents such as educational brochures are created to promote programs. They can provide information about what is included but it does not mean they provide balanced information about the effectiveness or credibility of the program (Owen, 2014). Prior (2003) notes that content is not the most important feature of a document and that “we should forever keep in mind the dynamic involved in the relationships between production, consumption, and content” (p. 26).

Advantages and Limitations. As with any method, there are advantages and limitations to document analysis, though the advantages are certainly more abundant. The advantages include availability, coverage, exactness, stability, and efficiency (Bowen, 2009). The availability of documents is high because many documents are in the public domain and can be accessed without permission. Documents exist for all types of events and subjects and across all periods of time, so they also provide a broad range of coverage. Merriam (1988) argues that locating public records is only limited by one’s imagination and industriousness, keeping in mind that if a public event happened, some official record of it likely exists. The internet and electronic archives have greatly increased the availability and retrievability of documents in the past few years. In response to the forced closure of libraries across the globe during the 2020 coronavirus pandemic, libraries were compelled to make their inventories available online. This not only increased the availability and retrievability of documents but the ease at which they are analyzed. With electronic documents, keyword searches can be used as a method of skimming for relevant passages, which is considerably easier than finding keywords in paper copies.

Documents also come with an exactness. Names, dates, and details are recorded and easily retrieved, eliminating the need to rely on the accuracy and memory of research participants or the researcher (Yin, 1994). There is a high level of stability with documents as well, as they are non-reactive to the investigator's presence and do not have an effect on the phenomenon being studied (Merriam, 1988). Another advantage is the ability to track change and development through documents. With documents such as annual reports, even subtle changes can be discovered (Yin, 1994). Documents can also save time and money. Bowen (2009) notes that documents are cost-effective because the data contained in documents have already been gathered, only requiring analysis. This also saves time by eliminating the need to construct, prepare, coordinate and conduct interviews, questionnaires, surveys, or make observations. However, a great deal of time can be spent searching for relevant documents. This is especially true for historical documents if names and titles change between time periods, and when the format of a document is altered or changed over time.

As for limitations, the first is that documents are produced for some other source than a research agenda and may contain insufficient details for the researcher's use. Researchers are also unable to check in for clarity or additional details when relying on documents. Other documents may have low retrievability and are purposely blocked from the public domain (Yin, 1994), or search terms chosen by the researcher may limit the documents that are retrieved as part of the data. There is also possibility of biased selectivity from organizations releasing the texts. Documents are sometimes selected to be aligned with corporate policies, procedures, and agendas or can be reflective of the organizational unit handling the record-keeping (Bowen, 2009; Yin, 1994). Bowen (2009), however, sees these challenges as flaws rather than limitations. Many of these challenges can be addressed by a thorough and careful researcher.

Data Generation or Collection

The next step in the framework provided by Chun Tie et al. (2019) is data generation or data collection. Birks and Mills (2015) describe data generation as the process of the researcher directly engaging with a data source to produce materials for analysis. An example of this would be generating data from interviews where the researcher has engaged with a participant. Data collection is a process of gathering data from static materials like documents and literature, which the researcher has limited influence on. Data collection is the process used for this study and the term that will appear hereafter.

In grounded theory research, data collection happens more than once. In fact, it happens throughout the research study until a theory is identified, which Chun Tie et al. (2019) refer to as *concurrent data collection.* Initial data is collected, coded, and analyzed, providing insight for the researcher. The researcher uses this insight like clues to find more data (which is collected and analyzed) to "fill gaps, clarify uncertainties, check hunches and test interpretations" (Chun Tie et al., 2019, p. 3). This process of following clues is called *theoretical sampling* and the additional data helps saturate categories under development, enabling the researcher to identify and form emerging themes and theories (Birks and Mills, 2015; Creswell & Poth, 2018; Chun Tie et al., 2019). It is also typical when examining documents to be led to other documents in search of answers to "questions that need to be asked and situations that need to be observed as part of the research" (Bowen, 2009, p. 30). Following leads to other documents in search of answers and clarity is expected and required to produce a thorough and credible study.

What is also important during data collection and for the emergence of themes, is *theoretical sensitivity*. This is the "ability to recognize and extract from the data elements that have relevance for the emerging theory" (Birks & Mills, 2011, p. 176). In other words, theoretical sensitivity identifies elements that become the building blocks for theory development. According to Birks and Mills (2015), grounded theorists must strike a balance between keeping an open mind and identifying elements of theoretical significance. They assure us that "as grounded theorists become immersed in the data, their level of theoretical sensitivity to analytic possibilities will increase" (p. 12). This substantiates the need for repetitive interaction with data in grounded theory work, as mentioned earlier in this chapter. Constantly churning through the data increases the ability to identify threads of connection between data sources, as well as one's sensitivity to emerging themes.

The remainder of this chapter will detail the search criteria used for initial data collection, the primary ways concurrent data collection and theoretical sampling were pursued, and the sorting process for selecting documents to be examined and coded.

Initial Data. The intent of data collection for this study was to amass information that would provide an overview of research previously conducted on agricultural literacy, primarily in formal school settings (such as elementary and secondary schools), to gain a thorough understanding of its development, progress, and challenges. To find studies conducted on agricultural literacy, keyword search terms were used to locate documents focused on agricultural literacy through the Education Resources Information Center (ERIC) database, accessed through the Queen's University Library. ERIC was chosen over Google Scholar to retrieve data because the keyword search parameters procured many of the same studies but with fewer unrelated articles. Search parameters were peer-reviewed articles and the search terms "agricultural literacy," "agricultural curriculum," and "agricultural knowledge." "Agricultural education" was not used as a search term because, as stated in Chapter 1, this is learning *within* agriculture and it covers topics about specific agricultural practices instead of a general learning *about* agriculture. As well, the boolean "AND" was intentionally not used with search terms (e.g., agricultural "AND" literacy) because this retrieved articles that were outside the desired literacy field. The search was not limited to a particular journal or journals so that studies focused on agricultural literacy, which may have been published in a variety of agriculturally-related publications, could be retrieved. However, it is acknowledged that the keyword search terms used in this study unavoidably contributed to limiting the scope of data collected.

Sorting Process. The sorting process began by inputting the search results from ERIC into an Excel document, which included the title of the article, authors, date of publication, abstract, and a link to the full article. The results of each search term were separated by using different sheets within the Excel file. The first step taken to determine relevant articles for this study was to skim the titles to determine whether to take the next step of reading the abstract. A new column was inserted next to the title column in the Excel document so a "Y" or "N" to represent "yes" or "no" could be recorded next to the title to indicate if the abstract would be read. An "N" was placed next to the titles that indicated the research was conducted in a country other than Canada or the United States. An "N" was also placed next to titles that clearly indicated the study was focused on a very specific aspect of agriculture, such as a study on agricultural mathematics, agricultural mechanics, or dairy farm nutrition management, since agricultural literacy focuses on a more generalized, broad range of basic agricultural knowledge. An "N" was also placed next to articles where the focus was on post-secondary students enrolled in agricultural programs. This is because agricultural programs designed for post-secondary students would be considered agricultural education and meant for students already interested in and part of the industry, which is outside the scope of agricultural literacy. A "Y" was recorded for all other articles, and abstracts for these studies were then read. This process was repeated for each of the three search terms, with the additional step of noting duplicate articles retrieved by more than one search term. These were marked with "N" and noted as a duplicate.

A similar process was followed after reading abstracts marked with "Y." A new column in the Excel file was inserted next to the abstracts and a "Y" or "N" was recorded to indicate whether to read the full article or not. If the abstract revealed information that was not obvious in the title, such as being conducted in a country other than Canada or the United States or having an intense focus on a very specific aspect of agriculture, "N" was recorded. Remaining articles were checked to ensure authenticity and credibility, such as who conducted the study, for what purpose, and was it unsolicited and balanced. The database ERIC and the peer-reviewed search criteria significantly helped to ensure the articles retrieved met these standards. After this process, the remaining articles were determined to be relevant to the focus and scope of this study and marked with "Y." This process was repeated for each of the search terms.

At the end of this sorting process, 40 articles in total were investigated, analyzed, and coded. Table 2.1 displays the initial number of articles retrieved by each keyword search, the number of abstracts read, and the number of studies read in full and examined. The search term “agricultural literacy” retrieved 59 articles, 40 abstracts were read, and 14 were analyzed. The term “agricultural curriculum” retrieved 105 articles, 25 abstracts were read, and eight were analyzed. The final search term “agricultural knowledge” retrieved 118 articles, with 32 abstracts read, and 18 analyzed.

Table 2.1

Keyword Search Results

Search Terms in ERIC	Agricultural Literacy	Agricultural Curriculum	Agricultural Knowledge
Initial Results	59	105	118
Abstracts Read	40	25	32
Studies Analyzed	14	8	18

Theoretical Sampling and Concurrent Data Collection. While all of the documents analyzed for this study are part of theory building, some of the studies retrieved through theoretical sampling (which discussed previously is following clues in the data to more data to help evolve theories under development) were selected to be coded along with the initial data collected. Nine documents retrieved through theoretical sampling were analyzed and coded, bringing the total number of documents that were coded to 49. Data collected concurrently through theoretical sampling was accomplished in three primary ways. The first was by tracking down studies cited in reference lists of the initial data to gain additional context and greater insight. The second was through searches in Google Scholar for studies that answered emerging questions or further explained a phenomenon. The third was through an internet search for websites of organizations that promote agricultural literacy, such as the American Farm Bureau Foundation for Agriculture (AFBFA), Agriculture in the Classroom, AgScape, and the National Center for Agricultural Literacy. These sources provided supplementary data that filled in knowledge gaps and saturated categories under development to aid in the development of the avenues of agricultural literacy model produced by this study.

Memoing

Memoing is a form of analysis and an integral part of grounded theory research, which starts in the very early stages of planning a study and is an ongoing activity until the study's completion. It is a simple process but one that is essential to grounded theory research and is part of ensuring quality (Birks & Mills, 2011). Memoing is the writing down of ideas generated from interacting with data (Corbin & Strauss, 2008). They are written records of propositions and ideas that mark the connections between codes and categories that eventually become part of a developing theory (Creswell & Poth, 2018; Strauss & Corbin, 1990). Birks and Mills (2011) remind researchers that "however harshly you may critique your efforts at memo writing, never throw a memo away as you cannot anticipate when it might suddenly become vitally important…your memos will in time transform into your grounded theory findings" (p. 10). Memoing took place from the very beginning of this research and did, in fact, transform into theory.

Memoing was instrumental to this study because it helped track developments in theory building. Notes pertaining to theory development were reinforced when the idea resurfaced over and over, especially if the memo remained relevant between historical documents and contemporary studies. In other cases, a memo was set aside because it no longer fit with the subsequent literature that was collected and analyzed. Memos were used to record emerging connections, note lingering questions, or jot down comments and opinions that arose through analysis. Short memos were written in the margins of articles and longer ones were logged in journals. Memos for this study included acronyms created to summarize an idea, as well as diagrams attempting to connect philosophies and pedagogies. Memos also appeared in the form of graphics used to represent emerging theories. These memos, especially the graphic representation of emerging themes and evolving ideas, transformed into the avenues of agricultural literacy model. Examples of the memos that led to this model are displayed in Appendix A. Memos also initiated the coding of literature in this research. One or two-word memos that were scribed in the margins of articles during an initial reading, eventually became codes that were applied to all other studies analyzed.

Coding

Coding is an analytical process "used to identify concepts, similarities, and conceptual reoccurrences in data" (Chun Tie et al., 2019, p. 4). It can be described as short labels given to major categories of information that researchers construct as they interact with the data (Charmaz, 2012; Creswell & Poth, 2018). This is an area in grounded theory work where the researcher interacting with the data is vital for theory development. Charmaz (2012) explains that "something kinaesthetic occurs when we are coding; we are mentally and physically active in the process" (p. 5). Chun Tie et al. (2019) say coding is the "pivotal link between collecting…data and developing a theory that explains the data" (p. 4). Strauss and Corbin (1990) use the terms *open, axial,* and *selective* to describe three levels of coding that are used in grounded theory. Glaser (1978) only lists two stages, *substantive* and *theoretical*. Staying with the research design of Chun Tie et al. (2019), the terms for coding used in this study are *initial*, *intermediate*, and *advanced.*

Initial Coding. Initial coding is the first step of data analysis. The researcher dissects the data and looks for patterns, similarities, and differences. Important words or groups of words are identified and as many codes as possible are generated. These codes are then grouped into categories to help the researcher decide what further data should be gathered and from where (Birks & Mills, 2015; Creswell & Poth, 2018). The initial coding stage in this research began after reading several articles and noticing reoccurring content and themes in the memos. The articles were read a second time and more short codes were added to mark emerging information discovered in the data. Some early codes were: *definition*, *need ag lit*, *media*, *public interest*, and *relationships*. These codes were applied to each consecutive article read and new short codes were generated when additional themes and ideas were identified. These codes and any corresponding supplementary memos, along with the title of the article they were recorded in, were entered into an Excel file so they could be easily located and investigated when desired. At the end of this process 65 codes were recoded.

Intermediate Coding. Intermediate coding builds on the initial coding phase. It begins to pull the pieces of the data-puzzle together, identifying ideas, abstract concepts, and theories emerging from the data. During this stage of coding, codes are refined, refitted, and reduced by clustering them into categories that form around core concepts (Chun Tie et al., 2019; Heath & Cowley, 2004). This is done with the help of *constant comparative analysis*, which is the method of comparing incident to incident in each code, code to code, and category to category throughout the intermediate and advanced coding stages. By constantly comparing data — tacking back and forth between increasingly focused data collection and analysis — abstract theories are conceptualized and hypotheses are formed, which are then proved or disproved through the process of analysis (Charmaz, 2017; Chun Tie et al., 2019; Creswell & Poth, 2018).

During this stage of coding, some codes were renamed for clarity and some were refitted into others, reducing the codes from 65 to 42. For example, the codes *teaching methods* and *experiential learning* were merged with the code *approach* because they all represented ways to deliver agricultural literacy curriculum. To ensure the uniqueness of the original code was not lost, the memo associated with the original code was kept in the adjacent column of the Excel sheet.

Next, the codes were clustered into core concepts. There were 18 concepts of agricultural literacy that kept surfacing from the data, which were fitted into four main categories. These categories were formed in the midst of data analysis and do not represent the final theory; they are shared here for the sake of transparency. The first category was comprised of reasons to teach agricultural literacy, the second category included areas that past studies have focused on, the third category included areas that need to be refined, and the last category was concerned with approaches to agricultural literacy. These categories and associated concepts are displayed in Table 2.2. The concepts in the first two categories surfaced the most frequently during coding, but the latter two categories contained concepts with the greatest potential to increase agricultural literacy effectiveness. The concepts identified as having the greatest potential to improve agricultural literacy included the refinement of definitions, adding modern updates to the understanding of agriculture, refocusing goals and curriculum content, examining teaching approaches, agriculture as a subject versus integration of curriculum, analysis of experiential and vocational programs, personal connections to agriculture, and the reach of agricultural literacy efforts.

Table 2.2

Categories Identified During Intermediate Coding

Reasons to teach Agricultural Literacy	Previous studies have focused on	Refining Agricultural Literacy	The "how" to Agricultural Literacy
Need	Elementary Students	Definitions	Approach
Want	Teachers	Updates in Agriculture	Subject vs Integration
Future	Benchmarks	Focus/Goals	Experiential/Vocational
Media Bias	Surveys	Content	Connection to Ag
	Measurements		Reach of Literacy

Advanced Coding. In this final stage of coding, a theory grounded in data is produced through "integration, construction, formulation, and presentation of research findings" (Birks & Mills, 2015, p. 180). Initial coding "fractures" the data, but in this final stage of coding, the fractured story is "weaved back together again into an organized whole theory" (Glaser, 1978, p. 165). Chun Tie et. al (2019) explain that this stage of coding builds a story through explanatory statements that connect the categories and produces theoretical propositions.

While initial coding identified gaps and hindrances in agricultural literacy, advanced coding brought emerging themes together to offer a framework that addresses these barriers and offers suggestions for advancing the field. This framework is presented as the avenues of agricultural literacy model. It focuses on four areas of agricultural literacy, which encompass the concepts and categories identified in intermediate coding: definitions, goals and outcomes, research and teaching methods, and suggestions for raising societal levels of agricultural literacy. The gaps and hindrances identified in this research are presented in the following chapter, supported by evidence from the data. Chapters 4 and 5 address these barriers and detail the formulation of the avenues of agricultural literacy model, thoroughly explaining the theory that evolved from this study.

Additional Documents Collected. Empirical and conceptual literature on agricultural literacy was collected as initial data for this study and is discussed in detail in the previous section. However, additional documents were collected and analyzed throughout this study to situate agricultural literacy in Ontario, since literature and studies collected with a focus on "agricultural literacy" were predominantly from the United States. This information included primary documents pertaining to agricultural curriculum in Ontario schools, which were retrieved from electronic and hardcopy volumes of Ontario Minister of Education annual reports, as well as Ontario curriculum documents provided by the Ontario Institute for Studies in Education (OISE) and the Queen's University Education Library. Secondary historical studies were also collected through Google Scholar to describe the conditions, atmosphere, and contextual setting for agricultural curriculum in Ontario in different time periods. Secondary studies on food studies (such as food literacy, food systems, and agri-food systems) from Canadian researchers were found through Google Scholar as well, to provide insight on how agricultural literacy could possibly blend with this curriculum and be incorporated into Ontario schools. News articles, press releases, and surveys on the state of agricultural awareness and agri-job vacancies were also retrieved from agricultural organizations such as the Ontario Federation of Agriculture, LEAF, and ACER through internet searches and by browsing hard copies of agricultural magazines and newspapers. This additional information was used to fill gaps in knowledge, "check hunches and test interpretations," and help ensure that evolving theories from agricultural literacy research could be effectively situated in and applicable to an Ontario secondary school context (Chun Tie et al., 2019, p. 3).

Chapter Summary

A grounded theory methodology was chosen to help discover trends, gaps, themes, and theories to improve and advance agricultural literacy in Ontario and abroad. Its flexible methodological procedures allowed space to work with a range of documents such as empirical and conceptual studies, journalistic articles, and historical curriculum guidelines from various sources such as journals, conferences, and annual reports. It also encouraged thoughtful, repetitive engagement with the data to allow for themes to emerge. This methodology paired well with the strategies of document analysis to analyze, scrutinize, evaluate, and synthesize the data, ensuring quality and a high level of academic rigor. The study was guided by the philosophical framework of pragmatism and generated a product with practical intentions for present and future agricultural literacy outcomes. The combination of pragmatism, grounded theory, and document analysis led to the discovery of gaps and barriers that hinder the advancement of agricultural literacy and led to the formation of the avenues of agricultural literacy model — a framework developed to address these inefficiencies. The hindrances identified through analysis and the model established from this study are discussed over the next three chapters of this thesis.

Chapter 3: Analysis Results and Observations

"Persons choose to do research because they have a dream that somehow they will make a difference in the world through the insights and understanding they arrive at. But it is not enough to dream. Dreams must be brought to fruition." [2]

Introduction

Kovar and Ball (2013) suggest that researchers "identify areas of deficiency in research related to agricultural literacy efforts and continue these efforts in the future" (p. 175). This study, through analysis, evaluation, and specifically the intermediate coding stage of grounded theory, identifies four areas of agricultural literacy that have considerable potential to increase agricultural literacy effectiveness if modifications are applied to them. The four areas include: the definitions of agricultural literacy, goals, teaching and research approaches, and an emphasis on societal levels of agricultural literacy. This chapter elaborates on these discoveries and their associated barriers, drawing on support and evidence from data. A response to these barriers and suggestions for addressing them are discussed in Chapters 4 and 5.

The Definition of Agricultural Literacy

The first theme to emerge from the study is the idea that revised definitions of agricultural literacy could make outreach efforts more effective. There are a few widely embraced, and commonly cited, definitions of agricultural literacy found throughout literature (Frick et al., 1991; Meischen & Trexler, 2003), as well as a few updated offerings (Clemons et al., 2018; Spielmaker and Leising, 2013), However, there appears to be a need to clarify what agricultural literacy is and to make its definition and intentions more obvious. In a 2017 study, Rice and Kitchel found that agriculture teachers struggled to define agricultural literacy and were only able to offer vague descriptions as to what it means, such as "basic agricultural knowledge" and "informed consumers" (p. 209). I, too, struggled to find a clear and

[2] (p. 13). Corbin, J., & Strauss, A. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3rd ed.), p. 13. Thousand Oaks, CA: Sage.

simple way to explain to others what I studied. Even after scouring literature, I was unable to find a satisfactory script that defined and explained agricultural literacy. Powell et al. (2008) acknowledge that while there has been effort to define and fully articulate agricultural literacy, there has been very limited consensus due to perceived philosophical, political, and epistemological differences. Stofer and Newberry (2017) inform, that failing to agree upon definitions, and assuming educators and their students have the same understanding of the meaning of agricultural terms, hampers communication from the beginning. They also insist that not having a clear initial understanding can distract learners from the larger message. It becomes evident then, how important definitions are to the foundation of agricultural literacy and how critical it is to address the gaps and barriers that exist with current definitions.

Agricultural Literacy Defined

Agricultural literacy was first defined in 1988 by the National Research Council (NRC) in the United States, which formed a committee aimed at shedding light on agricultural literacy. The committee met seven times through hearings, conferences, and school visits beginning in 1985. Committee members reviewed statements and materials from more than 300 representatives from agribusiness, farm organizations, agricultural education groups and educators, parent and youth organizations, and state and national policy leaders to evolve agricultural literacy. Through this outreach, the committee decided that an agriculturally literate person would have some knowledge of the food and fibre system; production, processing, and domestic and international marketing, including its history and current economic, social, and environmental significance, along with enough information to make informed personal choices concerning diet and health (NRC, 1988).

Although the definition produced by the NRC provides a comprehensive list of knowledge that agriculturally literate people should possess, it still fails to specifically explain what agricultural literacy is. Furthermore, the use of "some knowledge" begets the onerous task of determining how much knowledge must be obtained to be considered agriculturally literate. Some guidance is provided at the end of the definition by stating an agriculturally literate person is someone who has "enough" agricultural knowledge to make informed personal decisions concerning diet and health, but more explicit guidance is needed.

In 1991, a refined definition of agricultural literacy was offered by Frick, Kahler, and Miller. Requests were sent by the researchers to faculty members of agricultural education departments at land-grant universities in the United States, seeking three nominees for a Delphi panel. The Delphi method is widely used and accepted for achieving consensus of opinion within certain topic areas, solicited from experts in the field (Hsu & Sanford, 2007). One hundred forty-seven individuals were nominated in this study with 98 agreeing to participate. Thirty percent of panelists were from the agriculture industry, 34% were from elementary and secondary education, and 36% were from higher education (Frick et al., 1991). Qualitative analysis was conducted on 78 definitions to create a definition of agricultural literacy that the group approved. The following definition has become a fundamental definition of agricultural literacy, widely accepted and used by researchers in the field (Mars & Ball, 2016):

> Agricultural literacy can be defined as possessing knowledge and understanding of our food and fiber system. An individual possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture. Basic agricultural information includes: the production of plant and animal products, the economic impact of agriculture, its societal significance, agriculture's important relationship with natural resources and the environment, the marketing of agricultural products, the processing of agricultural products, public agricultural policies, the global significance of agriculture, and the distribution of agricultural products. (Frick et al., 1991, p. 52)

This definition remains one of the most detailed definitions of agricultural literacy to date. It directly defines agricultural literacy as the possession of knowledge and understanding of our food and fibre systems, and it provides examples of the type of information that should be known primarily on the production side of food. It also lists the skills that an agriculturally literate person should have — the ability to synthesize, analyze and communicate about agriculture – which in turn provides guideposts for determining if a person is agriculturally literate or not. There is an attempt to limit the scope of knowledge and depth of understanding required with the word “basic” and by providing a list of required information, but it does little to narrow down the amount of material that ought to be included in agricultural literacy and for one to be considered agriculturally literate.

Throughout the 1990s, agricultural literacy focused mainly on the technical aspects of production and distribution of agricultural goods (Mercier, 2015). But in 1999, the National Council for Agricultural Education wanted to see students conversationally literate in agriculture, food, fibre, and natural resources systems, as it sought to reinvent agriculture education in schools for the year 2020 (Powell et al., 2008). This set a new goal for researchers to define what the term “conversationally literate” meant before the definition of agricultural literacy could be updated. Trexler (2000) reminded others that, while an agreed-upon definition was essential, based on historical definitions, “literacy is a moving target” (p. 2). Knobloch (2000) suggested conversational literacy could only be accomplished through the collaboration of teachers, educators, and stakeholders in providing experiential learning opportunities for students, wherefore students could produce a language related to their own context, awareness, and experience.

In 2003, Meischen and Trexler suggested an updated definition that they assert combines agricultural content with definitions of literacy from the field of linguistics. According to Clemons et al. (2018), Meischen and Trexler’s definition, along with that of Frick et al. (1991), are the most relied upon descriptions of agricultural literacy among researchers.

> Agricultural literacy entails knowledge and understanding of agriculturally related scientific and technologically based concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity. At a minimum, if a person were literate about agriculture, food, fiber, and natural resource systems, he or she would be able to a) engage in social conversation, b) evaluate the validity of media, c) identify local, national, and international issues, and d) pose and evaluate arguments based on scientific evidence. Because agriculture is a unique culture, an understanding of beliefs and values inherent in agriculture should also be included in a definition of agricultural literacy so people can become engaged in the system. (p. 44)

In this explanation, knowledge and understanding are linked to scientific and technological concepts of agriculture, as well as processes that directly involve civic participation. Meischen and Trexler's (2003) definition also includes a list of minimal skills a person must have to be considered agriculturally literate and appears to be the first definition to suggest the inclusion of culture, beliefs, and values of agriculture.

Fifteen years after Meischen and Trexler's (2003) proposed definition, Clemons et al. (2018) conducted a Delphi study with four rounds of investigation and a panel of 15 agriculture experts to offer a revised definition. Experts had a minimum of a Bachelor's degree in an agricultural area of study and were employed in the agriculture industry in a leadership role from across seven states. Round one asked panelists to define agricultural literacy. Rounds two to four collected panelists' level of agreement on closed-ended questions about the definitions evolving from the panel. After four rounds of investigation, industry professionals decided agricultural literacy was "the awareness and understanding of food, fiber, natural resources, and animal health and its relationship to the public and the environment." (Clemons et al., 2018, p. 248). As with other definitions, it highlights several aspects of agriculture that are to be learned and understood as part of agricultural literacy but presents them in a more general manner than the more detailed and specific past definitions.

The AFBFA, in 2019, described agricultural literacy as "understanding the intersection between agriculture and society" (AFBFA, 2019a, para. 3), and an agriculturally literate person as someone who "understands the relationship between agriculture and the environment, food, fiber and energy, animals, lifestyle, the economy and technology," (AFBFA, 2019a, para. 1). These definitions focus on agriculture's intersections and relationships with various aspects of society, providing an overview of agriculture and its importance instead of listing specific agricultural concepts like previous definitions. Clarity is also provided by separating the terms agricultural literacy and agriculturally literate from each other. However, in 2021 the foundation revised the definitions on its website and used a description of an agricultural literate person to explain agricultural literacy. An agriculturally literate person is described as someone who "understands how the agricultural industry works — not just where food comes from, but who grows it, agriculture's effect on the economy, environment, technology, lifestyle and its relationship to livestock" (AFBFA, 2021, para. 1). This definition clearly states what an agriculturally literate person needs to understand, but it does not explain what agricultural literacy is.

Agriculture in the Classroom (2020b) responds to the question "what is agricultural literacy?" on its website by saying "a person who understands and can communicate the source and value of agriculture as it affects our quality of life" (para 1.) This definition is the one that a group of researchers, practitioners, and government officials centered their work around in 2013 when they convened in Washington, D.C. in an effort to capture agricultural literacy constructs (Spielmaker & Leising, 2013). This is another case where agricultural literacy is not directly defined but is instead answered with a list of attributes of an agriculturally literate person. Ontario's agricultural literacy experts, AgScape (2021), clearly state the organization's mission on their website but do not offer a definition of agricultural literacy.

Definition Gaps and Stumbling Blocks

Through examination of these definitions, three elements were identified that require clarity: the difference between agricultural literacy and agriculturally literate, the absence of any mention of agricultural careers, and the absence of an explanation of what agriculture is to begin with. These factors are discussed below.

Agricultural Literacy and Agriculturally Literate. In several of the definitions of agricultural literacy analyzed above, the bulk of the description focused an "agriculturally literate person" and in more than one case no direct explanation for agricultural literacy was provided. This is equivalent to being asked what dentistry is and having someone define a dentist. There is useful information in such an answer and an understanding can be deduced, but dentistry and dentist are not synonymous and have independent definitions. If agricultural literacy and agriculturally literate had distinct and separate definitions it could promote better comprehension of what they mean.

Clemons et al. (2018) argue that the terms “literacy” and “literate” are not synonymous and have different and important meanings. They argue that literacy is focused on knowledge and understanding while being literate centers on communication and learning through reading, writing, and speaking. In a related article, Clemons and Lindner (2018) rely on the Merriam-Webster dictionary to describe literacy as “knowledge that relates to a specific subject” and literate as “being able to read and write” (p. 8). Based on these understandings, Clemons et al. (2018) found that agriculture experts did not discern a difference between agricultural literacy and being agriculturally literate. The participants in their study formed a definition of agricultural literacy that focused on awareness and understanding of foundational components of agriculture and its relationships to the public and the environment. For the term agriculturally literate, the participants focused the definition on knowing and understanding the importance of agriculture to people. Other than a slight shift in focus, there was essentially no difference between the two definitions offered. The researchers suggest the nuance between literacy and literate was not detected due to either a lack of awareness of the differences between the two terms or a lack of training in effective communication with those outside of the agriculture industry.

Based on the definitions above, agricultural literacy is typically described as the possession of information, knowledge, understanding, and awareness of various aspects of agriculture. An agriculturally literate person is typically associated with skills required to competently interact with agricultural information. The ability to read, write, communicate, synthesize, analyze, evaluate, identify, engage, and make decisions are words and skills listed in descriptions of an agriculturally literate person. This notable difference between terms — one focuses on comprehension, the other on skills — affirms that it could be helpful, for both teaching and researching agricultural literacy, if they had separate and distinct definitions.

The Absence of Careers. Missing from each of the definitions analyzed in this chapter is any reference to agricultural careers. One of the emerging themes of this study is the need to explicitly identify and state the goals of agricultural literacy. The goals (discussed later in this chapter) are to increase awareness of agriculture and to inform about agri-career options. While agricultural literacy differs from agricultural education, in that it is not intended to *prepare* students for careers in agriculture, it is still meant to inform students about agri-careers so they can identify ways they can contribute to, influence, and be involved in agriculture. As one of the goals of agricultural literacy it would be relevant to include careers in the definition.

What is Agriculture? Also missing from the above definitions is an explanation of what "agriculture" is. Stofer and Newberry (2017) point out that the word is used in definitions in various contexts, "yet a clear definition of agriculture is not included, making the definition of agricultural literacy circular" (p. 142). Given that agricultural literacy was designed to educate the general public about agriculture, it cannot be assumed that students, most of whom are arguably far removed from agrarian culture, instinctively know what agriculture means or what it entails. In fact, according to Spielmaker (2019), even the abbreviation of agriculture, "Ag," caused confusion in Agriculture in the Classroom programs among teachers and students. A review of the term agriculture and the consideration of its inclusion in an updated definition could be significantly helpful to promote understanding of what agricultural literacy is.

An investigation of the definition of agriculture is presented in Chapter 4, along with a deeper look at the root terms literacy and literate to offer updated definitions that can help educators, students, and stakeholders have a clearer and more congruent understanding of agricultural literacy. If definitions are more easily and better understood, this will enable the focus to be on the larger message of the discipline, thus increasing the effectiveness of outreach efforts.

The Goals of Agricultural Literacy

Another theme that emerged from this study is the need to explicitly identify and state the goals of agricultural literacy so outreach and teaching efforts can collectively move in the same direction. This could potentially make agricultural literacy efforts more effective and advance the field. Though not explicitly stated, two goals of agricultural literacy were identified in this study and can be traced throughout literature. The first goal is to increase *awareness* of agriculture for the general public with the anticipated outcome that it will naturally garner support for the agriculture industry. The second is to inform students about agricultural *careers* and cultivate interest, with the anticipated outcome that it will help secure a future workforce. These goals and outcomes are first perceived in the reasons agricultural literacy was formed, which were discussed in Chapter 1 — to raise awareness of the non-farming population to increase respect for the industry, increase enrollment in agricultural programs, and improve conditions for agriculture (Hubert, et al, 2000; Mercier, 2015; NRC, 1988).

In 1991, the Regional Director of Cooperative Extension Programs in California listed three reasons for making agricultural literacy a priority. According to King (1991), the efforts of agricultural literacy are meant to build a citizenry that is aware of agriculture and better-informed to make policy choices that affect agricultural production. It is also meant to foster a large body of young adults who are knowledgeable about agriculture and excited to pursue agricultural careers; it is meant to inspire the next generation to be devoted to solving problems faced by agriculture and its intersecting industries. Dailey et al. (2001) list only one reason for learning about agriculture in their study — to develop a love and understanding of agriculture and its importance — but their summary includes both of these purposes. The researchers say agricultural literacy will lead to “informed individuals as decision-makers going to the polls and dealing with agricultural issues,” and it will also prepare the next generation of agriculturalists for “leaderships roles for future careers in the field” (p. 19). A 2015 study by Mercier explains that agricultural literacy efforts aim to create a society that understands food and agricultural systems so that a secure food supply can be maintained, which can be done by informing consumers who can then make educated purchasing and voting decisions. Mercier also draws attention to the need to “build a cadre” of next-generation farmers, ranchers, and those who are interested in food and agricultural careers (p. 1), further emphasizing the goals are to raise awareness and inform about agri-careers to cultivate interest. Rice and Kitchel (2017) also confirm these purposes with their study results. After interviewing agriculture high school teachers in Missouri, they determined there are four reasons for teaching agriculture that commonly overlap to form two categories. Literacy and practical life skills form one category; the second category is career and college preparation.

Agricultural literacy organizations in Canada and the United States list the abovementioned goals on their websites as well. Ontario's agricultural literacy organization, AgScape (2021), states that its mission is to increase awareness of the agri-food system (food produced through agriculture, as opposed to hunting, fishing, and gathering), and to inspire agriculture-related careers. The AFBFA (2021), in the United States, states that it seeks to cultivate awareness of agriculture by helping people understand agriculture's relationship with society.

Previous Research Focus

While these goals can be clearly traced throughout literature, it has been well documented that the number one focus of agricultural literacy research has been on individuals' knowledge and understanding of agriculture (Brune et al., 2021; Doerfert, 2003; Trexler & Hess, 2004). This is, in part, because these terms are used in both Frick et al.'s (1991) and Meischen and Trexler's (2003) widely embraced and commonly cited definitions. Kovar and Ball (2013) found that nearly half of the 49 studies they analyzed between the years 1988 and 2011 focused on assessing participants' knowledge and understanding of agriculture. These terms, however, have not been approached equivalently in agricultural literacy research as knowledge has been strongly favoured over understanding (Brune et al., 2021; Doerfert, 2003). There is also discourse amongst researchers about whether knowledge or understanding is more important to focus on. Trexler and Hess (2004) confirm that the majority of the studies from the previous 15 years focused on knowledge of agriculture, ignoring the understanding aspect, and argue that doing so emphasizes "ascertaining bits and pieces of agricultural knowledge" instead of trying to make "apparent what people understand" (p. 12).

According to Dictionary.com (2021), there is a discernable difference between knowledge and understanding as Trexler and Hess (2004) point out. Dictionary.com (2021) defines knowledge as "acquaintance with facts, truths, or principles, as from study or investigation," and understanding as the "mental process of a person who comprehends; comprehension; personal interpretation." However, these terms beg the question, what should be known and what should be understood in agricultural literacy? Committees and researchers have attempted to address this question by listing specific requirements in definitions or stating that “basic” agricultural facts and concepts should be the focus, but agriculture is a massive industry with numerous sectors. Limiting knowledge and understanding to basic information still leaves an overwhelming amount of information to be obtained. Setting parameters with words such as “enough,” and “at minimum” can be moderately helpful but they still do not provide adequate direction. Curriculum guidelines and benchmarks, such as the Food and Fibre Literacy Systems Framework (FFLS) (Leising et al, 1998) and the National Agricultural Literacy Outcomes (NALOs) (Spielmaker & Leising, 2013), have been created to help provide direction in agricultural literacy work and to determine appropriate grade level curriculum benchmarks, but discourse continues on what should be known and understood as well as how to assess it (Powell et al., 2008). Enns et al. (2016) encourage this discourse and the refinement of what needs to be known about agriculture, so programs can be designed or redesigned to be effective at increasing agricultural literacy.

Much of the agricultural literacy curriculum suggested in benchmarks, guidelines, and used in assessment research has focused on the production side of agriculture. While this is a way to raise awareness of agriculture, this type of content perhaps, falls into the category of agricultural education. As discussed in Chapter 1, agricultural education is described as being for those already interested in or working within the agricultural industry and agricultural literacy is said to be for the general public to increase their awareness of agriculture and to learn about agri-careers. While there may always be a curricular overlap between these fields of research, despite efforts to distinguish them, it can be argued that the general public, and more precisely here, a secondary school body, does not necessarily need to know and understand specific agricultural practices and sector-specific information to be “aware” of agriculture. It may be beneficial for agricultural literacy research to have more discourse about what “awareness” entails. Further discussion on awareness as a goal occurs in Chapter 4.

A noticeable gap in previous research is a focus on agricultural careers. As mentioned earlier, the focus on careers in agricultural literacy differs from agricultural education, in that it is not intended to *prepare* students for careers in agriculture, it is meant to inform students of ways they can contribute to, influence, and be involved in agriculture. Thoron et al. (2016) attest that in-school curriculum is one of the most influential factors in pursuing a path in agriculture, though Mercier (2015) argues there is a lack of "broad-based empirical analysis" of how well agricultural curriculum attracts young people to careers in agriculture from farming to agribusiness to science and food-related professions (p. 13). There also appears to be limited studies focused on secondary students (Bradford et al., 2019; Dale et al., 2017), yet secondary students are the appropriate age for career-related studies since they are planning for post-secondary education and career options. Kovar and Ball (2013) note that between 1988 and 2011, only five of the 49 studies they reviewed focused on secondary students.

In the data collected for this study, only three studies appeared to have an intentional focus on careers. A study by Cannon et al. (2009) evaluated a summer enrichment program in Virginia for gifted and talented students. They promoted agricultural careers by showing the connection between agriculture and college, business, and scientific occupations. The researchers found that the program did not have an overwhelming influence on career choice or goals. Another study by Riedel (2006) looked at the influence of an introductory agriculture course on North Carolina high school students' agricultural knowledge and their perception of the agricultural industry. The researcher found that agricultural knowledge did improve, but the least amount of improvement was in career-related knowledge. Pinkerton et al. (2021) gave interactive classroom lessons to over 2,300 students in Florida between the ages of 11 and 18. One of the direct objectives was to interest students in agricultural careers. The researchers found there was a significant increase in interest in agricultural careers from pre- to post-surveys.

In the agriculture industry today, career opportunities are plentiful but so are the vacancies. In an investigation of labour shortages in agriculture, Parker (2016) visited England, Scotland, New Zealand, Australia, the United States, and Jamaica. She discovered that the availability of skilled people to work in agricultural positions is "not meeting the demand in most developed regions of the world" (p. 12). In particular, Australia is in "dire need" of candidates to fill positions. The grain sector indicates there are 10 agronomy jobs for every graduate, and the agri-business sector was only able to fill 40% of their agricultural science positions in 2010. In the United Kingdom, the National Farmers Union found that 29% of growers had trouble recruiting enough labour in 2015. The United States indicated a $3.1 billion loss in potential sales due to a decline in farm labour over a ten-year period. Jamaica had a higher percentage of people working in agriculture than the other countries Parker visited, but agriculture jobs there were associated with a “subsistence way of life,” not careers to aspire to (p. 29).

In the spring of 2020, the Ontario Federation of Agriculture (OFA) announced an annual national labour shortage of approximately 60,000 workers. The Temporary Foreign Worker Program (TFWP) is routinely relied on to address the labour shortage that exists in primary agriculture, and typically brings 45,000 agricultural professionals to Canada each year, leaving the industry with 15,000 vacancies annually. Ontario alone expects 20,000 temporary workers to assist with spring preparation and planting, and to work in processing plants (OFA, 2020). More than half of these foreign professionals come from Mexico, 20% come from Guatemala, and 18% from Jamaica (MacLean, 2020). When Canada’s border closed in 2020 due to the pandemic, international flights that usually bring in temporary workers shut down too (MacLean, 2020). The federal government assured the agriculture industry that workers belonging to the TFWP would be allowed across the border to aid in agriculture production, but many countries were hesitant to send workers out of concern for their safety, and some decided to send fewer professionals than normal (Knutt, 2020; Roberts, 2020).

The general public commonly misunderstands why foreign labour is brought in. Comments on a CBC News story about unharvested crops in 2020, criticized farmers for not trying to hire Canadians or wanting “dirt cheap” labour. Some insisted workers should be paid $40 an hour without considering how this would raise the price of food. Others fail to realize the level of skill that is required in most of these positions and do not appreciate that some of these foreign workers have 20 or more years of experience (McGregor, 2020). Nevertheless, if Canada cannot provide domestic labour to fill these positions, farmers must rely on foreign labour, which the pandemic showed is a risky system to place the weight of a nation’s food supply on.

Without skilled employees filling these open positions the agricultural industry cannot operate at its full potential. However, the ACER study mentioned in Chapter 1, found that only 16% of secondary students in Australia are considering careers in primary industries (Hillman & Buckley, 2011).

Enrollment levels in the Agriculture SHSM program indicate that an even lower percentage of Ontario's secondary students are interested in agri-careers (OMOE, 2017). It is important to inform the next generation about agriculture and its career opportunities so students can discover interests they may have in agricultural positions, ways they can influence the industry and become involved, and in order to prepare for these careers with the right education and training. Agricultural literacy is also important to help people understand the complexity of the agricultural labour situation described in the preceding paragraphs. These factors underscore the value of including agri-careers curriculum in agricultural literacy programs and to notify students of involvement opportunities. Further discussion on careers as a goal of agricultural literacy occurs in Chapter 4.

Teaching and Research Approaches

The third theme emerging from this study is the need to evolve teaching and research methods (Clemons et al., 2018; Enns et al., 2016; Mercier, 2015; Powell et al., 2008). One specific area of teaching agricultural literacy, as well as researching agricultural literacy, that could use consideration is the vernacular used. As discussed in Chapter 1, a large majority of the Canadian and American populations have little awareness of farming, ranching, and the agriculture industry in general (American Farm Bureau Federation, 2019; Pense et al., 2005, Powell & Agnew, 2011; Statistics Canada, 2019; U.S. Farmers and Ranchers Alliance, 2011). Agriculture is "simply not a part of their world" for the majority of Americans, (AFBFA, 2022, para. 1), and a majority of Canadians are disconnected from their food systems (Balogh, 2020; OFA, 2017). This lack of connection and awareness with agriculture means the general population also lacks familiarity with agricultural terminology, creating a language barrier that is likely hindering the effectiveness of agricultural literacy efforts and impeding understanding.

Several studies noted the interference of industry-specific terminology in gauging participants' knowledge and understanding of agriculture and recommended addressing this obstacle to benefit agricultural literacy (Brandt et al. 2017; Clemons et al, 2018; Meischen & Trexler, 2003; Stofer & Newberry, 2017). Brandt et al. (2017) found their upper elementary student participants were unable to answer interview questions about agriculture and the environment, based on the corresponding grade-level benchmarks from National Agricultural Literacy Outcomes (NALOs), because they did not understand the vocabulary and language used. Words such as conservation, inherited traits, and ecosystems were listed by the researchers as interfering with student understanding. Meischen and Trexler (2003) found that their fifth grade participants were either not familiar with agricultural terms such as processed and distributed, or the terms were too advanced for that age group. If students have difficulty understanding and grasping agricultural terminology it hampers communication, distracts learners from bigger messages, and prevents them from further engaging with the material (Stofer & Newberry, 2017). Brandt et al. (2017) also point out that insufficient understanding of agricultural terms interferes with researchers accurately assessing agricultural literacy levels. They suggest the terminology used in agricultural literacy curriculum be revised to eliminate or lessen the communication divide so researchers can better develop interventions to improve agricultural literacy. Clemons et al. (2018) assert that currently, “the manner in which our profession explains and communicates with non-agriculturalists is not effective” (p. 249). As such, the language and terminology used in agricultural literacy should be reviewed and revised to improve communication and make agricultural information more accessible to students and the public in general. Approaches to modifying vernacular are discussed in Chapter 5.

Another area of consideration in teaching and research is that of approach. While modes of delivery have been a concern for the field of agricultural literacy since the beginning, it continues to garner much attention (Powell et al., 2008; Edgar et al., 2016). Enns et al. (2016) inform that educational effectiveness of agricultural programs has been the focus of many research studies and that across all types of programs, effective methods are typically “varied, personal, relationship-based, well-planned, targeted, interactive, skill-based, or experiential in nature and enhanced through inquiry” (p. 15). These studies, however, focused on one or a few of these strategies, but an approach that aims to incorporate all of them or as many as possible, may have additional benefits and help effectively raise agricultural literacy levels of participants. A suggestion for pairing agricultural literacy with a multiliteracies pedagogy — a pedagogy that encourages multiple and many modes of communication and meaning-making — has potential to make agricultural curriculum more accessible and impactful for students. This approach is discussed in detail in Chapter 5.

When it comes to agricultural literacy research, many studies focus on instructional material assessment (Leising et al., 2001). Indeed, many of the studies analyzed in this research focused on assessment of some aspect of agricultural literacy. The majority of these studies made use of semi-structured or clinical interviews (Brandt et al., 2017; Dailey et al., 2001; Henry et al., 2014; Hess & Trexler, 2011a, 2011b; Mars & Ball, 2016; Meischen & Trexler, 2003). Others used questionnaires or surveys (Cannon et al., 2009; Knobloch et al., 2007). Several others used tests, including pre-tests and post-tests that were designed per grade level and utilized either pictures, short text, or written statements. These tests were often paired with planned systematic instruction and classroom lessons (Brandt et al., 2017; Hubert et al., 2000; Leising et al., 2001; Pense et al, 2005). Details about how this material was delivered or how students engaged with it were not included in the literature analyzed, other than it was conducted within a typical classroom setting.

There is no intention here to frown upon standard research methods or traditional teaching approaches, but only to highlight that there may be more effective methods for raising and assessing agricultural literacy levels. The limited impact of agricultural literacy on what the public knows and understands about agriculture solicits more serious consideration of different pedagogical approaches and broader ways of gauging what students know and understand about agriculture. According to Ryan et al. (2010) if teachers do not embrace different modes of learning, they can exclude significant student knowledge. Standard text and interview approaches typically used in agricultural literacy research, may not accurately capture what students fully understand about agriculture (Brandt et al., 2017; Trexler & Hess, 2004). More innovative, engaging methods of conducting empirical research, which can be informative and effective for researchers, can transpire with a multiliteracies approach, introduced above and discussed more in Chapter 5.

Integration into Core Curriculum

Most schools in Canada and the United States do not have a standard or even optional agriculture course, so many researchers suggest integrating agricultural curriculum into core subjects (Mars & Ball, 2016; Pense et al., 2005; Powel & Agnew, 2011; Powell et al., 2008; Vallera & Bodzin, 2016). Leising et al. (2001) assert this is the "most appropriate and least intrusive way to incorporate instruction into an already overloaded curriculum" (p. 146). There are some shortcomings with this strategy, however, especially for secondary schools. Teachers are not integrating agricultural curriculum into their classroom lessons or subject areas even when they think the information is beneficial and they are provided with ample resources and guidance (Bellah & Dyer, 2009; Cannon et al., 2006; Dale et al., 2017; Knobloch et al., 2007; Sutherland & Comacchio, 2000; Vallera & Bodzin, 2016).

A study by Knobloch et al. (2007) lists several reasons teachers choose not to integrate agriculture into their classrooms. Some teachers do not believe in the benefits of teaching agriculture. Some do not have the resources they need to teach agricultural concepts. Others feel that agriculture does not relate to their subject area or grade level, or they choose not to teach it because they feel it is irrelevant for preparing students for standardized tests. Some teachers assert they do not have time to teach anything about agriculture. Vallera and Bodzin (2016) cite a lack of agricultural knowledge, lack of interest, and lack of time due to "over-stuffed curriculum and high-stakes testing," as reasons teachers do not integrate agricultural curriculum (p. 115). Vallera and Bodzin also claim that industry-related stereotypes influence teachers' decisions to not include agricultural content. Bellah & Dyer (2009) as well, list lack of time, interest, and knowledge as the primary reasons teachers do not integrate curriculum. Their study concluded that even when teachers have favourable attitudes and perceptions towards agriculture, and are provided with agricultural literacy curriculum, implementation of the curriculum is unlikely. Lambert et al. (2014) found in their study that no teacher participant "made it all the way through" the agricultural material provided, even though they enjoyed having agricultural content available (p. 100), and Pense et al. (2005) found that teachers in upper elementary grades struggled to make relevant connections to agriculture in their classrooms when agriculture instructional materials were provided.

Historically, integration has not worked well either. In the early 1900s, even when teachers enjoyed their agriculture training and involvement in garden programs, they did not cover agricultural curriculum in their classes. In 1910, only 16 of 97 teachers had started garden programs a year after receiving training, and the majority were not doing any sort of nature study at all (Sutherland & Comacchio, 2000). This is despite teachers enjoying their agriculture training, with one teacher describing it as “more worthwhile” than all academic and professional work combined from a “life viewpoint” (OMOE, 1912, p. 240). Another said it gave her “a broader sympathy with rural life” and taught her “to look on Agriculture as a Science” (OMOE, 1912, p. 240). Teachers stated that they did not incorporate agricultural curriculum in their classrooms because school trustees and inspectors were not supportive of school gardens, and because it was not a priority due to its optional status combined with the already overwhelming demands of teaching (OMOE, 1912; Sutherland & Comacchio, 2000).

Dale et al. (2017) allege that even when agricultural curriculum is integrated, it is usually not done successfully. Teachers often struggle with the content because they feel they have too little information, cannot use the curriculum effectively in their subject area, or they lack the confidence to teach the material (Bellah & Dyer, 2009; Hubert et al. 2000; Rice & Kitchel, 2017). Knobloch et al. (2007) add that teaching antiquated ideas and outdated information are additional reasons integrating agricultural content is not often successful. A study by Leising et al. (2001) further casts doubt on integration as an impactful strategy. The researchers found conflicting results regarding the relationship between student knowledge and the number of teachers reported connections to agricultural curriculum. They suggest additional research is needed to understand how teacher behavior in the classroom impacts acquisition of agriculture knowledge by students, but other factors could be contributing to these findings such as unclear definitions, inaccessible terminology, and perhaps the need for a more relatable and interactive approach.

Even when agricultural concepts are present in core curriculum due to their natural relationship with the subject, such as with science or environmental studies, these concepts are generally not related back or connected to agriculture. Vallera and Bodzin (2016) conducted a content analysis of basal science textbooks and curriculum programs that are widely adopted in upper-elementary classrooms in the United States and concluded that while many agricultural concepts appeared in the materials, most concepts were disconnected from agriculture and conceptual ideas were not developed. They also found that topics were "primarily presented as isolated facts or examples illustrating separate, non-agricultural ideas in science education" (p. 108). Similarly, Norton (2012) examined the level of agricultural content in Nova Scotia's science curriculum in elementary schools and found that basic agricultural concepts were present in grades one to three, but these concepts were not related back to agriculture. Norton also found that agricultural content significantly diminished in grades four through six, concluding that students in those grade levels are no longer exposed to agriculture in the science classroom.

Though integration of agricultural curriculum into core subjects may work in some settings and for some teachers (Lambert et. Al, 2014; Leising et al., 2001), based on the studies analyzed for this research and the low agricultural literacy levels in Canada and the United States, integration does not appear to be a strategy that raises awareness of agriculture or ways to become involved, such as through careers. A conversation on alternative ways of advancing agricultural literacy, other than through integration into core subjects, continues in Chapter 5.

A Societal Focus

Much of agricultural literacy research has focused on evaluating agricultural literacy levels of small, elected populations. This research has determined that agricultural literacy efforts generally increase competency in agriculture (Bradford et al, 2019; Kovar & Ball, 2013), but research has also shown that increasing agricultural literacy levels has been met with varying degrees of success. For example, competency can be raised in some categories of agricultural curriculum, but not all, or a partial understanding is achieved but not enough to adequately communication and apply what was learned (Hess & Trexler, 2011a; Kovar & Ball, 2013; Riedel, 2006). Overall, researchers have determined that neither Canadians nor Americans are agriculturally literate (Kovar & Ball, 2013; Powell & Agnew, 2011; OFA, 2017). Thus, as it stands, agricultural literacy is not having the impact hoped for and is not collectively achieving its goals (Doerfert, 2003). Enns et al. (2016) admit agricultural literacy needs to be refined through goals, methods, models, and programs to "ultimately drive change in our discipline" (p. 16).

The optional, limited, and voluntary agricultural programs available in Ontario high schools are inadequate for raising societal agricultural literacy levels, as are the more abundant, yet still optional and voluntary programs in the United States. And as illustrated in the previous section, integration of agricultural curriculum into core subjects as a way to expand agricultural literacy outreach, is not an effective strategy for raising societal agricultural literacy levels. Teachers have cited several valid reasons for not integrating agricultural content, even when curriculum is provided, and others lack the knowledge and confidence to connect related concepts to agriculture. Such fragmented delivery of agricultural curriculum is not helping to raise awareness of agriculture, nor informing students about agri-career opportunities. This warrants a shift in focus away from small, elected populations of students, optional, voluntary, and integrated methods to methods that promote agricultural literacy societally. As with the other topics introduced in this section, further conversation follows in Chapter 5.

Chapter Summary

The definitions and goals of agricultural literacy are foundational components of this field of research, however, this chapter identified cracks in these foundations. An investigation into these elements is presented in Chapter 4, along with analysis and results that offer clarity and direction to the discipline of agricultural literacy. The two other areas identified in this chapter as having potential to increase agricultural literacy's effectiveness are teaching and research approaches and a shift in focus from agricultural literacy levels of small populations to societal agricultural literacy levels. These areas are further addressed in Chapter 5.

Chapter 4: Theory Development, Definitions and Goals

"There is nothing so practical as a good theory"

~ Kurt Lewin ~

Redefining Agricultural Literacy

In Chapter 3, it was determined that agricultural literacy could be more effective with revised and clear definitions so that the meaning and intentions of the discipline are more obvious. This chapter investigates the definitions of the core terms "agriculture," "literacy," and "literate" in order to construct and propose definitions of "agriculture," "agricultural literacy," and "agriculturally literate" that promote a clear and comprehensive understanding of the notion of agricultural literacy for students, teachers, researchers, and other stakeholders. In their article, *When defining Agriculture and Science, Explicit is not a Bad Word*, Stofer and Newberry (2017) list two ways of constructing definitions. The first is proposing a definition for use in one's own research or writing, and the second is forming a consensus from a literature review. In the following section, definitions are offered for both the purpose of this research and to propose revised definitions based on the literature and data collected in this study. An investigation of the term agriculture and a revised definition is offered first, followed by an investigation of literacy and literate to help revise the terms agricultural literacy and agriculturally literate later in the chapter.

So, What is Agriculture Anyway?

Agriculture has been referenced in circular ways in agricultural literacy definitions but without clear explanations of what it means (Stofer & Newberry, 2017). Agriculture, in its most basic form, can be broken down into "ager" meaning "field" and "cultura" meaning "cultivation" (Harper, 2019). The Merriam-Webster Dictionary in 1988 (as cited by Dailey et al., 2001), defined agriculture as "an applied science that combines principles of the physical, chemical, and biological sciences in the process and production of food and fiber" (p. 12). In the 2019 edition of Merriam-Webster's dictionary, "agriculture" is listed as "the science, art, or practice of cultivating the soil, producing crops, and raising livestock and in varying degrees the preparation and marketing of the products" (Merriam-Webster, 2019). The Oxford English Dictionary (2019) definition of agriculture is very similar: "the science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products." Interestingly, its definition of farming is nearly the same: "the activity or business of growing crops and raising livestock" (Oxford University Press, 2019). Several other dictionary definitions simply describe agriculture as the act of farming (Cambridge University Press, 2021; Collins, 2021; Macmillian, 2021; Oxford University Press, 2021). This is inaccurate because farming is not synonymous with agriculture. Farming is the heart of the agriculture industry, but it is only one part of the larger scene and does not represent the scope of agriculture. Nonetheless, these definitions describe agriculture as the process of cultivating soil, growing crops, and raising livestock for products. The notion of agriculture, however, especially in modern society is much more complex.

Looking beyond dictionary definitions, how do industry members define agriculture? Stofer and Newberry (2017) searched for a definition of agriculture on government agency websites for the U.S. Departments of Agriculture, the Interior, Labor, and Education, as well as the National Science Foundation, but found no direct results. Sub-domains or sub-specialties were found, such as "sustainable agriculture" or "organic agriculture" but not the broadly defined term. A search of Canadian agencies, Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), Agriculture and Agri-Food Canada, Statistics Canada, the Canadian Encyclopedia, Agriculture in the Classroom Canada, and AgScape, provided no definition of agriculture, though sub-domains, such as "organic" and "sustainable agriculture" were listed on a few of the governmental websites.

A search of the web led to a review by Bareja (2010) on the definition of agriculture. He searched books and legal documents to compose his own definition of agriculture for his Crops Review website: "agriculture is the science and practice of producing plants, other crops, and animals for food, other human needs, or economic gain" (Bareja, 2010, para. 29). Real Farm Lives (2019) states that "agriculture is the broad term for everything that goes into growing crops and raising animals, to provide food and materials that people can use and enjoy. Farming, which involves cultivating the land and raising livestock, is one part of agriculture" (para. 1). The AFBFA (2022) defines agriculture as "all of the industries and processes involved in the production and delivery of food, fiber and fuel that humans need to survive and thrive" (Foundational Knowledge, para. 1). The 4-H Learning Network (2019) describes agriculture as "the basis of all civilization. It is part of everything from the food we eat to the clothing we wear. Agriculture shapes many of the traditions and values that this country was built on" (para. 1).

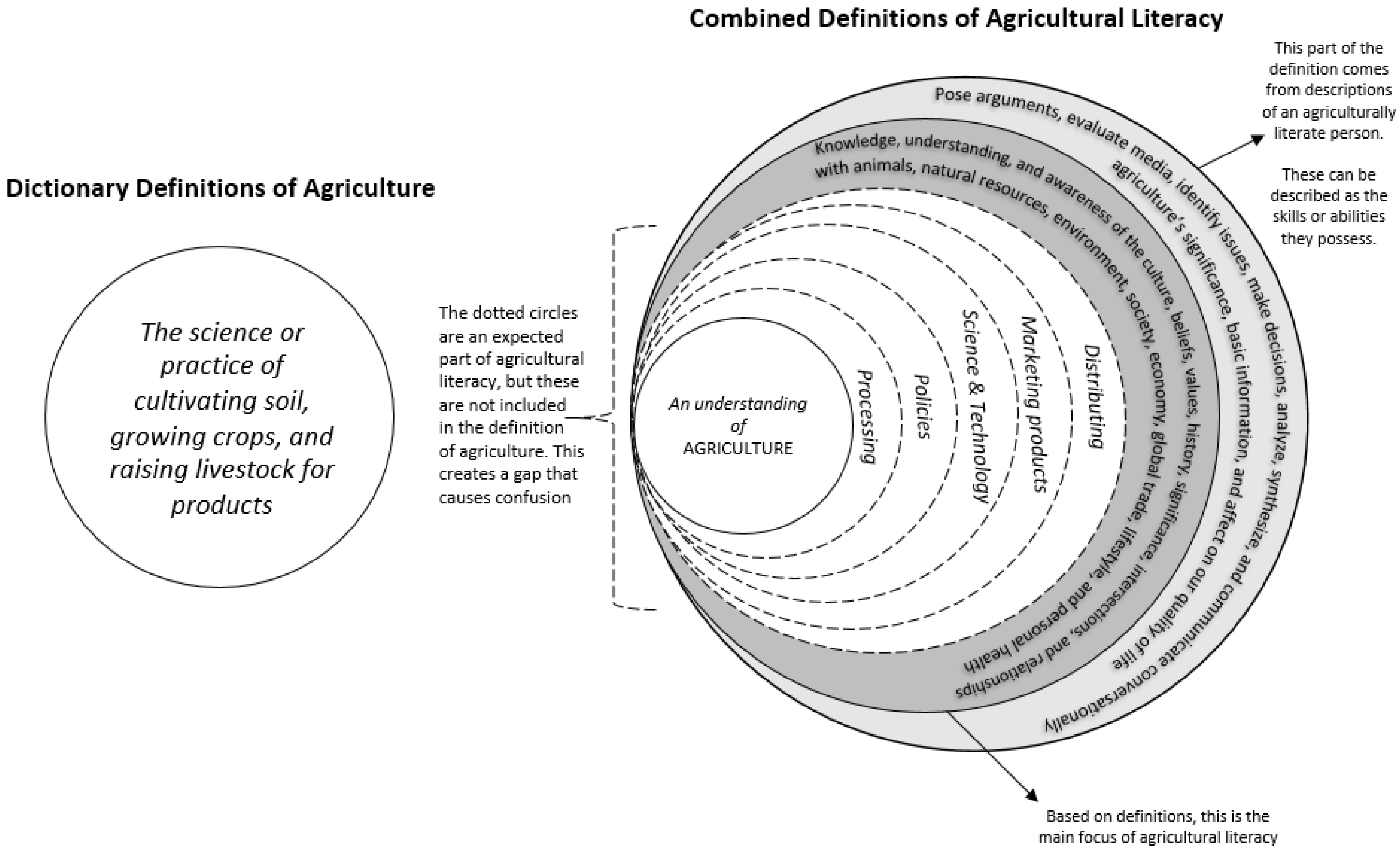
Surprisingly, not many agricultural organizations were found to provide a definition of agriculture on their websites, and when a definition was present it was quoted from a dictionary. It appears, from the lack of definitive definitions on government websites and from agricultural organizations that these simplified dictionary definitions are sufficient for describing agriculture. However, agricultural literacy seems to require that one know a lot more about agriculture than growing crops and raising livestock. This discrepancy creates a noticeable gap that is further illustrated in Figure 4.1.

Figure 4.1 is a visual representation of the definitions of agriculture discussed in this chapter and the definitions of agricultural literacy discussed in Chapter 3. The smaller circle contains a definition of agriculture based on the Oxford English Dictionary and the Merriam-Webster Dictionary (Merriam-Webster, 2019; Oxford University Press, 2010). The definitions of agriculture from these dictionaries were chosen because they are quoted by agricultural organizations on their websites and have similar entries to other dictionaries, as previously discussed. I formed the resulting definition from choosing terms that appeared in both definitions to provide an average description of agriculture: *the science or practice of cultivating soil, growing crops, and raising livestock for products.*

The larger circle represents the combined definitions of agricultural literacy presented in Chapter 3. The result is a complex list of required knowledge and expectations. To simplify these combined definitions, the terms and ideas that reoccurred and appeared to be the main focus of agricultural literacy were placed in the shaded section: *knowledge, understanding, and awareness of the culture, beliefs, values, history, significance, intersections, and relationships with animals, natural resources, environment, society, economy, global trade, lifestyle, and personal health*. The required skills and abilities of an agriculturally literate person, as described in these definitions, were also separated and placed in the outer ring: *pose arguments, evaluate media, identify issues, make decisions, analyze, synthesize, and communicate conversationally agriculture's significance, basic information, and effect on our quality of life*. Specific aspects of agriculture listed in agricultural literacy definitions were placed within the dotted rings: *processing, policies, science and technology, marketing products, and distributing.*

Figure 4.1

A Visual Representation of the Current Definitions of Agriculture and Agricultural Literacy



Note. Situated inside the smaller circle is a definition of agriculture composed from the Oxford English Dictionary and the Merriam-Webster Dictionary (Merriam-Webster, 2019; Oxford University Press, 2010). The larger circle represents the current combined definitions of agricultural literacy provided by AFBFA (2019), Agriculture in the Classroom (2020b), Clemons et al., 2018, Frick et al. (1991), Meischen and Trexler (2003), and NRC (1988).

This visual first highlights a gap between the commonly used dictionary definitions of agriculture and the understanding of agriculture within the concept of agricultural literacy. The oversimplified commonly used dictionary definition does not include several of the elements that agricultural literacy expects students to know and understanding about agriculture, such as processing, policies, science and technology, marketing products, and distributing. This can lead to confusion for learners who think agriculture is limited to what is included in its common definition — growing crops and raising animals. This image also illustrates that a clear division can be made between agricultural literacy and agriculturally literate, as previously discussed.

The investigation of the term agriculture, thus far, has determined that the common understanding of agriculture is oversimplified and that many agricultural organizations do not offer a more in-depth definition, but how do scholars define agriculture? The NRC (1988) used the following to describe "agriculture" and "agricultural system," which they state they use interchangeably:

> …the production of agricultural commodities, including food, fiber, wood products, horticultural crops, and other plant and animal products. The terms also include the financing, processing, marketing, and distribution of agricultural products; farm production supply and service industries; health, nutrition, and food consumption; the use and conservation of land and water resources; development and maintenance of recreational resources; and related economic, sociological, political, environmental, and cultural characteristics of the food and fiber system. (NRC, 1988, p. vi)

The NRC also includes Moore's (1987) idea of agriculture in its report: "agriculture encompasses the study of economics, technology, politics, sociology, international relations and trade, and environmental problems, in addition to biology" (as cited in NRC, 1988, p. 8).

Mercier (2015) notes that while agriculture was traditionally focused on farming it now includes food and nutrition, natural resources, physical and scientific infrastructure, information technology, and a global food system. According to Dailey et al. (2001), even a small family farm is no longer the norm for agricultural producers. They note that agriculture today is a "highly intensive, technologically sophisticated industry" (p. 12). Kovar and Ball (2013) list organic farming, ethanol production, international trade, buying local, environmental stewardship and climate, and genetically modified organisms as trends of 21st century agriculture. Conner et al. (2017) also list technological advances, corporate farming, and globalization of industry as modern aspects of agriculture. Caldwell (2015) explains that agriculture is a web of relationships between natural systems and human systems. He includes in this web: farms, natural environment, government, agribusiness (processing, packaging, and distributing), technical and professional expertise, and the non-profit sector (research and innovation). These descriptions capture the complexity and scope of modern-day agriculture that common definitions are lacking, and they indicate that agriculture includes more than farming, but there appears to be a blending between the terms agriculture and agricultural systems with no clear divide. Perhaps an effective way to describe agriculture to the general public, and more specifically to students, is to form a definition of agriculture that includes descriptions of traditional farming, modern updates, and agricultural systems.

Based on the synthesis of the above analysis, I formed the following definition of agriculture: *the production of food, clothing, energy, and other plant and animal products that meet human needs, through the skilled activity of farming and the natural and human systems associated with the environment, natural resources, science, technology, research (including that of health and nutrition), business (such as processing, distributing, and marketing products), and policy (including financing, trade, ethics, and conservation).* While this definition is not "new," it is constructed to provide a direct answer to what agriculture is and is arranged to illuminate critical components of agriculture such as farming and agricultural systems, with examples from modern day agriculture. Also, industry-specific terminology such as crops, livestock, fibre, and fuel, were replaced with general terms such as plants, animals, clothing, and energy to promote better understanding for the general population. The use of this definition will help students and educators understand what is meant by "agriculture" in an agricultural literacy course and what kind of topics could be included.

Investigation of Literacy and Literate

Separating the terms agricultural literacy and agriculturally literate has been identified in this study as a useful step to bring clarity and transparency to the notion of agricultural literacy. An investigation of the root terms literacy and literate was conducted to help determine the proposed definitions. It was found that few studies attempted to separate the terms or analyze any differences. The Oxford English Dictionary lists both terms separately and gives several variations of each. Literacy is listed as a noun: 1) the state of being literate; ability to read and write, and 2) competence or knowledge of a particular subject or field. Literate is described as an adjective: 1) a person or society acquainted with literature, 2) able to read and write, and 3) competent or knowledgeable in a particular area. Literate is also listed as a noun: 1) a learned person, and 2) a person who can read and write (Oxford University Press, 2011). According to these options, there is overlap between the two terms and it seems in some cases they can be used interchangeably, but they do not necessarily convey the same meaning.

In their article *What is Literacy? The Power of a Definition,* Keefe and Copeland (2011) say it is surprising how often literacy is discussed without explicitly defining what it means. The authors believe defining what is meant by literacy in a given context is important for impacting literacy opportunities. They acknowledge, however, that any effort to define literacy “for all people in all places and time is doomed for failure” and that “definitions of literacy will always change with time and place” (p. 96). Knoblauch (1990) also agrees: “no definition tells…what literacy is; definitions only tell what some person or group…wants or needs literacy to be” (p. 80).

The United Nations Educational, Scientific, Cultural Organization (UNSECO) explains that for most of its history, “literate” has referred to being “familiar with literature” or being “well educated” but that its meaning has changed throughout history. In the late 1800s, the term became associated with the ability to read and write, with a secondary meaning of being “knowledgeable or educated in a particular field or fields” (UNSECO, 2006, p. 148). The 2006 UNSECO report includes various definitions for literacy that come from aid agencies from around the world. These definitions fall into four categories: 1) literacy as an autonomous set of skills, 2) literacy as applied, practiced, and situated, 3) literacy as a learning process, and 4) literacy as text. According to the report, the most popular definition of literacy is the first category, *literacy as a set of skills*. It is defined as the ability to use reading, writing, and numeracy in a single national language, effective for meeting personal and communal development. The second category *literacy as applied, practiced, and situated* focuses on the use of literacy skills in a practical way, mainly to impact socio-economic development. The report informs that this take on literacy is often criticized for operating independently of social context and for being presented as the one and only way to be literate. The third category *literacy as a learning process* is based on the belief that individuals become literate as they learn. Personal experiences and experiential learning are at its core. The fourth category *literacy as text* focuses on subject matter and the nature of text. This form of literacy includes analysis of the complexity of the language and ideological content.

Knoblauch discusses four slightly different variations of literacy in his popular 1990 article *Literacy and the Politics of Education*: functional literacy, cultural literacy, personal growth literacy, and critical literacy. Each category has its own history, evolution, and debates (Knoblauch, 1990). Knoblauch (1990) describes *functional literacy* as being utilitarian; having the required basic reading and writing skills to operate in society. *Cultural literacy* goes beyond reading and writing for survival, and beyond language as a tool. It includes an awareness of cultural heritage and a capacity for higher-order thinking. *Personal growth literacy* is explained as a way to self-discovery and an avenue to developing imagination through the expression of language. Finally, Knoblauch states *critical literacy's* agenda is "to identify reading and writing abilities with a critical consciousness of the social conditions in which people find themselves" (Knoblauch, 1990, p. 6).

Allan Luke (2012), a literacy educator, researcher, and theorist, refers to critical literacy as the "use of technologies of print and other media of communication to analyze, critique, and transform the norms, rule systems, and practices governing the social fields of everyday life" (p. 5). In the field of agricultural literacy, Meischen and Trexler (2003), who lean on James Gee's work, explain literacy as a mastery of language in both oral and written forms. They say that "as one becomes literate, he or she masters the ability to make judgements based on culturally based norms that…reshape the culture and its institutions" (p. 43).

While there are many different forms of literacy and a number of ways literacy is defined, scholars tend to agree the conventional view of literacy — being able to read and write — is too narrow. Sang (2017) said it is necessary to broaden the scope of literacy to "satisfy people's needs to fully participate in social and cultural activities" (p. 16). Keefe and Copeland (2011) believe that the limited definition of literacy routinely leads to a lack of literacy opportunities for people with extensive needs for support. They suggest literacy focus on an individual's capacity to understand, use, and reflect, challenging the utility-based definition of literacy. They propose the definition be expanded to include assessing, using, and communicating about things in various formats, including print and image media or its equivalent, essentially embracing "all modes of communication" (p. 96). Keefe and Copeland's description of literacy is very similar to what the New London Group (NLG) (1996) refers to as multiliteracies. One of its central tenets, multiliteracies focusses on the importance of multiple modes of communication and meaning making. It is a literacy not restricted to printed and written forms of language, but instead encourages multiple modes of representation — multimodality — including modes such as oral, gestural, and visual (NLG, 1996). Multiliteracies is discussed in more depth in Chapter 5.

To define literacy and literate for the context of my research, a word cloud was created to capture the most commonly used words in the definitions and descriptions of literacy and literate discussed in this section and recorded in several different dictionaries (HarperCollins, 1991; Landoll, 1991; Oxford University Press, 2002; Oxford University Press, 2010). According to Atenstaedt (2012), a word cloud is a "visual representation of word frequency" and is "increasingly being employed as a simple tool to identify the focus of written material" (p. 1). When the definitions of literacy were analyzed the main words to emerge were *skills*, *ability*, and *knowledge*. When the definitions of literate were analyzed the main words to emerge were *able* and *mastery*. To unearth the nuances between *ability* and *able,* these words were further investigated by looking up their meanings in dictionaries and adding them to their corresponding word cloud. From *ability* came the terms *action, power*, *cleverness*, and *competency*. From *able* came the terms *capable*, *competent*, *sufficient*, and *enough* (HarperCollins, 1991; Landoll, 1991; Oxford University Press, 2002; Oxford University Press, 2010).

UNSECO's version of "literacy as a learning process" was also selected to help form a definition of literacy for this study because it fits with the description from Chapter 1 that agricultural literacy is "learning about agriculture," and because its emphasis on personal experiences and experiential learning fits very well with learning about agriculture, as these have always been a foundational part of learning about agriculture (Shoulders & Myers, 2013b). Learning through various modes of communication was emphasized in this definition to be inclusive of students with varying abilities or extensive learning needs, and to indicate that literacy is more than just reading and writing (Keefe & Copeland, 2011; NLG, 1996). Based on this inquiry, the resulting definition of literacy proposed for the context of this research is: *learning about a specific subject through the power and skills of various modes of communication.*

For the term literacy, the word cloud terms *sufficient*, *enough*, and *mastery* were key in constructing a definition. They indicate that a certain level of knowledge needs to be achieved before becoming literate. This level is reached when a person can take action or do something with that knowledge, expressed through various modes and formats of communication, and through the ability to make judgements concerning that knowledge. The proposed definition of literate is: *having enough mastery of a specific subject to be able to take action; to make judgements and communicate them through various modes and formats.*

Though there may still be some overlap between these definitions (and it is conceivably, unattainable to completely separate these terms) creating some space between these definitions for the purpose of this study helped laid the groundwork to formulate separate definitions for agricultural literacy and agriculturally literate.

Proposed Definitions of Agricultural Literacy and Agriculturally Literate

It has been determined in this study and suggested by other scholars (Clemons et al., 2018) that separating the terms agricultural literacy and agriculturally literate can be useful for promoting understanding in agricultural literacy work. Much of the preliminary work for constructing these definitions was done through the investigation of the terms agriculture, literacy, and literate. This section introduces the definitions I formed for agricultural literacy and agriculturally literate and explains the determining factors.

The definition I compiled for agricultural literacy is: *learning what agriculture entails, the careers it includes, and our connectedness to it; learning about its relationships and importance (including historical and cultural) to the environment, society, economy, personal lifestyle and well-being.* The updated and comprehensive definition of agriculture developed in this study, allowed for the removal of specific agricultural processes from the definition of agricultural literacy (those within the dotted lines of Figure 4.1), consequently simplifying it. Furthermore, the traditional idea of possessing knowledge and understanding of agriculture was replaced with the notion of learning about agriculture. This aligns with the definition of literacy proposed in this study, "learning about a specific subject," and is based on the fact that agricultural literacy is described as "learning about agriculture."

Three concepts that were also added to the definition are connectedness, well-being, and careers. As one of the two goals of agricultural literacy, it is reasonable to indicate that agricultural literacy includes learning about agri-careers. The addition of connectedness is a response to the lack of connection that the majority of the population has with primary agriculture and food production, as discussed in Chapter 1. Illuminating everyday individual connections with agriculture to food, fibre, and fuel is one way to do this (and is discussed more in Chapter 5). The category of well-being was also added to the definition to encompass personal life choices such as diet and health, as listed in traditional definitions of agricultural literacy, and to also encompass the passions and convictions of individuals which relate to agriculture. As discussed earlier in this chapter, more people are becoming concerned with the use of natural resources, how animals are treated, and the effects of climate change, so it is important to their well-being to accurately understand how their passions and convictions are related to agriculture.

The final concepts included in this proposed definition were those identified as the main focus of agricultural literacy in Figure 4.1 that were not addressed by the previous categories. This included learning about agriculture's intersections, relationships, and importance to numerous areas of civilization, including historically and culturally.

This constructed definition captures the essence of agricultural literacy (to learn about agriculture) and illuminates its intentions (to become aware of agriculture's significance to civilization and the careers that are part of it), as well as the importance of learning about this subject (recognizing its relationships to individuals and society). This definition will help educators and students have a better understanding of what agricultural literacy is and what it entails. It can also help educators and researchers develop or deliver curriculum and assessments that focus on aspects of agriculture which promote awareness and understanding in these areas.

The definition I compiled for agriculturally literate is: *Having enough comprehension of agriculture to communicate (in various ways and format) what it is, the jobs it includes, and its contribution to our lives; to critically analyze it and make balanced decisions related to agricultural matters.* To construct this definition, the descriptions of an agriculturally literate person from Figure 4.1. were plugged into the definition of literate, as defined by this study. Literate means having enough knowledge of a subject to communicate about it, apply an action, and make judgements as proof of that knowledge. To be agriculturally literate one has to have enough knowledge of the subject (what agriculture is, jobs included, contributions) to apply an action (communicate, critically analyze), and make judgements (make decisions) as proof of that knowledge. This definition can be especially useful for providing direction for those designing agricultural literacy programs and for providing guideposts for researchers who wish to gauge agricultural literacy levels.

These definitions are offered in this thesis to promote clarity in agricultural literacy work and make outreach, teaching, and research efforts more effective. They are not intended to define agricultural literacy and agriculturally literate "for all people in all places and time" but to help teachers, students, researchers, and other stakeholders have a better and more clear understanding of what agricultural literacy is, what it includes, and what qualifies as being literate (Keefe & Copeland, 2011, p. 96).

Importance of Goals and Learning Outcomes

As introduced in Chapter 3, the goals of agricultural literacy are to increase *awareness* of agriculture with the anticipated outcome of garnering support for the industry and to inform students about agricultural *careers* with hopes to cultivate interest and secure a future workforce. But these goals have not been explicitly stated and it appears there is a lack of research on agri-careers curriculum, especially for high school students (Bradford et al., 2019; Dale et al., 2017; Mercier, 2015). An argument asserting that the goals of agricultural literacy have been overlooked and insisting they need to be proclaimed, might seem trite, but low levels of agricultural literacy across Canada and the United States call for a refocusing of the discipline (Enns et al., 2016), making alignment with goals essential. Focusing specifically on the goals of agricultural literacy may be the key to designing (or redesigning) programs to maximize effectiveness and for raising agricultural literacy levels.

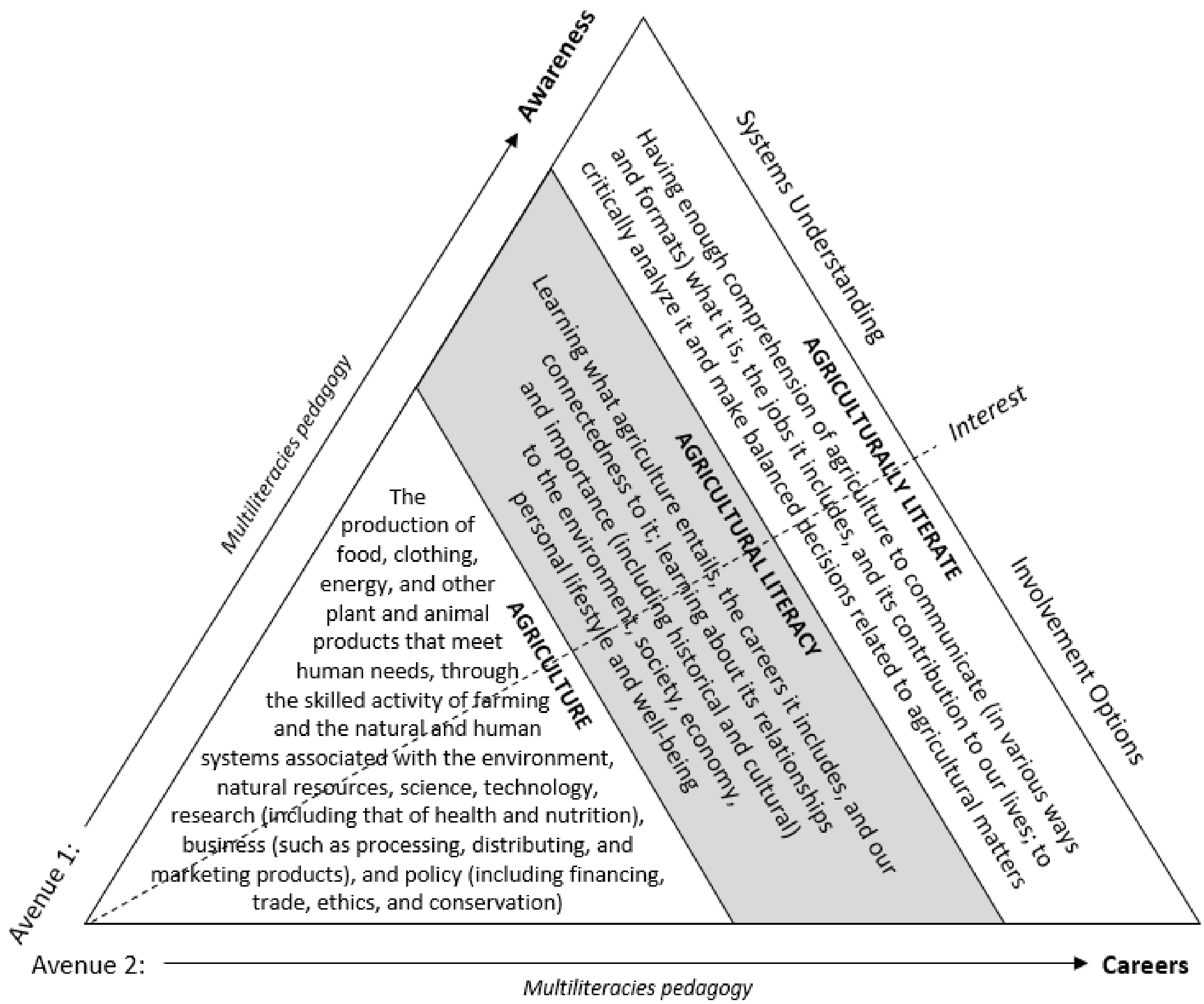
Educators and researchers have made a grand effort to provide guidelines and benchmarks that cover the main components of agriculture. They often divide agriculture into themes and link it to core school subjects per grade in attempts to address "what people need to know about agriculture" (Enns et al., 2016, p. 15). Some of the most popular guidelines emerging from the United States are the Food and Fibre Literacy Systems Framework (FFLS), and the National Agricultural Literacy Outcomes (NALOs) (Leising & Zilbert, 1994; Spielmaker & Leising, 2013). These guidelines have been the basis for many research studies and have laid the groundwork for those teaching about agriculture. The more recent guideline, NALOs, is set up to integrate agricultural content into the core areas of science, social studies, and health. The benchmarks are listed by grade level from Kindergarten to grade 12 and divided into five themed areas: 1) agriculture and the environment, 2) plants and animals for food, fibre, and energy, 3) food, health and lifestyle, 4) science, technology, engineering and mathematics, and 5) culture, society, economy and geography. Ontario's AgScape curriculum is similarly organized by grade and subject.

The AFBFA (2022) developed the Pillars of Agricultural Literacy, which is based on agriculture's relationships with six fundamental areas of society. The first area is the environment. This category includes land and water stewardship, environmental responsibilities and decision-making. The second area is food, fibre and energy, which consist of food safety, inspection, ethics, energy sources, shared values, and production methods. The third category covers agriculture's relationships with animals, including their welfare, safety, and housing systems. Lifestyle is also a category, which includes food cost, nutrition, healthy living, and processing. The fifth category is agriculture's relationship with technology, including its impact on the environment, new developments, and biotechnology. The final relationship category is the economy. This encompasses careers, its impact on local and global economies, and impact on hunger. It should be noted, that while all of this curriculum can raise awareness of agriculture, there is far less focus on informing students about agri-careers.

While there is certainly no lack of what "could be taught" to raise awareness in agriculture, it may be beneficial to guide curriculum by adding a desired learning outcome to this goal. Though the underlining anticipated outcome of raising awareness through agricultural literacy is to garner support for the industry, a more student-centered outcome such as gaining a "systems understanding," which requires looking at curriculum from several angles, could make teaching agricultural literacy more impactful for students and more informative for researchers, and thus more effective. The goal of careers could also be connected to a student-centered outcome. Though the underlining hope is that students will gain an interest in agriculture and enter the workforce, the learning outcome of a careers curriculum could be to identify involvement opportunities for students to be able to apply their skills and interests in ways that can impact or influence the industry. These concepts are further illustrated in Figure 5.1, the avenues of agricultural literacy model, which is the pragmatic product of this study, which brings together the definitions of agricultural literacy, the goals and possible learning outcomes, and a suggested pedagogical approach.

Figure 5.1

Avenues of Agricultural Literacy Model



The foundation of the avenues of agricultural literacy model is the combined definitions of agriculture, agricultural literacy, and agriculturally literate, as proposed in this study. The definitions are presented independently to provide a precise and clear meaning for each, but they are also offered together in a scaffolded triangle to promote a layered understanding of the discipline. These definitions can be used to promote a comprehensive understanding of what agricultural literacy is, but they can also be used to guide agricultural literacy teaching and research, especially in conjunction with reminders of the goals and learning outcomes (which are presented in Avenue 1 and 2 along the outer edge of triangle).

For example, for the goal of awareness, teachers and researchers can focus on the first part of the definition of agricultural literacy “learning what agriculture entails, the careers it includes, and our connectedness to it,” and choose from an abundant amount of agricultural curriculum to meet this goal and raise agricultural literacy levels of students. However, to promote a broader understanding of agriculture and to look at the complexity and interconnectedness of the industry — to promote a systems understanding — teachers and researchers can dive into the second part of the definition “learning about its relationships and importance (including historical and cultural) to the environment, society, economy, personal lifestyle and well-being.”

Promoting this type of systems understanding can also be accomplished by applying other frameworks to the avenues of agricultural literacy model. For example, a conceptual food literacy model by Hernandez et al. (2021) suggests looking at food systems at an individual level, community level, and population level. Using the definition of agricultural literacy as a foundation, agriculture, what it entails, and its connectedness to the environment, society, economy, personal health, and well-being could be discussed through individual, community, and population level perspectives, which would promote a more comprehensive understanding of food systems within culture, society, and how agriculturally-related decisions impact health and wellbeing (Cullen et al., 2015). A food literacy framework that includes agri-food systems by Martin and Massicotte (2021), adapted from a widely adopted health literacy framework, lists three levels for measuring literacy: functional, interactive, and critical. This framework could be applied to the proposed definition of agriculturally literate (having enough comprehension of agriculture to communicate about it, critically analyze it, and make balanced decisions about it) to help gauge literacy levels. This framework would consider communication about agriculture to be at a functional literacy level, the ability to make balanced decisions about agriculture would be at the interactive literacy level, and the ability to critically analyze agricultural matters would be at the critical literacy level. While awareness can be achieved at each level, reaching the critical literacy level would be an indicator that a systems understanding has been achieved.

The avenues of agricultural literacy model can also be used to guide curriculum towards the goal of careers and the learning outcome of understanding "involvement options." Though the goals and learning outcomes are presented separately in the model, they do not need to be taught in silos. Awareness and careers are presented separately to remind educators and researchers to cover both, especially because the goal of careers requires more attention in agricultural literacy work, as previously established. But teaching towards awareness can lead to discussion on careers and teaching about careers can raise awareness, and both can increase interest in agriculture (as indicated by the dotted line between the goals).

A focus on careers in agricultural literacy is not intended to prepare students for agri-careers but to inform them of opportunities and to identify places where they can apply their skills and interests in order to influence, change, impact, or contribute to the industry. Almost any piece of agricultural curriculum can be connected to careers, whether careers directly associated with agriculture or an intersecting industry. The first step towards this goal would be to identify these positions. According to Parker (2016), when asked to name a career in agriculture, the majority of high school respondents named careers in primary production despite the plethora of careers in the industry. Agronomists, food scientists, heavy equipment mechanics, input and service suppliers, food and beverage processors, and food retailers are agricultural positions that Parker (2016) indicates students are unaware of. Henry et al. (2014) found that when students associate agriculture with basic farming practices it negatively impacts their interest in pursuing higher education and careers in agriculture, which is reason to expand student knowledge of agricultural careers by including careers in agricultural literacy curriculum.

To achieve the learning outcome of understanding "involvement options" these careers should be associated with certain skills or interests so students can discover how their talents and skills might correlate with specific agricultural professions. According to the New London Group (1996), this idea aligns with ample evidence that people learn well when they are both motivated to learn and believe that what they are learning is useful to them and in some way connected to their interests. Luke (2000) affirms that starting with student resources such as skills, interests, and context is key to learning. Schumacher

(1973) claims that education should inspire people to participate in life and that people are looking for ideas that make the world and their own lives intelligible to them. He exclaims “when a thing is intelligible you have a sense of participation” (p. 69). A careers curriculum within agricultural literacy that highlights agri-careers and associated skills, has the potential to stir up a sense of participation and a desire to get involved by helping students identify places and roles within the industry that are connected to their interests and skills — places and roles they may be able impact, change, or contribute to, which can lead to dialogue about solutions. This type of curriculum could include knowledge of “food movements,” which are networks of people, groups, and organizations centered around “experimenting with a variety of alternative ways of producing, harvesting, foraging, processing, distributing, consuming, and ultimately governing food” to challenge industrial food systems (Clark et al., 2021). This aligns with the goals of food studies instructors and researchers in Canada who want to see a shift in curriculum away from critique of problems within food systems towards exploring solutions (Stephens & Hinton, 2021). A curriculum that connects students’ skills and interests to careers and other opportunities to get involved, and that promotes the exploration of solutions, is a way of thinking about agriculture and food systems “that may empower the learner to take action towards social change” (Hernandez et al., 2021, p. 9). It is one way to make agricultural literacy outreach more impactful for students, and in turn, more effective.

The final component of the avenues of agricultural literacy model is its pairing with a multiliteracies pedagogy for teaching and research approaches. This approach is discussed thoroughly in the next chapter.

Chapter Summary

This chapter investigated the definitions of agriculture, agricultural literacy, and agriculturally literate, and offered revisions of these definitions to bring clarity and direction to field through a comprehensive description of the discipline. This can potentially increase the effectiveness of agricultural literacy efforts by ensuring educators and students have the same understanding of terms. As well, when the terms are easily understood, attention can be focused on larger messages and the curriculum can be more freely engaged. The definitions proposed are as follows:

Agriculture: *the production of food, clothing, energy, and other plant and animal products that meet human needs, through the skilled activity of farming and the natural and human systems associated with the environment, natural resources, science, technology, research (including that of health and nutrition), business (such as processing, distributing, and marketing products), and policy (including financing, trade, ethics, and conservation).*

Agricultural literacy: *learning what agriculture entails, the careers it includes, and our connectedness to it; learning about its relationships and importance (including historical and cultural) to the environment, society, economy, personal lifestyle and well-being.*

Agriculturally literate: *Having enough comprehension of agriculture to communicate (in various ways and format) what it is, the jobs it includes, and its contribution to our lives; to critically analyze it and make balanced decisions related to agricultural matters*.

This chapter also determined that aligning curriculum, programs, and research with the goals of agricultural literacy can increase the effectiveness of agricultural literacy efforts by proceeding in a consistent direction. Adding learning outcomes to the goals can also promote a deeper, more complex understanding of agriculture and the opportunities that exist to participate in and explore solutions to food systems problems. The avenues of agricultural literacy model was introduced as the pragmatic product of this study, which combines the themes that emerged from this grounded theory research: updated definitions, explicitly stated goals and learning outcomes, and idea of pairing agricultural literacy with a multiliteracies pedagogy. The model can be used to guide current and future agricultural literacy programs and it was demonstrated how the model can be paired with other frameworks, particularly food literacy frameworks commonly used in Canada.

Chapter 5: Theory Development, Pedagogical Approaches

"Research is seeing what everybody else has seen and thinking what nobody else has thought"

~ Albert Szent-Györgyi ~

Introduction

In Chapter 3, teaching and research approaches were identified as areas that can be modified to increase effectiveness of agricultural literacy efforts. In this Chapter, a multiliteracies pedagogy is recommended for pairing with agricultural literacy to address some of the barriers associated with approach. This pedagogical approach is also suggested because it includes diverse and multiple ways for students to become engaged in their learning and to include their own economic, social, and cultural perspectives, which can help develop a deeper understanding of agriculture. This chapter briefly explains multiliteracies and demonstrates how this approach is an exceptional fit for teaching agricultural literacy concepts and for assisting researchers in conducting agricultural literacy studies. A discussion about ways to increase agricultural literacy societally, concludes Chapter 5.

Introduction to Multiliteracies Pedagogy

Multiliteracies is a pedagogical framework developed by ten international educators, known as the New London Group (NLG), that focusses on "modes of representation much broader than language alone" (NLG, 1996, p. 64). The group coined the term multiliteracies based on the fact that new media communications are reshaping language, and that there cannot be "one set of standards or skills that constitute the end of literacy learning, however taught" (p. 64). The NLG observed that literacy "has been a carefully restricted project — restricted to formalized, monolingual, monocultural, and rule-governed forms of language" (NLG, 1996, p. 61), and that communication technologies are rapidly creating a situation where written language interfaces with visual, oral, audio, gestural, tactile, and spatial patterns to create new modes of meaning-making (NLG, 1996). The group acknowledged the current context requires a new educational response to provide learning experiences where students can access "powerful forms of self-expression and communication" (Cope & Kalantiz, 2006, p.42). Multiliteracies is a framework that responds to this situation, advocating for multiple modes of communication and meaning-making that incorporates cultural, social, and economic diversity.

Including cultural, social, and economic diversity in multiliteracies is one way the NLG (1996) chose to extend the scope of literacy pedagogy. They recognized that doing so could account for cultural and linguistic diversity in an increasingly globalized society and prepare students to be successful in designing social futures (Alvermann, 2017; NLG, 1996). Muller et al. (2009) add that multiliteracies "involves an awareness of the social, economic and wider cultural factors that frame communication" (p. 88), while Cope and Kalantzis (2006) further explain that it allows room for meaning making in different cultural, social and professional contexts.

In the development of agricultural literacy, Enns et al. (2016), argue that it is important to consider a person's "demographic location, occupation, political ideology, family background, education, and experiences" because it will influence how they conceive agriculture. They further emphasize that these differences are not minute or trivial and need to be considered by agricultural professionals. Mars and Ball (2016) too, encourage agricultural literacy programs to balance conventional knowledge with "that which is anchored in community, cultural heritage and traditions, as well as alternative lifestyles" (p. 69). Pairing a multiliteracies pedagogy with agricultural literacy can account for and include these cultural, social, and personal differences in learning, and can also encourage diversity in agriculture in an increasingly globalized marketplace (Conner et al., 2017).

When implementing multiliteracies, Alvermann (2017) contends that teachers benefit from understanding how multiliteracies differs from "incorrectly assumed near synonyms" (p. 99). Alvermann (2017) lists multimodal reading and writing, new literacies, digital literacies, and multiple literacies as examples of such synonyms, though these can arguably be considered branches of multiliteracies. An in-depth look at these differences is beyond the scope of this thesis, but Alvermann notes that multiliteracies' four components of situated practice, overt instruction, critical framing, and transformed practice highlights the robustness of multiliteracies in comparison to other terms. The NLG (1996) explains that these four components of pedagogy "do not constitute a linear hierarchy, nor do they represent stages" but rather, they are related in complex ways, may occur simultaneously, at times one or another will predominate, and all are "repeatedly revisited at different levels" (p. 85).

Situated practice is described as an immersion in experience. Students participate in learning activities that are grounded in personal experiences and related to relationships situated in workplaces and public spaces. *Overt instruction* is explained as all of the teacher interventions that encourage students to gain knowledge and understanding through organization, guidance, and scaffolding — not by way of direct transmission, drills, and rote memorization. *Critical framing* is when students distance themselves from what they have learned, then reevaluate what they know through critique of its relation to its social and cultural contexts. *Transformed practice* is the activity of students applying their knowledge in other contexts or cultural sites. Students demonstrate that they can apply, revise, and implement understanding in other situations (NLG, 1996; Sang, 2017).

Multiliteracies and Meaning-Making

With a multiliteracies approach, students can learn about agriculture, its importance, and its relationships to self and society through various methods and design elements that best help them grasp understanding and validates their learning style and pace (Andenoro et al., 2016; Powell et al., 2008). The NLG (1996) explain that multiliteracies is a multimodal pedagogy, utilizing multiple modes of meaning-making. Meaning can be derived from gestural, spatial, audio, linguistic, and visual designs. Examples of elements for *gestural design* are kinesics, feelings, and behavior. Elements of *spatial design* can be related to architecture, environment, and geography. *Audio design* includes music and sound. *Visual design* can include colours, perspective, foreground, and background, and examples of *linguistic design* elements are vocabulary, delivery, and information structures.

The process of shifting the emphasis back and forth between design modes is what creates meaning. For example, scenes can be described with words as well as pictures, and a song can be described with gestures as well as lyrics (Cope & Kalantzis, 2000, 2009). In a garden program, meaning can be created between shifting back and forth between oral instruction from the teacher, written text on a seed packet, the kinesthetic planting and harvesting process, and visually capturing the growing process in photographs. The learning process and modes of meaning of multiliteracies are summarized by Muller et al. (2009), as "the ability to identify, interpret, create, and communicate meaning across a variety of visual, oral, corporal, musical and alphabetical forms of communication" (p. 88). Sang (2017) further explains that multiliteracies "is not restricted to printed or written forms of language but instead, it involves multiple modes of representation, such as music, gestures, and pictures," emphasizing the need to involve and combine multiple ways for students to construct meaning (p. 17).

Multiliteracies and Teaching Approaches

Experiential learning has commonly been relied on as an effective pedagogical approach for teaching agriculture throughout history (Bradford et al., 2019; Shoulders & Myers, 2013b) and is an excellent way to incorporate more than one way of meaning-making. Canada's first agriculture school operated at St-Joachim, Quebec from 1670 to 1715, where a "literary and practical education" was provided to youth who worked on the farm (Jarrell, 2016, p. 23). In the early 1800s, experiential farms were viewed as a form of apprenticeship where youth could advance agriculture through the adoption of new and innovative ideas (Jarrell, 2016). Garden programs were also initiated in Ontario schools in the early 1900s through a "nature study" curriculum where children actively participated in growing, tending, and harvesting their gardens. Teachers noted that enthusiasm and wonder arose in the children when nature study and garden programs were a part of their day (OMOE, 1912; Stamp, 1968). This same wonder arises today when children are involved in garden programs. Upitis et al. (2013) noted that children commonly used the words "freedom," "happy," and "fun" to describe their experiences gardening (p. 113).

Experiential learning, however, is not limited to working on farms or tending a garden. It includes classroom settings, laboratories, field trips, and agricultural experience programs. Anything that includes a series of pragmatic activities sequenced in a way to enhance the educational experience of the learner is considered experiential learning (Shoulders & Myers, 2013b). Shoulders and Myers (2013b) argue that a holistic approach to experiential learning that includes reflecting, evaluating, refining, and testing has many benefits for students, and that this holistic process must occur for learning to take place. Bradford et al. (2019) found that implementation of all four of these stages resulted in students gaining a greater understanding of agriculture than those who received only contextualized lectures. Thoron et al. (2016) found that students engaged in experiential learning outperformed peers on subject matter exams, argumentation skills, and scientific reasoning.

Employers, in particular, notice many benefits in students who partake in experiential learning. A study from the University of Guelph (2017) reported a strong demand from agriculture and food employers for applicants who have participated in co-operative and experiential learning opportunities. Employers consider these students “much further ahead and more successful” than their peers (p. 9). Parker (2016), who travelled to England, Scotland, New Zealand, Australia, Jamaica, and the United States to investigate how these countries are tackling their issue of labour shortage in agriculture came to the same conclusion. Without exception, youth who participated in experiential learning through agricultural organizations were “well-rounded, engaged citizens who exhibited stronger inter-personal skills than their peers” (p. 16). The benefits of experiential learning, such as engaging students, deepening understanding, and increasing skill sets that lead to well-rounded students, demonstrates that multi-modal methods of meaning-making is a positive approach for teaching agricultural literacy and that a multiliteracies pedagogy is a complimentary pairing for agricultural literacy.

Agricultural literacy learned outside of the classroom at education centers, farms, gardens, processing plants, etc. are examples of multimodal learning that engages several modes of meaning. These are excellent ways of learning about agriculture and immersing in experience. Indeed, a study by Kubitz et al. (2013) found that the best way to educate journalists about global and domestic agricultural issues was through excursions, farm visits, educational tours, and face-to-face opportunities with farmers and other key players. These types of experiences are beneficial for student learning too. However, the reality is that most secondary school courses occur within classrooms and may not always have opportunities or resources to seek alternative options, so planning for multiliteracies learning within a classroom is also necessary.

An example of a multiliteracies project that can be planned for a classroom is found in a study by Hepple et al. (2014). The researchers used Claymation to bring together different modes to represent and communicate meaning for adolescent English language learners. The project incorporated several visual components, such as storyboard drawings during the planning phase, backdrop drawings to establish the mood and context of the final product, as well as photographs of each scene. There was also the gestural component of moving the clay figures, and the linguistic component of written dialogue. Hepple et al. (2014) found that this not only allowed students to create meaning through multiple modes, but it encouraged group work that allowed students to contribute using their respective strengths. For example, students with visual skills contributed with drawings and their partners provided accompanying texts. Similar multimodal projects can be designed for agricultural literacy as well. A Claymation project that includes visual, gestural, and linguistic components can be easily adapted to explain an agricultural process, the relationship between individuals and agriculture, or the intersections between agriculture and different aspects of society.

As another example, I once expressed how I view agriculture through a photovoice project shared in a blog. I took photos that represented "how I see agriculture" and briefly described the meaning behind the photo with text. My photos included a pumpkin patch I took my son to for a fun outing. In the photo, I saw more than produce, I "saw" the farmer's toil, marketing, and income. I included a photo of a neighbour's tractor that had caught on fire and noted how expensive and dangerous farming can be. My favourite t-shirt was included as well, and I thanked cotton farmers for their contribution to my clothing. Food containers were also showcased in my project, as they were made from corn and sugar cane and are biodegradable packaging that comes directly from the agriculture industry. The final photo included a glimpse of the brand new house built in my neighbourhood. While I appreciate the craftsmanship and new neighbours, it also makes me sad to see prime agricultural land permanently put out of production (see this photovoice project in Appendix B).

Allowing students to learn through different methods and express what they understand through various and multiple formats will help them personally connect to the material and show the depth of their understanding. It also allows students to express their individual, historical, cultural, and societal perspectives, which is desired in agricultural literacy work (Enns, et al., 2016). This kind of engagement creates a meaningful learning experience for students that is needed in agricultural literacy, and also answers the call from scholars to switch from “passive, teacher-centered instruction to active, student-centered instruction" (Edgar et al., 2016, p. 38).

Vocabulary

Clemons et al. (2018) state that in order to promote understanding in agriculture “it may be necessary to use basic words and terms of which the public has a higher percentage of ability to read, write, and communicate” (p. 249). With less than 2% of the American and Canadian populations involved in farming, and the majority of the population being two to four generations removed from the farm, simple industry words like crop, livestock, production, and cultivation can be barriers to the general public (American Farm Bureau Federation, 2019; Powell & Agnew, 2011; Statistics Canada, 2019; U.S. Farmers and Ranchers Alliance, 2011). Clemons et al. (2018) suggest that agriculturalists use general terms to communicate effectively with the public, “just as a medical doctor must use general words and terms to effectively communicate with patients” (p. 249). Knobloch (2000) proposes this be done through a collaboration with teachers and students to produce a language related to their own context, awareness, and experience. Stofer and Newberry (2017) concur that words can mean different things to people based on their personal experiences, so shared meaning-making in communication and education is required for “faithful transmission of information” (p. 132). Since the general population has little knowledge and understanding of agriculture, and even rural students who understand some agricultural processes lack knowledge of industry discourse (Meischen & Trexler, 2003), ensuring agricultural terms are properly understood is essential for grasping larger concepts.

Modifying the vocabulary used in agricultural literacy courses is a form of overt instruction found within the multiliteracies framework that can help students grasp understanding. Modifying agricultural literacy vocabulary starts with linguistic design elements but other design elements can be added to further enhance understanding. For example, children often learn farm animal names and sounds from simple and catchy songs such as “Old MacDonald Had a Farm” and “Down on Grandpa’s Farm.” This illustrates how audio and linguistic design elements can be combined to teach agricultural concepts and terminology. This is perhaps more easily done with younger children, but it has potential use at the secondary level. In a first-year graduate course, I used the song and lyrics from “Blue Collar Man” by Styx (1978)[3] to help connect terminology and ideas from a social efficiency ideology (a theory that education is for the purpose of work) to contemporary language that my peers could grasp quickly and easily during my presentation. Visual design elements can also be easily added to linguistic designs to promote terminology understanding, such as photos, pictures, props, and videos. Props and live examples can be included in lessons as gestural design elements as well. For example, a discussion about how agriculture produces fibre can be connected to student clothing and materials like wool, which comes from agriculture, and synthetic fibres such as polyester, which are manufactured. Students can examine these materials through sight and touch and note their individual properties. Overall, spending time familiarizing students with agricultural terms with multimodal approaches can effectively promote comprehension and greatly improve their understanding of agricultural concepts.

Multiliteracies and Assessment Research

The use of multiliteracies for assessment of agricultural literacy has the potential to inform researchers in ways that traditional approaches have not. A major focus of agricultural literacy research has been on instructional material assessment and creating unique instruments to measure independent variables of agricultural literacy (Doerfert, 2003; Leising et al., 2001). A multiliteracies approach could make rigorous measurement instruments unnecessary. For example, if a student cannot express or communicate what agriculture is and their own connectedness to it through a method of their choice, then a lack of understanding may be the problem. The same could be true if they are unable to transform their understanding of agriculture and agricultural systems to other contexts and cultural sites (NLG, 1996).

[3] Shaw, T. (1978). Blue Collar Man [Recorded by Styx]. On *Pieces of eight* [Album]. A & M.

Self-expression projects allow students to display their understanding of agriculture through their choice of gestural, spatial, audio, linguistic, and visual formats, and through their own cultural, social, and economic perspectives. Using these types of self-expression projects in research would likely require studies with mixed-methods approaches, which Brandt et al. (2017) state have not been frequently conducted in agricultural literacy research but broadening the scope of research methods may bring many benefits to agricultural literacy research. Kovar and Ball (2013) assert there are two main purposes of agricultural literacy research, which are to assess agricultural literacy levels of a population and to test program effectiveness. Using multiliteracies to assess agricultural literacy levels and test program effectiveness could result in rich feedback to further inform and advance agricultural literacy. It is recommended that future studies research the use of a multiliteracies pedagogy in agricultural literacy.

Raising Agricultural Literacy

As discussed in Chapter 3, agricultural literacy programs have been shown to increase agricultural knowledge, but the majority of these programs were small in scale and the increase in knowledge was not consistent across a variety of agricultural topics (Kovar & Ball, 2013; Riedel, 2006). Overall, agricultural literacy levels in Canada and the United States are low. Although agricultural literacy programs and networks have been established in both Canada and the United States, Spielmaker (2019) informs that a larger audience needs to be reached. Optional, voluntary, and integrated approaches have not achieved the aims of agricultural literacy — to raise awareness of agriculture of the general public and to inform about agricultural careers. Kovar and Ball (2013) agree that agricultural literacy efforts are not reaching enough people and recommend "increasing the variety of populations and programs assessed" (p. 175). Mars and Ball (2016) also suggest that the scope of the agricultural literacy movement should expand to better account for more diverse sets of learners (adults), worldviews (local food production and consumption), and curricular models and settings (formal and nonformal). Schools, however, are still the primary source for learning about agriculture (Bradford et al., 2019; Braverman & Rilla, 1991; Edgar et al., 2016, Hess and Trexler, 2011a). The majority of agricultural literacy research has focused on Kindergarten to grade 12 curricula (with elementary participants receiving the greatest attention) (Kovar & Ball, 2016), but "both research and practice have focused almost entirely on the infusions of agricultural concepts" (Mars & Ball, 2016, p. 56). The limited success of an infused or integrated strategy and the limited reach of agricultural literacy programs warrants a shift in focus away from studies and programs that reach a small population of learners to methods that promote agricultural literacy societally.

Mandatory agricultural literacy programs for all Ontario secondary students would be one way to raise societal levels. And ensuring agricultural literacy curriculum is guided by the definitions, goals, and learning outcomes used in the avenues of agricultural literacy model, could also help increase awareness, promote a systems understanding of agriculture, and increase knowledge of agri-careers and involvement options across a range of agricultural topics. There would be benefits to having agricultural literacy programs in elementary schools, since introducing agricultural literacy initiatives early in life can "create globally competent consumers" and help people make "better decisions regarding their health, the environment, and the future" (Vallera & Bodzin, 2016, p. 101), but high school students are at an age to begin exercising personal decision-making towards agriculture and planning for higher education and career training.

Mandating agricultural curriculum in secondary school curriculum may seem challenging, but it is not impossible, and a reform of some sort is necessary. In Ontario, a private member's bill passed two readings in the legislature to mandate food literacy from grades one to 12 (Balogh, 2020; Martin & Massicotte, 2021). The authors of the bill have encountered "phenomenal reception… from across the political, personal, private and industrial spectrum" (Balogh, 2020, para. 10). The curriculum is planned to teach students how to grow and prepare food, make important nutrition choices, and look at issues surrounding the food system (Balogh, 2020). This push for food literacy curriculum in Ontario schools is evidence that opportunities exist to establish a place for agricultural literacy as well. There is also opportunity here to combine food literacy and agricultural literacy efforts. This particular view of food literacy appears to lack specific content on agricultural systems related to food production, though it does indicate a planned review of issues related those systems. Sumner (2013) argues that conceptualizations of food literacy “must move beyond individualized prescriptions and notions of blames to become a concept that can analyze current foodscapes and model sustainable alternatives” (p. 84). Martin and Massicotte (2021) also inform that regardless of the broadness of scope of food studies, most instructors still tend to emphasize aspects of food literacy “related to their expertise or areas where they would like to see improvements, rather than looking at it from a multidimensional and interdisciplinary perspective” (p. 138). According to Martin and Massicotte (2021), incorporating agri-food systems dimensions in food literacy can help learners develop critical skills to think about food and agri-food systems more broadly. It can also allow “individuals and citizen’ organizations to participate in transforming today’s agri-food systems” (p. 136). Combining these literacies is a way to bridge other differences that also exist in perspectives and is way to create and support an interdisciplinary scope (Hernandez et al., 2021).

Schools tend to make room in curriculum for subjects that seem of modern importance, but Christou (2012) insists that “if we try to bring schools into alignment with contemporary society — and this modern age is evolving more and more quickly — we will find that we are chasing our tails” (p. 145). Agriculture is not one of these contemporary subjects. It is a subject for the ages and should take priority over topics that may come and go. The current fragmented delivery of agricultural curriculum is insufficient. Students need agricultural content delivered in a systematic manner to “become better decision-making adults in matters relating to agriculture” (Hubert et al., p. 527). Nobel Peace Prize recipient, Norman Borlaug (1970), declares, “civilization as it is known today could not have evolved, nor can it survive, without an adequate food supply” (para. 1) — a reminder that agriculture has been important since its commencement and will remain so. It is a curriculum worth having and keeping in our classrooms.

This study does not extend so far as to offer suggestions about the structure of a potential mandatory agricultural literacy program, but Parker (2016) suggests collaborations between industry, schools, and youth organizations are an effective way for students to learn about agriculture and be inspired to pursue agricultural careers. Ontario’s SHSM and AgScape programs are already structured to be collaborative, so perhaps the next step is to expand the reach of these programs and establish a mandatory course for all Ontario students in the early grades of high school before the option to enroll in the senior-level SHSM program becomes available.

Agriculture Teachers

One prerequisite for a mandatory agricultural literacy course is an instructor who has "agricultural experiences and deep conceptual understandings" so they can teach confidently and accurately (Knobloch, 2007). Having experts — people who have mastered certain practices — is a requirement for the situated practice component of multiliteracies and for immersion in meaningful multimodal experiences. Such experts are needed to guide learners and serve as mentors in the learning process and for navigating the complexities of a subject that is so multifaceted (NLG, 1996). This would address some of the common struggles and barriers that teachers have when attempting to integrate agriculture into core curriculum, as discussed in Chapter 3, which are the same challenges that teachers encounter when integrating food literacy curriculum — lack of time, resources, and training (Martin & Massicotte, 2021). It would also resolve the problem of agriculture being taught by non-agriculture teachers with less depth and lower quality than other subjects (Powell et al., 2008; Vallera & Bodzin, 2016).

A qualified agriculture teacher is also needed to help students see their own personal connectedness to agriculture. Mars and Ball (2016) note that connecting agricultural content to community, cultural heritage, tradition, and lifestyle choices promotes learning. Students should be reminded of their personal connection to agriculture through food, but other areas of connection need to be highlighted as well. Students may have historical connections to farming through family, or perhaps farming has played a significant role in a student's culture. It is also possible some students have personal experiences on a farm to recall. According to Ahn (2020), recalling an experience with a specific locale can have a powerful impact on an awareness of an issue. Lesser recognized connections should be highlighted as well. If students own wool sweaters or leather accessories, those are a direct result of agriculture too, though students may not easily identify them as such. If non-agriculture teachers cannot help students make connections with prior meaningful experiences or help students identify personal connections to agriculture, they will not be able to translate curricular requirements into lessons that resonate with the students (Rowsell et al., 2008). Finding connections through food, associations with farms, passions for the environment or animals, and through interests and hobbies such as cooking or gardening, are important for helping students engage with agricultural content and for promoting understanding and awareness. There are numerous ways agriculture connects to our individual lives, but teachers must have the knowledge and experience necessary to recognize and highlight personal connectedness between students and the curriculum (Henry et al., 2014).

It will also take an experienced, knowledgeable teacher to chair conversation around systems understanding at individual, community, and population levels. And to apply interventions, through overt instruction, such as organizing, guiding, and scaffolding lessons that encourage students to gain knowledge and understanding at functional, interactive, and critical levels of literacy. Experts are also needed to discuss careers opportunities in agriculture and intersecting industries, and to elaborate on the focus of those positions and skills required. This is no easy task, even for someone with extensive knowledge of the industry, which is another reason to ensure collaborations are an integral part of founding a mandatory agricultural literacy course. It is not effective to place the navigation of this curriculum on other subject matter teachers or to ask them to integrate it into their subjects.

A final reason knowledgeable and experienced agriculture teachers are needed to teach agricultural literacy is that teachers who lack agricultural knowledge are often influenced by media-driven stereotypes in the same way as their students (Vallera & Bodzin, 2016). This is concerning since Canadian institutions offer “very little significant agri-food communications training and education at the post-secondary level” resulting in a lack of “well-written and relevant agri-food stories” (Roberts, 2001, p. 2). Journalists who are not well versed in agriculture can furthermore create sensationalism and confusion concerning agricultural matters (Roberts, 2010). Non-agriculture teachers without a reliable knowledge base can (and sometimes do) pass on incomplete, inaccurate, biased media information to students. Some Canadian provinces have added “media literacy” to curricula to address media persuasion. It is meant to help students determine source credibility, analysis of tone, bias, and motive, and to recognize manipulative patterns and formats in media such as the use of suspenseful music, specific colours, and routine visual cues (Ahn, 2019). But if non-agriculture teachers do not know how to separate fact from fiction concerning agricultural matters, their ability to help equip students to scrutinize, analysis, and synthesize media information will be limited. Being able to critically analyze agricultural information is part of becoming agriculturally literate, therefore an experienced agriculture teacher with a comprehensive understanding of the industry is needed to help students wade through the abundance of (often skewed and biased) media information on agriculture.

The use of multiple forms of media, however, can be used by informed and experienced agriculture teachers to help organize, guide, and scaffold learning for students concerning agriculture and its relationships with natural resources, the environment, the economy, nutrition, and heath. This can be done using journalistic stories, documentaries, or social media from both critics of agriculture and those who work in agriculture (for instance, farmers sharing videos of their daily lives and activities on the farm). It is essential for teachers to help students with the critical framing process of multiliteracies, where students distance themselves from what they have learned and reevaluate what they know based on social and cultural contexts. An inexperienced, non-agriculture teacher would have difficulty tackling agricultural topics and understanding relationships and connections to other areas of society.

Designing the Future

Another facet of a multiliteracies pedagogy that pairs well with agricultural literacy is its objective to help design social futures. The NLG (1996) articulate “we are both inheritors of patterns and conventions of meaning and at the same time active designers of meaning. And, as designers of meaning, we are designers of social futures — workplace futures, public futures, and community futures” (p. 65). The agriculture community is concerned with workplace, public, and community futures. This concern is the very reason why agricultural literacy was developed. The agriculture community recognizes that the general public plays a role in policy decisions that affect the economy, society, and the environment (Hubert et al., 2000), but that “most citizens are incapable of intelligently participating in democratic discourse that critically evaluates…food and fiber systems” (Trexler & Hess, 2004, p. 2).

Canada currently has a shortage of citizens working in the agriculture industry and a generation of people who lack knowledge in agriculture. Its citizens largely misunderstand the agriculture industry and pressure is mounting in the small percentage of people who produce food. The ramifications of these imbalances are playing out in the aftermath of the coronavirus pandemic with less food planted, harvested, and processed. In order to address these challenges and future challenges that are sure to come concerning food, fibre, and fuel, Ontario needs to invest in agricultural literacy in secondary schools, to learn more about the industry that produces our food, to ask questions about how our current food systems have contributed to this situation, to have dialogue about what changes can be made, and to learn how to get involved. Agricultural literacy in secondary schools has the opportunity to foster the critical engagement necessary to design workplace, public, and community futures that recognize and interact harmoniously with food production. This can be done by allowing space for cultural, social, linguistic, economic, and ideological differences in learning about agriculture, and by encouraging various modes of meaning-making through individual perspectives and self-expression, all of which are promoted in a multiliteracies pedagogy. Always adding something of ourselves to meaning is how Cope and Kalantzis (2000) say we change the world (and thus our future).

Current agricultural curriculum in Ontario reaches very few students and is only offered in voluntary or optional formats. Even the United States, which has more prevalent agricultural programs, struggles to raise societal agricultural literacy. The suggestions from this study can help educators understand the purpose, intentions, and necessity of agricultural literacy and advocate for its place in school curriculum.

Chapter Summary

In this chapter, a multiliteracies pedagogy was introduced and paired with agricultural literacy as a way to teach and assess agricultural literacy. The pedagogy encourages holistic learning that incorporates experience and reflection to grasp and transform knowledge. Multiliteracies encourages the use of multiple modes of communication and meaning-making that is rich for both students and researchers. Suggestions to raise societal agricultural literacy levels were also included, such as establishing a mandatory agricultural literacy program in the early grades of high school with expert agriculture instructors.

Chapter 6: Conclusion

"Education is for improving the lives of others and for leaving your community and world better than you found it"

~ Marian Wright Edelman ~

Introduction

Chapter 6 is the conclusion of this thesis. It offers a summary of the study and findings, limitations, considerations for future studies, an introduction to the 3D version of the avenues of agricultural literacy model (AALM) and closing remarks.

Summary of Study and Findings

The purpose of this study was to investigate agricultural literacy to gain insight that can improve the effectiveness of agricultural literacy and advance it in Ontario and elsewhere. This was accomplished by discovering trends, gaps, themes, and suggestions from documents and literature about agriculture literacy using a grounded theory methodology.

The first theme that emerged was the need for clearer definitions. Several stumbling blocks were identified in existing definitions and addressed with proposed definitions of agriculture, agricultural literacy, and agriculturally literate. The second theme that emerged was the identification of the goals of agricultural literacy, which are to promote awareness of agriculture and to inform about agri-careers. Although the goals are present in literature they have not been explicitly stated and have often been overlooked in research studies, particularly the goal of careers. These goals were paired with learning outcomes, which are to gain a systems understanding and to learn about involvement opportunities in agriculture, which can provide additional direction and focus for agricultural teaching and research.

Teaching and research approaches were identified as the third theme that has potential to increase agricultural literacy effectiveness, particularly in the area of vocabulary and methods used to teach and assess agricultural literacy. A multiliteracies pedagogy was introduced and suggested for pairing with agricultural literacy to address these barriers and to promote a greater depth of learning through multiple modes of communication and meaning making. The final theme to emerge was the disconnect between educating small populations of students and the overall agricultural literacy levels of society. It was recommended that a mandatory agricultural literacy course be advocated for in Ontario secondary schools.

Other studies on agricultural literacy have identified similar themes within this field of research that need to be addressed (Cosby et al., 2022; Enns et al., 2016; Mercier, 2015), but this study differs in that it offers a model to address these barriers, which evolved through synthesis of recommendations, themes, and trends that emerged from the data. Findings led to the development of the avenues of agricultural literacy model (Figure 5.1), which is offered as the pragmatic product of this study and can be used as a framework to help guide current and future agricultural literacy programs. The definitions of agriculture, agricultural literacy, and agriculturally literate, displayed within this model, inform teachers, students, and other stakeholders, in clear terms, what this field of research entails. The definitions can also be referred to when planning curriculum and deciding on assessment criteria that aligns with the goals of awareness and careers and the learning objectives of fostering a systems understanding and increasing knowledge of involvement options. The model can be paired with other frameworks as well, particularly those from the field of food studies, which are commonly referenced in Canada, as a way to combine efforts between food literacy and agricultural literacy to foster a deeper, more comprehensive understanding of agriculture and its related systems.

Researcher's Note

A 3D printed model of the avenues of agricultural literacy model (AALM) was produced as a mode of knowledge mobilization to share with researchers, educators, policymakers, and agricultural literacy organizations (See Appendix C). The 3D model has four pieces in total that come apart and reconnect like a puzzle, so users can interactively discover how the layered definitions of agricultural literacy form a comprehensive understanding of the discipline. Users are also reminded, through the two pieces that represent Avenue 1 and Avenue 2, to tie curriculum and research to the two goals and learning outcomes of agricultural literacy so efforts can effectively proceed towards a unified purpose. The model, furthermore, serves as a physical reminder to incorporate a multiliteracies pedagogy through its own visual, linguistic, gestural, and spatial components.

Limitations

The avenues of agricultural literacy model was developed from a limited number of documents and articles retrieved by search terms that included the word "agriculture." This excluded similar literacy work, particularly from Canada, that focused on the word "food." At the time when initial data was collected for this study an abundance of "food literacy" documentation was primarily focused on nutrition and food skills (Cullen et al., 2015; Hernandez et al., 2021), which influenced the decision to specifically study and collect initial data on agricultural literacy, as it appeared to be more multidimensional. The scope and definitions related to food studies, however, have quickly evolved and expanded to incorporate elements of food security, sustainable food production, health and well-being, and systems-thinking that includes environmental, social, economic, cultural, and political components (Martin & Massicotte, 2021). Although food studies literature was collected at a later point in this study to help situate agricultural literacy in a Canadian context, it is possible that the retrieval of documents and literature with search terms that included "food" could have altered the themes that emerged from initial data as well as the final product. However, the model remains a framework that can be applied generally to both agricultural and food literacy in Canada and the United States and is adaptable to content and situations, which is in line with what Glaser and Strauss (1967) describe as a good practical grounded theory: fit the substantive area it will be used in and be understood by laymen in that area, be general enough to apply to many situations in the area, and allow the user some control over the theory as the daily situations change over time.

Another limitation of this study is the absence of a mix-methods approach that includes data gathered from Ontario students. Partnering with AgScape to conduct surveys with student participants, teachers or other primary sources of data collection, could have provided beneficial information about agricultural literacy programs in Ontario. However, the coronavirus pandemic, which temporarily closed schools and AgScape's Teacher Ambassador program during my period of study, made this a non-viable option. Relying on peer-reviewed literature, however, led to interesting discoveries about the definitions, goals, and approaches to agricultural literacy, that were addressed and combined to form the avenues of agricultural literacy model, effectively helping to organize, streamline, and make agricultural literacy programs more effective.

Considerations for Future Studies

Exploring the avenue of agricultural literacy model's practical application in research and outreach is suggested as the next stage of study. It is of particular importance to test its use in high school settings with secondary students. Pairing with AgScape is one way to practically test this theory in Ontario. It would also provide opportunity to evaluate any increase in awareness of agriculture and of agri-careers through a stand-alone curriculum with expert subject-matter instructors, in comparison to an integrated approach. It is suggested that future studies research the use of a multiliteracies pedagogical approach. This has potential to offer rich feedback for agricultural literacy research, particularly for assessment studies since standard tests, surveys, and interviews have been the primary approach.

According to Martin and Massicotte (2021), federal and provincial governments in Canada are "still lacking a broad policy coherent approach, and evidence-based evaluation" of the effectiveness of food literacy studies (p. 139), making it timely for agricultural literacy and food literacy initiatives to join together. Having compatible frameworks and a shared vision that incorporates interdisciplinary, and sometimes, disparate perspectives could help shape future programs that contribute to increasing the effectiveness of curriculum focused on our food, fibre, and fuel systems (Hernandez et al., 2021). Continued research on combining food literacy and agricultural literacy efforts is suggested.

Closing Remarks

Agriculture requires innovation and creativity in all of its sectors. It requires good communicators and problem-solvers. It requires people with different cultural perspectives and different experiences. It requires scientists, engineers, out-of-the-box thinkers, people who love food, and those who care deeply about the environment and animals. It requires the participation of all of earth's citizens in one way or another, realized or not. Agricultural literacy is needed in today's and tomorrow's society. Addressing the challenges that face us, like feeding expanding populations in sustainable ways, will be left to a generation that knows too little about food production — that is, unless dialogue about agriculture reaches the classroom and reaches the students. To quote Greene (1995) once again, she says imagination that dares to shape a more fulfilling social order and more vibrant ways of being in the world

> may be released through many sorts of dialogue: dialogue among the young who come from different cultures and different modes of life, dialogue among people who have come together to solve problems that seem worth solving to all of them, dialogue among people undertaking shared tasks, protesting injustices, avoiding or overcoming dependencies or illnesses. When such dialogue is activated in classrooms, even the young are stirred to reach out on their own initiatives. (p. 5)

This stirring and reaching out is exactly why dialogue about agriculture needs to happen in classrooms. The world needs students to be aware that agriculture produces our food and also what that entails. Students should understand their personal connectedness to agriculture and their societal dependence on it, as well as ways they can participate and contribute to changes and developments that lead to innovative, just, sustainable and alternative practices and systems to produce our food, fibre, and fuel, today and in the future.

References

4-H Learning Network (2019, September 4). *What is agriculture?* https://4hlnet.extension.org/what-is-agriculture/

Addams, J. (1908). The public school and the immigrant child. *Journal of Proceedings of the National Education Association*, *46*, 99-102.

Age, L.-J. (2011). Grounded theory methodology: Positivism, hermeneutics, and pragmatism. *The Qualitative Report*, *16*(6), 1599-1615.

Agriculture in the Classroom. (2020a). *About Agriculture in the Classroom*. https://www.agclassroom.org/get/about/

Agriculture in the Classroom. (2020b). *What is agricultural literacy?* https://www.agclassroom.org/

AgScape. (2019). *2019 Annual General Report.* https://agscape.ca/about

AgScape. (2021). *Educate and inspire.* https://agscape.ca/index

Ahn, C. (2020). Considering the role of documentary media in environmental education. *Journal of the Canadian Association for Curriculum Studies*, *17*(2), 67-79.

Ahn, C. (2019, February 4). How analyzing patterns helps students spot deceptive media. *The Conversation*. https://theconversation.com/how-analyzing-patterns-helps-students-spot-deceptive-media-110490

Ahn, C. (2018). *Visual rhetoric in environmental documentaries.* [Dissertation, The University of British Columbia]. UBC Theses and Dissertations. https://open.library.ubc.ca/cIRcle/collections/ubctheses/24/items/1.0368554

Alvermann, D. (2017). The M word: Dare we use it? *Journal of Adolescent and Adult Literacy, 61(*1), 99-102.

American Farm Bureau Federation. (2019). *Fast facts about agriculture*. https://www.fb.org/newsroom/fast-facts

American Farm Bureau Foundation for Agriculture. (2019). *Agricultural literacy.*

https://www.agfoundation.org/what-is-ag-literacy

American Farm Bureau Foundation for Agriculture. (2021). *Agricultural literacy.* https://www.agfoundation.org/what-is-ag-literacy

American Farm Bureau Foundation for Agriculture. (2022). *The pillars of agricultural literacy*. https://www.agfoundation.org/pillars

Andenoro, A., C., Baker, M., Stedman, N. L. P., & Pennington Weeks, P. (2016). Addressing complex problems. In T. G., Roberts, A. Harder, & M. T. Brashears (Eds). (2016). *American Association for Agricultural Education national research agenda: 2016-2020.* Department of Agricultural Education and Communication.

Atenstaedt, R. (2012). Word cloud analysis of the BJGP. *British Journal of General Practice, 62*(596), 148. Doi:10.3399/bjgp12X630142

Balogh, M. (2020, November 11). Kingston-developed private member's bill would be first in Canada to mandate food literacy education. *The Kingston Whig Standard.* https://www.thewhig.com/news/local-news/kingston-developed-private-members-bill-would-be-first-in-canada-to-mandate-food-literacy-education

Bareja, B. (2010). What is agriculture, Definition of agriculture. *Crops Review*. https://www.cropsreview.com/what-is-agriculture.html

Bellah, K. A., & Dyer, J. E. (2009). Attitudes and stages of concern of elementary teachers towards agriculture as a context for teaching across grade-level content area standards. *Journal of Agricultural Education, 50*(2), 12-25.

Birks, M., & Mills, J. (2011). *Grounded theory: A practical guide*. SAGE Publications.

Birks, M., & Mills, J. (2015). *Grounded theory: A practical guide* (2nd ed.). SAGE Publications.

Borlaug, N. (1970, December 11). *Nobel Lecture.* https://www.nobelprize.org/prizes/peace/1970/borlaug/lecture/

Bowen, G. (2009). Document analysis as qualitative research method. *Qualitative Research Journal, 9*(2), 27-40.

Boyatzis, R. (1998). *Transforming qualitative information: Thematic analysis and code development.* SAGE Publications.

Bradford, T., Hock, G., Greenhaw, L., & Kingery, W. (2019). Comparing experiential learning techniques and direct instruction on student knowledge of agriculture in private school students. *Journal of Agricultural Education, 60*(3), 80-96.

Brandt, M., Forbes, C., & Keshwani, J. (2017). Exploring elementary students' scientific knowledge of agriculture using evidence-centered design. *Journal of Agricultural Education, 58*(3), 134-149.

Braverman, M. T., & Rilla, E. L. (1991). How California educators and CE directors view "agricultural literacy" programs. *California Agriculture, 45*(6), 4-9.

Britannica, T. Editors of Encyclopaedia (2020, May 4). *Hull House*. *Encyclopedia Britannica*. https://www.britannica.com/topic/Hull-House

Brune, S., Knollenber, W., & Stevenson, K. T. (2021). The influence of agritourism experiences on consumer behavior toward local food. *Journal of Travel Research, 60*(6), 1318-1332.

Bryant, A., & Charmaz, K. (2007a). Grounded theory in historical perspective: An epistemological account. In A. Bryant and K. Charmaz (Eds.), *The SAGE handbook of grounded theory*. (pp. 31-57). SAGE Publications.

Bryant, A., & Charmaz, K. (2007b). Introduction. Grounded theory research: Methods and practices. In A. Bryant and K. Charmaz (Eds.), *The SAGE handbook of grounded theory*. (pp. 31-57). SAGE Publications.

Bryant, A. (2009). Grounded theory and pragmatism: The curious case of Anselm Strauss. *Forum: Qualitative Social Research, 10*(3). https://www.qualitative-research.net/index.php/fqs/article/view/1358/2850

Caldwell, W. (2015). The agricultural system: Components, linkages, and rationale. *Green Belt. Possibility grows here.* http://www.waynecaldwell.ca/Consulting/farming_in_ontario039s_greenbelt_possibility_grows_here.pdf

Cambridge University Press. (2021). Agriculture. In *Cambridge Dictionary*. https://dictionary.cambridge.org/dictionary/english/agriculture

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

Cannon, J. G., Broyles, T. W., & Anderson, R. (2006). Summer enrichment programs: Providing agricultural literacy and career exploration to gifted and talented students. *Journal of Agricultural Education, 47*(4), 27-38.

Carter, M. J., & Fuller, C. (2015). Symbolic interactionism. *Sociopedia.isa*, *1*(1), 1-17.

Charmaz, K. (1990). ‘Discovering’ chronic illness: Using grounded theory. *Social Science & Medicine, 30*(11), 1161-1172.

Charmaz, K. (2003). Grounded Theory. In M. S. Lewis-Beck, A. Bryman, & T. Futing Liao (Eds.), *The SAGE Encyclopedia of Social Science Research Methods*. (Vol 1, pp. 441-444). SAGE Publications.

Charmaz, K. (2012). The power and potential of grounded theory. *Medical Sociology, 6*: 2-15.

Christiansen, O. (2011). The literature review in classic grounded theory studies: A methodological note. *Grounded Theory Review*. *10*(3). https://groundedtheoryreview.com/2011/12/20/the-literature-review-in-classic-grounded-theory-studies-a-methodological-note-2/

Christou, T. M. (2010). Recovering our histories: Studying educational history through stories and memoirs. *Education Canada, 50*(4), 64-67.

Christou, T. M. (2012). *Progressive Education: Revisioning and Reframing Ontario's Public Schools*, 1919-1942. University of Toronto Press.

Christou, T. M. (2014). Taking action in teacher education: Social studies as a means of cultivating engaged citizenship. *Learning Landscapes, 8*(1), 71-85.

Christou, T. M., & Deluca, C. (2013). Curriculum studies at a crossroad: Curating inclusive and coherent curriculum conversations in Canada. *Journal of the Canadian Association for Curriculum Studies, 11*(1), 13-22.

Chun Tie, Y., Birks, M., & Francis, K. (2019). Grounded theory research: A design framework for novice researchers. *SAGE Open Medicine*, 7: 1-8.

Clark, J., Lowitt, K., Levoke, C., & Andree, P. (2021). The power to convene: Making sense of the power of food movement organizations in governance processes in the Global North. *Agriculture and Human Values, 38*, 175-191.

Clemons, C. & Lindner, J. (2018). They said what? The crossroads of content literacy and agricultural literacy. *The Agricultural Education Magazine, 90*(4), 8-9.

Clemons, C., Lindner, J., Murray, B., Cook, M. P., Sams, B., & Williams, C. (2018). Spanning the gap: The confluence of agricultural literacy and being agriculturally literate. *Journal of Agricultural Education, 59*(4), 238-252.

Collins. (2021). Agriculture. In *Collins English Dictionary*. https://www.collinsdictionary.com/dictionary/english/agriculture

Colvin, C. (2022). Sharing the road: OFA reminds farmers and motorists to practice road safety. *Better Farming*. June/July, 14.

Conner, N. W., Gates, H., & Stripling, C. T. (2017). Identifying international agricultural concepts for secondary agricultural education curriculum. *Journal of Agricultural Education, 58*(1), 118-130.

Cope, B. & Kalantzis, M. (2009). “Multiliteracies”: New literacies, new learning. *Pedagogies: An International Journal, 4*(3), 164-195.

Corbin, J., & Strauss, A. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3rd ed.). SAGE.

Cosby, A., Manning, J., Power, D., & Harreveld, B. (2022). New decade, same concerns: A systematic review of agricultural literacy of school students. *Education Science, 12*, 235-255.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry & research design: Choosing among five approaches.* SAGE.

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.

Dailey, A. L., Conroy, C. A., & Shelley-Tolbert, C. A. (2001). Using agricultural education as the context to teach life skills. *Journal of Agricultural Education, 42*(1), 11-20.

Dairy Farmers of Ontario. (2020). *Elementary school milk program.* https://www.milk.org/Corporate/View.aspx?Content=Teachers/esmp&group=teachers

Dale, C., Robinson, J. S., & Edwards, M. C. (2017). An assessment of the agricultural literacy of incoming freshman at a land-grant university. *NACTA Journal, 61*(1), 7-13.

Deluca, C., & Christou, T. M. (2016). December 2016. *Canadian Journal of Education*, *39*(4), 1-3.

Dewey, J. (1930). *The quest for certainty: a study of the relation of knowledge and action.* G. Allen & Unwin Ltd.

Dey, I. (1999) *Grounding Grounded Theory: Guidelines for Qualitative Inquiry*. Academic Press.

Dictionary.com. (2021). Knowledge. In *Dictionary.com*. https://www.dictionary.com/browse/knowledge

Dictionary.com. (2021). Understanding. In *Dictionary.com*. https://www.dictionary.com/browse/understanding

Doerfert, D. L. (2003). Agricultural literacy: An assessment of research studies published within the agricultural education profession. In *Proceedings of the 22nd Annual Western Region Agricultural Education Research Conference*. (Vol. 41).

Durst, A. (2010). *Women Educators in the Progressive Era: The Women behind Dewey's Laboratory School.* Palgrave Macmillian.

Edgar, D. W, Retallick, M. S., & Jones, D. (2016). Meaningful, engaged learning in all environments. In T. G., Roberts, A. Harder, & M. T. Brashears (Eds). (2016). *American Association for Agricultural Education national research agenda: 2016-2020.* Department of Agricultural Education and Communication.

Enns, K., Martin, M., & Spielmaker, D. (2016). Public and policy maker understanding of agriculture and natural resources. In T. G., Roberts, A. Harder, & M. T. Brashears (Eds). (2016). *American Association for Agricultural Education national research agenda: 2016-2020.* Department of Agricultural Education and Communication.

Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods, 5*(1), 1-11.

Frick, M. J., Kahler, A. A., & Miller, W. W. (1991). A definition and concepts of agricultural literacy. *Journal of Agricultural Education, 32*(2), 49-57.

Glaser, B. (1978). *Theoretical sensitivity.* Sociology Press.

Glaser, B. (2007). All is data. *Grounded Theory Review: An International Journal, 6*(2).

Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory.* Aldine Publishing Company.

Government of Canada. (1953). *Ninth census of Canada, 1951. Volume 4. Labour force: Occupations and industries.* http://publications.gc.ca/site/eng/9.836019/publication.html

Government of Canada. (2020). *Greenhouse gases and agriculture.* https://www.agr.gc.ca/eng/agriculture-and-climate/agricultural-practices/climate-change-and-agriculture/greenhouse-gases-and-agriculture/?id=1329321969842

Graham, D. L., Arnold, S., & Jayaratne, K. S. U. (2016). Vibrant, resilient communities. In T. G., Roberts, A. Harder, & M. T. Brashears (Eds). (2016). *American Association for Agricultural Education national research agenda: 2016-2020.* Department of Agricultural Education and Communication.

Greene, M. (1995). *Releasing the imagination: Essays on education, the arts, and social change.* Jossey-Bass Publishers.

Greene, M. (2001). *Variations on a blue guitar: The Lincoln Center Institute lectures on aesthetic education.* Teachers College Press.

Hallberg, L. (2010). Some thought about the literature review in grounded theory studies. *Journal of*

Qualitative Studies on Health and Wellness, 5(3), DOI: 10.3402/qhw.v5i3.5387.

Hamington, M. (2018). Janes Addams. *The Stanford Encyclopedia of Philosophy.* (Summer). https://plato.stanford.edu/entries/addams-jane/#StaEpi

HarperCollins. (1991). Ability. In *Collins Canadian English Dictionary*. (p. 1). HarperCollins Publishers

HarperCollins. (1991). Able. In *Collins Canadian English Dictionary.* (p. 1). HarperCollins Publishers

HarperCollins. (1991). Literacy. In *Collins Canadian English Dictionary.* (p. 244). HarperCollins Publishers

HarperCollins. (1991). Literate. In *Collins Canadian English Dictionary.* (p. 244). HarperCollins Publishers

Harper, D. (2019). Agriculture. In *Online Etymology Dictionary*. https://www.etymonline.com/word/agriculture

Harper, D. (2020). Pragmatic. In *Online Etymology Dictionary*. https://www.etymonline.com/word/pragmatic

Heath, H., & Cowley, S. (2004). Developing a grounded theory approach: a comparison of Glaser and Strauss. *International Journal of Nursing Studies*, *41*(2), 141-150.

Henry, K. Talbert, B. A., & Morris, P. (2014). Agricultural education in an urban charter school: Perspectives and challenges. *Journal of Agricultural Education, 55*(3), 89-101.

Hepple, E., Sockhill, M., Tan, A., & Alford, J. (2014). Multiliteracies Pedagogy: Creating claymations with adolescent, post-beginner English language learners. *Journal of Adolescent & Adult Literacy, 58*(3), 219-229.

Hernandez, K., Gillis, D., Kevany, K., & Kirk, S. (2021). Towards a common understanding of food literacy: A pedagogical framework. *Canadian Food Studies*, *8*(4), 8-25.

Hess, A. J., & Trexler, C. J. (2011a). A qualitative study of agricultural literacy in urban youth: Understanding for democratic participation in renewing the agri-food system. *Journal of Agricultural Education, 52*(2), 151-162.

Hess, A. J., & Trexler, C. J. (2011b). A qualitative study of agricultural literacy in urban youth: What do elementary students understand about the agri-food system? *Journal of Agricultural Education, 52*(4), 1-12.

Hillman, K, & Buckley, S. (2011). Food, fibre and the future. *Australian Council for Educational Research.* research.acer.edu.au › national_surveys

Hsu, C. C., & Sandford, B. A. (2007). The delphi technique: Making sense of consensus. *Practical Assessment, Research, and Evaluation, 12*(10), 1-8.

Hubert, D., Frank, A., & Igo, C. (2000). Environmental and agricultural literacy education. *Water, Air, and Soil Pollution*, *123*: 525-532.

Hussein, M., Kennedy, A., & Oliver, B. (2017). Grounded theory and the conundrum of literature review: Framework for novice researchers. *The Qualitative Report, 22*(4), 1198-1210.

IDP Connect. (2022). *34 universities in Canada offering Agriculture degrees and courses*. https://www.hotcoursesabroad.com/study/training-degrees/canada/agriculture-courses/loc/32/cgory/a1-3/sin/ct/programs.html

Jarrell, R. A. (2016). *Educating the neglected majority: The struggle for agricultural and technical education in nineteenth-century Ontario and Quebec*. McGill-Queen's University Press.

Keefe, E. B., & Copeland, S. R. (2011). What is literacy? The power of a definition. *Research and Practice for Persons with Severe Disabilities*, *36*(3-4), 92-99.

King, N. (1991). Public literacy about agriculture: What is it? What is it for? *California Agriculture, 45(*6): 2.

Knoblauch, C. H. (1990). Literacy and the politics of education. In A. A. Lunsford, H. Moglenm, J. Slevin. (Eds). (1990). *The Right to Literacy*. (pp. 74-80). MLA.

Knobloch, N. A. (2000). And your next assignment is…conversational literacy. *The Agricultural Education Magazine, 73*(1), 6-7.

Knobloch, N. A., Ball, A., & Allen, C. (2007). The benefits of teaching and learning about agriculture in elementary and junior high schools. *Journal of Agricultural Education, 48*(3), 25-36.

Knutt, C. (2020, March 18). Government committed to allowing temporary foreign workers to enter

Canada. *Pembina Valley Online*. https://www.pembinavalleyonline.com/ag-news/government-committed-to-allowing-temporary-foreign-workers-to-enter-canada

Koelma, G. (2014, May 22). New research reveals many Australian children don't know where fruit and vegetables come from. *News.com.au*. https://www.news.com.au/lifestyle/food/new-research-reveals-many-australian-children-dont-know-where-fruit-and-vegetables-come-from/news-story/548398e1e6b70c4b9c90594fc1d7dc83

Kovar, K., Ball, A. (2013). Two decades of agricultural literacy research: A synthesis of the literature. *Journal of Agricultural Education, 54*(1), 167-178.

Kubitz, L., Telg, R., Irani, T., & Roberts, O. (2013). Perceptions of global and domestic agricultural issues held by international agricultural journalists. *Journal of Applied Communications, 97*(4), 77-95.

LEAF. (2012, June 12). *Young adults need lessons in food and farming.* [Press Release].

Lambert, M. D., Velez, J. J., & Elliott, K. M. (2014). What are the teachers' experiences when implementing the curriculum for agricultural science educations? *Journal of Agricultural Education, 5*(4), 100-115.

Landoll. (1991). Ability. In *Webster's Dictionary*. (p. 3). Landoll, Inc.

Landoll. (1991). Able. In *Webster's Dictionary*. (p. 3). Landoll, Inc.

Landoll. (1991). Literacy. In *Webster's Dictionary*. (p. 215). Landoll, Inc.

Landoll. (1991). Literate. In *Webster's Dictionary*. (p. 215). Landoll, Inc.

Legg, C., & Hookway, C. (2020). Pragmatism. *The Stanford Encyclopedia of Philosophy*. https://plato.stanford.edu/entries/pragmatism/

Leising, J., Igo, C., Heald, A., Hubert, D., & Yamamoto, J. (1998). *A guide to food and fiber systems literacy.* Oklahoma State University.

Leising, J. G, Pense, S. L., & Igo, C. (2001). An assessment of student agricultural literacy knowledge based on the food and fiber systems literacy framework. *Proceedings of the 28th Annual National Agricultural Education Research Conference, USA,* 146-151.

Luke, A. (2012). Critical literacy: Foundational notes. *Theory Into Practices*, *51*(4), 4-11.

Lynch, C. (2020, June 30). Ontario's new farm protection law passes. *Farmers Forum*. http://farmersforum.com/ontarios-new-farm-protection-law-passes/

MacLean, D. (2020, April 23). Farmers struggle to bring in migrant workers. *Observer*, pp. 13.

Macmillian. (2021). Agriculture. In *Macmillian Dictionary*. https://www.macmillandictionary.com/dictionary/british/agriculture

Mars, M., & Ball, A. (2016). Ways of knowing, sharing, and translating agricultural knowledge and perspectives: Alternative epistemologies across non-formal and informal settings. *Journal of Agricultural Education, 57*(1), 56-72.

Martin, A., & Massicotte, M. (2021). Agrifood systems and food literacy: Insights from two high school' programs in Ontario. *Canadian Food Studies, 8*(4), 135-160.

McGregor, J. (2020, May 17). Not so ready-to-pick: Canadian growers left hanging by COVID-19. *CBC News*. https://www.cbc.ca/news/politics/sunday-tfw-fruit-veg-1.5571508

Mead, G. H. (1956). In A. L. Strauss (Ed.) *The social psychology of George Herbert Mead*. University of Chicago Press.

Meischen, D. L, & Trexler, C. J. (2003). Rural elementary students' understanding of science and agricultural education benchmarks related to meat and livestock. *Journal of Agricultural Education, 44*(1), 43-55.

Mercier, S. (2015). *Food and agriculture education in the United States.* Agee.

Merriam, S. B. (1988). *Case study research in education: A qualitative approach.* Jossey-Bass.

Merriam-Webster. (2019). Agriculture. In *Merriam-Webster.com dictionary*. https://www.merriam-webster.com/dictionary/agriculture

Muller, J., Sancho, J. M., & Hernandez, F. (2009). New media literacy and the digital divide. In L. Tan Wee Hin, & R. Subramaniam. (2009). *Handbook of research: New media literacy at the K-12 level. Issues and challenges. Volume 1*. 72-88.

National Research Council. (1988). *Understanding agriculture: New directions for education.* National

Academy Press.

National Research Council. (2009). *Transforming agricultural education for a changing world*. National Academies Press.

Nesmith, T. (1984). "Pen and Plough" at Ontario Agricultural College, 1994-1910. *Archivaria 19.* (Winter 1984-85), 94-109.

New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, *66*(1), 60-92.

Norton, E. (2012). *Relearning food: Agricultural literacy in the elementary school science curriculum of Nova Scotia.* [Bachelor's thesis, Dalhousie University]. DalSpace. https://dalspace.library.dal.ca/bitstream/handle/10222/14861/Norton,%20Emma,%20BA,%20ESS,%20April%202012.pdf?sequence=1

O'Leary, Z. (2014). *The essential guide to doing your research project (*2nd ed.). SAGE Publications.

Ontario Federation of Agriculture. (2020, March 18). *OFA statement on emerging farm labour issues.* https://ofa.on.ca/newsroom/ofa-statement-on-emerging-farm-labour-issues/

Ontario Federation of Agriculture. (2017). *OFA food literacy initiative: Quantitative report.* Kynetec.

Ontario. Ministry of Agriculture, Food and Rural Affairs. (2017). *Statistical summary of Ontario agriculture.* http://www.omafra.gov.on.ca/english/stats/agriculture_summary.htm

Ontario. Ministry of Education. (1899). *Report of the Minister of Education: Province of Ontario for the year 1899*. Warwick Bros and Butter.

Ontario. Ministry of Education. (1912). *Report of the Minister of Education: Province of Ontario for the year 1912.* L. K. Cameron.

Ontario. Ministry of Education. (1924). *Report of the Minister of Education: Province of Ontario for the year 1924*. Clarkson W. James.

Ontario. Ministry of Education. (1961). *Intermediate division science, Grades 7, 8, 9 and 10.*

Ontario. Ministry of Education. (1973). *Environmental science: Intermediate and senior divisions interim document.*

Ontario. Ministry of Education. (1974). *Secondary school diploma requirements: Ministry of Education intermediate and senior division guidelines and courses.*

Ontario. Ministry of Education. (1976). *Circular 14 textbooks*.

Ontario. Ministry of Education. (1988a) *Curriculum guideline: Science - Intermediate and senior divisions 1988. Part 6 - Science, grades 11 to 12, basic level.*

Ontario. Ministry of Education. (1988b). *Curriculum guideline: Science - Intermediate and senior divisions 1988. Part 7 - Environmental science, grades 10 to 12, general level.*

Ontario. Ministry of Education. (1988c). *Curriculum guideline: Science - Intermediate and senior divisions 1988. Part 8 - Environmental science, grades 10 to 12, advanced level.*

Ontario. Ministry of Education. (1989). *Ontario Schools - Intermediate and senior divisions (Grades 7-12/OACs) Program and diploma requirements.*

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

Ontario. Ministry of Education. (2017, April 24). *Ontario honours employers for helping students gain hands-on experience.* [Press Release]. https://news.ontario.ca/edu/en/2017/04/ontario-honours-employers-for-helping-students-gain-hands-on-experience.html

Ontario. Ministry of Education. (2020a). *Education Facts 2018-2019.* http://www.edu.gov.on.ca/eng/educationFACTS.html

Ontario. Ministry of Education. (2020b). *Specialist high skills major.* http://www.edu.gov.on.ca/morestudentsuccess/SHSMcomplete.html

Ontario. Ministry of Education. (2020c). *Specialist high skills major*: *Courses focused towards a career.* http://www.edu.gov.on.ca/morestudentsuccess/SHSM.html

Ontario. Ministry of Education. (2022). *Ontario curriculum: Secondary*. http://www.edu.gov.on.ca/eng/curriculum/secondary/index.html

Owen, G. T. (2014). Qualitative methods in higher education policy analysis: Using interviews and document analysis. *The Qualitative Report, 19*(52), 1-19.

Oxford University Press. (2002). Ability. In *Oxford Dictionary Thesaurus & Wordpower Guide*. (p. 1).

Oxford University Press. (2002). Able. In *Oxford Dictionary Thesaurus & Wordpower Guide*. (p. 2).

Oxford University Press. (2002). Literacy. In *Oxford Dictionary Thesaurus & Wordpower Guide*. (p. 362).

Oxford University Press. (2002). Literate. In *Oxford Dictionary Thesaurus & Wordpower Guide*. (p. 362).

Oxford University Press. (2010). Ability. In *Oxford English Dictionary* (3rd Ed.). https://www.oxfordreference.com.proxy.queensu.ca/view/10.1093/acref/9780199571123.001.0001/m_en_gb0001310?rskey=S1kqcw&result=2

Oxford University Press. (2010). Able. In *Oxford English Dictionary* (3rd Ed.). https://www.oxfordreference.com.proxy.queensu.ca/view/10.1093/acref/9780199571123.001.0001/m_en_gb0001470?rskey=JT93vI&result=1

Oxford University Press. (2010). Agriculture. In *Oxford English Dictionary* (3rd Ed.). https://www. oxfordreference.com.proxy.queensu.ca/view/10.1093/acref/9780199571123.001.0001/m_en_gb0014280?rskey=NxtfU0&result=1

Oxford University Press. (2010). Farming. In *Oxford English Dictionary* (3rd Ed.). https://www. oxfordreference.com.proxy.queensu.ca/view/10.1093/acref/9780199571123.001.0001/m_en_gb0287900?rskey=2O5Aoj&result=1

Oxford University Press. (2011). Literacy. In *Oxford English Dictionary* (3rd Ed.). https://www-oed-com.proxy.queensu.ca/view/Entry/109054?redirectedFrom=literacy#eid

Oxford University Press. (2011). Literate. In *Oxford English Dictionary* (3rd Ed.). https://www-oed-com.proxy.queensu.ca/view/Entry/109070?redirectedFrom=literate#eid

Oxford University Press. (2021). Agriculture. In *Oxford Learner's Dictionary*. https://www.oxfordlearnersdictionaries.com/definition/english/agriculture?q=agriculture

Parker, B. (2016). Inspiring Gen Z to consider careers in agriculture and food. *Nuffield Canada Agricultural Scholarships*. http://nuffield.ca/wp/scholar/becky-parker/

Pense, S. L., Leising, J. G., Portillo, M. T., & Igo, C. G. (2005). Comparative assessment of student agricultural literacy in selected agriculture in the classroom programs. *Journal of Agricultural Education, 46*(3), 107-118.

Pinar, W. (2008). JCT Today. *Journal of Curriculum Theorizing, 24*(1), 1-10.

Pinkerton, M., Frey, C., Thompson, S., & Hodges, A. (2021). Expanding the curricula for Florida's youth: Outreach efforts in agricultural literacy. *Journal of Integrated Pest Management, 12*(1).

Powell, D. V., & Agnew, D. M. (2011). Assessing agricultural literacy elements of project food land and people in K-5 using the food and fiber systems literacy standards. *Journal of Agricultural Education, 52(*1), 155-170.

Powell, D., Agnew, D., & Trexler, C. (2008). Agricultural literacy: Clarifying a vision for practical application. *Journal of Agricultural Education, 49*(1), 85-98.

Prior, L. (2003). *Using documents in social research*. SAGE Publications.

Ralston, S. (2014). The pragmatic pyramid: John Dewey on gardening and food security. *Social Philosophy Today, 30*: 63-76.

Real Farm Lives. (2019). *What is agriculture? And other questions you've always wanted to ask.* https://realfarmlives.ca/what-is-agriculture/

Rice, A. H., & Kitchel, T. (2017). Teachers' beliefs about the purpose of agricultural education and its influence on their pedagogical content knowledge. *Journal of Agricultural Education, 58*(2), 198-213.

Riedel, J. S. (2006). *Effects of an introductory agricultural education course on agricultural literacy and perceptions of agriculture in urban students.* [Thesis, NC State University]. NC State Repository. https://repository.lib.ncsu.edu/handle/1840.16/1536?show=full

Roberts, O. (2001). *Integrated agricultural communication at the University of Guelph: An innovative approach to skill development*. [Master thesis, University of Guelph]. The Atrium. https://atrium.lib.uoguelph.ca/xmlui/handle/10214/24617

Roberts, O. (2005). [Review of the book *The cure of American abundance: A sustainable solution*, by W.

W. Cochrane]. *NACTA Journal, 49*(1), 66.

Roberts, O. (2010). *A model for student learning in knowledge translation and transfer in Ontario.* [Doctoral dissertation, Texas A&M University]. OAKTrust. https://oaktrust.library.tamu.edu/handle/1969.1/ETD-TAMU-2010-08-8561

Roberts, O. (2020, June 18). Need to promote, educate and automate to address worker gap. *Observer*, pp. 12.

Rorty, R. (2000). Pragmatism. *The International Journal of Psychoanalysis, 81*(4), 819-823.

Rowsell, J, Kosnik, C., & Beck, C. (2008). Fostering multiliteracies pedagogy through preservice teacher education. *Teacher Education, 19*(2), 109-122.

Ryan, J., Scott, A., & Walsh, M. (2010). Pedagogy in the multimodal classroom: An analysis of the challenges and opportunities for teachers. *Teachers and Teaching: Theory and Practices, 16*(4), 477-489.

Ryerson, E. (1870). *First lessons on agriculture; for Canadian farmers and their families.* Copp Clark & Co.

Sandlin, M. R., & Perez, K. (2017). Evaluation of an annual community-focused agricultural literacy event. *Journal of Agricultural Education, 58*(3), 293-309.

Sang, Y. (2017). Expanded territories of "literacy": New literacies and multiliteracies. *Journal of Education and Practice, 8*(8), 16-19.

Schumacher, E.F. (1973). *Small is beautiful: Economics as if people mattered*. Blond & Briggs.

Shoulders, C. W., & Myers, B. E. (2013a). Socioscientific issues-based instruction: An investigation of agriscience students' content knowledge based on student variable. *Journal of Agricultural Education, 54(*3), 140-156.

Shoulders, C. W., & Myers, B. E. (2013b). Teachers' use of experiential learning stages in agricultural laboratories. *Journal of Agricultural Education, 54*(3), 100-115.

Siegesmund, R. (2019). Establishing Foundations/Imagining Futures: Constructivism and Pragmatism. In *International Encyclopedia of Art and Design Education*. (pp.1-16). John Wiley & Sons, Inc.

Spielmaker, D. (2019). The green book: Chapter 2 – Agricultural literacy. *The Agricultural Education Magazine, 91*(6), 22-25.

Spielmaker, D. M., & Leising, J. G. (2013). *National agricultural literacy outcomes.* Utah State University, School of Applied Sciences & Technology. http://agclassroom.org/teacher/matrix.

Stamp. R., E. (1968). Urbanization and education in Ontario and Quebec, 1867-1914. *McGill Journal of Education, 3*(2), 127-135.

Statistics Canada. (2018). *Agriculture.* https://www150.statcan.gc.ca/n1/pub/11-402-x/2011000/chap/ag/ag-eng.htm

Statistics Canada. (2019). *Employed labour force who worked full year, full time and reported employment income in 2015, 2016 Census.* https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/dv-vd/occ-pro/index-eng.cfm

Stephens, P., & Hinton, L. (2021). The state of postsecondary food studies pedagogy in Canada: An exploration of philosophical and normative underpinnings. *Canadian Food Studies, 8*(4), 298-325.

Stofer, K. A., & Newberry, M. G. (2017). When defining agriculture and science, explicit is not a bad word. *Journal of Agricultural Education, 58*(1), 131-150.

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedure and techniques.* SAGE Publications.

Stephens, P., & Hinton, L. (2021). The state of postsecondary food studies pedagogy in Canada: An exploration of philosophical and normative underpinnings. *Canadian Food Studies*, *8*(4), 298-325.

Sutherland, N., and Comacchio, C., (2000). *Children in English-Canadian society: Framing the twentieth-century consensus*. Wilfrid Laurier University Press.

Thayer, H.S., & Rosenthal, S. B. (2017). Pragmatism. *Encyclopedia Britannica*. https://www.britannica.com/topic/pragmatism-philosophy.

Thompson, L. (2017, March 29). *Thompson takes action on implementing Agri-Food Careers Motion.*

[Press Release]. http://lisathompsonmpp.ca/2017/03/29/thompson-gets-action-on-implementing-agri-food-careers-motion/

Thoron, A. C., Myers, B. E., 7 Barrick, R. K. (2016). Efficient and effective agricultural education programs. In T. G., Roberts, A. Harder, & M. T. Brashears (Eds). (2016). *American Association for Agricultural Education national research agenda: 2016-2020.* Department of Agricultural Education and Communication.

Tran, K., & Shumsky, M. (2019, March 21). The educational advancement of Canadian farm operators. *Statistics Canada*. [Press Release]. https://www150.statcan.gc.ca/n1/pub/96-325-x/2019001/article/00002-eng.htm

Trexler, C. J. (2000). Agricultural literacy: A word that is yet to be defined. *The Agricultural Education Magazine*, *73*(1), 2-5.

Trexler, C. J, & Hess, A. J. (2004). 15 years of agricultural literacy research: Has the profession only focused on a practical picture of what it means to be literate? *Proceedings of the 23rd Annual Western Region Agricultural Education Research Conference*, 12-22.

U.S. Farmers and Ranchers Alliance. (2011, September 22). *Nationwide surveys reveal disconnect between Americans and their food*. https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=5830

UNICEF Canada. (2019, November 19). *Youth activities take over the future at largest national child day event in Canada.* [Press Release]. https://www.newswire.ca/news-releases/youth-activists-take-over-the-future-at-largest-national-child-day-event-in-canada-849937918.html

United Nations Educational, Scientific, Cultural Organization. (2006). *Understandings of literacy. Education for all global monitoring report.* https://en.unesco.org/gem-report/report/2006/literacy-life

University of Guelph. (2012, February 2). *Jobs Aplenty in Agri-Food, Report Finds.* [Press Release]. http://www.uoguelph.ca/news/2012/02/jobs_aplenty_in.html

University of Guelph. (2017, September 7). *Planning for tomorrow 2.0: Summary report, 2017.*

https://www.uoguelph.ca/oac/about/planning-tomorrow-20-report

University of Guelph. (n.d.). *SHSM*. https://www.uoguelph.ca/oac/future-students/shsm-scholarships

University of Illinois Chicago. (n.d.). *About Jane Addams and Hull-House*. https://www.hullhousemuseum.org/about-jane-addams

Upitis, R., Huges, S., & Peterson, A. (2013). Promoting environmental stewardship through gardens: A case study of children’s views of an urban school garden program. *Journal of the Canadian Association for Curriculum Studies, 11*(1), 92-135.

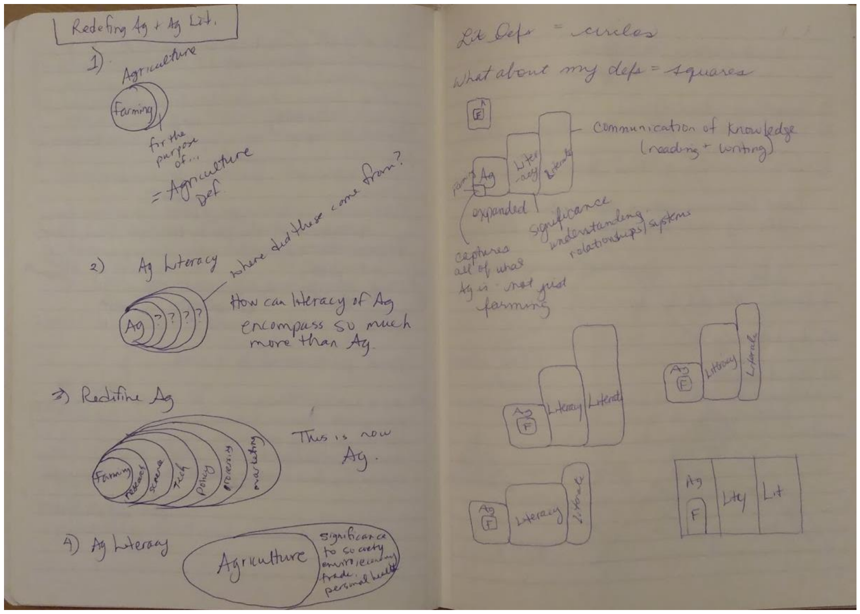
Vallera, F. L., & Bodzin, A. M. (2016). Knowledge, skills, or attitudes/beliefs: The contexts of agricultural literacy in upper-elementary science curricula. *Journal of Agricultural Education, 57*(4), 101-117.

Vallera, F. L., & Bodzin, A. M. (2020). Integrating STEM with AgLIT (agricultural literacy through innovative technology), The efficacy of a project-based curriculum for upper-primary students. *International Journal of Science and Mathematics Education, 18*(3), 419-439.

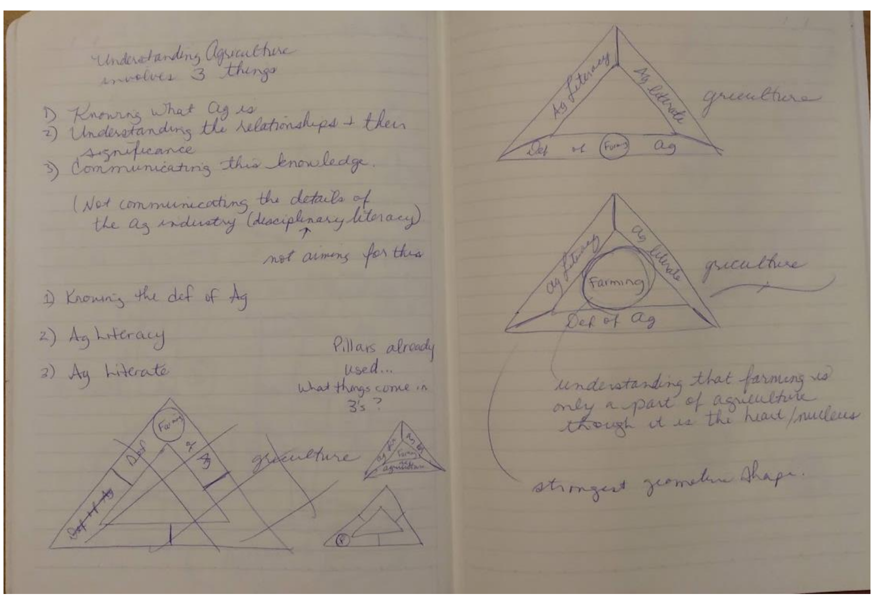
Yin, R. K. (1994). *Case study research: Design and methods*. 2nd ed. SAGE Publications.

Appendix A

Samples of Memos



These journaled memos display an early attempt to visually illustrate the gaps noticed between the terms agriculture, agricultural literacy, and agriculturally literate, and how redefined terms could build on one another.



These memos display a latter attempt to bring findings together graphically, getting closer to the final product of the avenues of agricultural literacy model.

Appendix B

Raising Ag Literacy Blog Post

How I see Agriculture: A Photovoice Project

October 31, 2019

I know I see “agriculture” differently than most people. It’s my passion. It’s my career. It’s what I research. I think I see it differently, not just because it matters so much to me, but because I understand its connection to all of our lives and how frequently we all interact with a product of agriculture. My hope is not to get people to see agriculture the way I do, but to SEE it at all. To see it in our daily lives and understand how significant it is to our society, which is the essence of agricultural literacy.

Today is Halloween! Jack-o-lanterns are a must and a visit to a pumpkin patch is great fall fun. I see a lot of toil, marketing, and a farmer's income in this photo (along with my adorable son!).

In the spring my neighbour's tractor caught on fire. These machines are so necessary for modern farming! Farming is a lot of hard work, it is expensive, and it can be very dangerous.

This is my favourite t-shirt. It's made of cotton. THANK YOU to cotton farmers for my clothes.

A beautiful new house is being built in my neighbourhood, but my heart hurts a little every time I see it. I see prime agricultural land permanently put out of production.

You might be connecting the fruit in this photo to agriculture, but I am connecting the containers. One is made from corn, the other from sugar cane. Biodegradable take-out containers are a part of agriculture.

This is how I see agriculture…. how do you see it?

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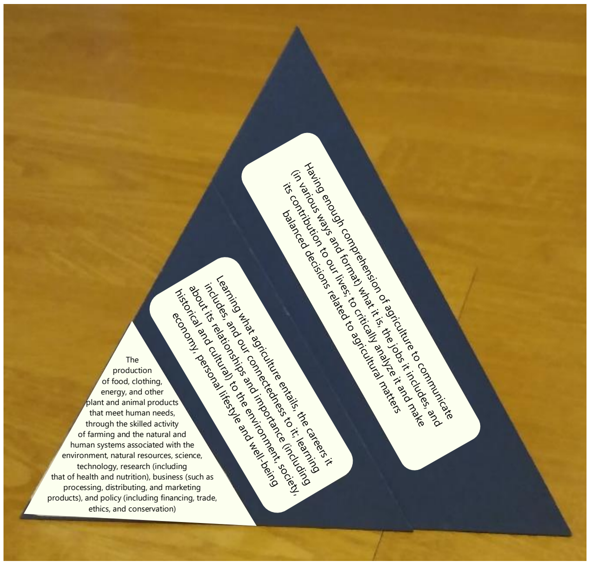
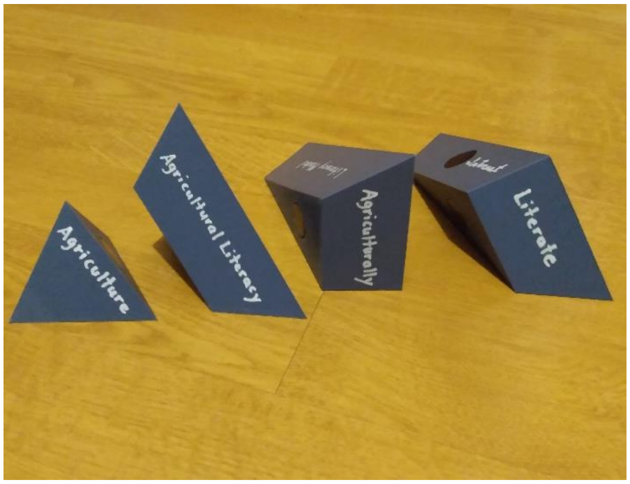
Appendix C

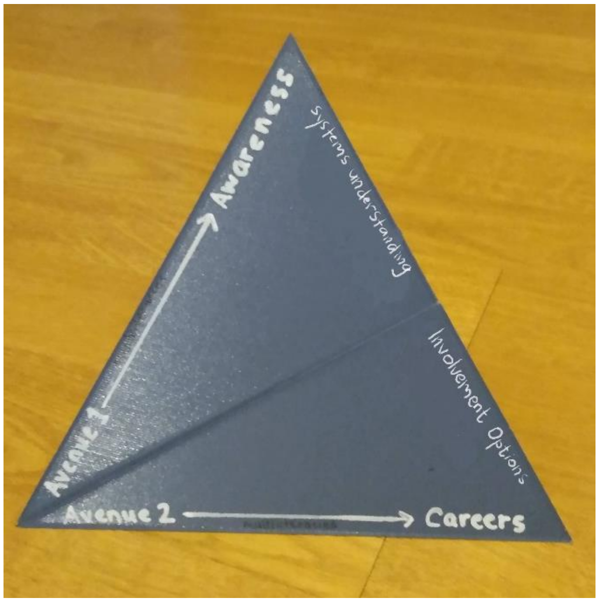
Prototype of the 3D Printed Version of the Avenues of Agricultural Literacy Model (AALM)



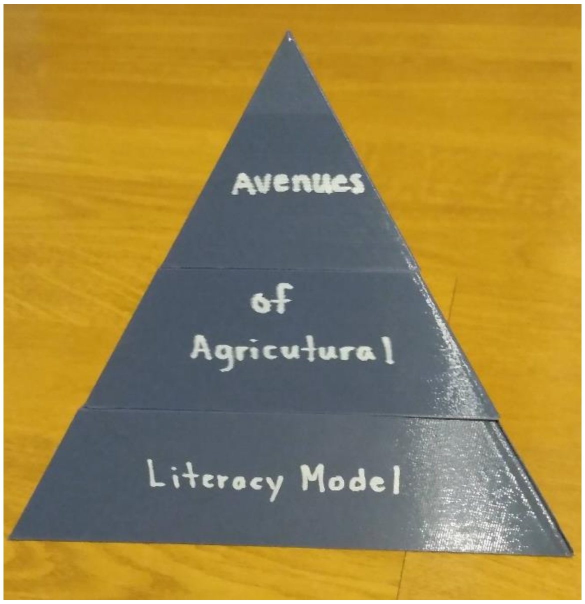
Side 1: Definitions



Side 2: Definition lables
(showing the model in its four pieces)



Side 3: Avenues



Side 4: Title of model (bottom)