

South Dakota State University

## Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange

---

Electronic Theses and Dissertations

---

2021

### School Gardening in America and a Survey of South Dakota Schools

Aminah Hassoun

South Dakota State University, aminah890@gmail.com

Follow this and additional works at: <https://openprairie.sdstate.edu/etd2>



Part of the [Agricultural Education Commons](#), and the [Family and Consumer Sciences Commons](#)

---

#### Recommended Citation

Hassoun, Aminah, "School Gardening in America and a Survey of South Dakota Schools" (2021).  
*Electronic Theses and Dissertations*. 208.  
<https://openprairie.sdstate.edu/etd2/208>

This Thesis - Open Access is brought to you for free and open access by Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. For more information, please contact [michael.biondo@sdstate.edu](mailto:michael.biondo@sdstate.edu).

SCHOOL GARDENING IN AMERICA AND A SURVEY OF SOUTH DAKOTA  
SCHOOLS

BY  
AMINAH HASSOUN

A thesis submitted in partial fulfillment of the requirements for the

Master of Science

Major in Agricultural Education

South Dakota State University

2021

## THESIS ACCEPTANCE PAGE

Aminah Hassoun

This thesis is approved as a creditable and independent investigation by a candidate for the master's degree and is acceptable for meeting the thesis requirements for this degree.

Acceptance of this does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Peter Troy White  
Advisor

Date

Jay Trenhaile  
Department Head

Date

Nicole Lounsbery, PhD  
Director, Graduate School

Date

## CONTENTS

LIST OF FIGURES .....	iv
LIST OF TABLES .....	v
ABSTRACT.....	vi
School Gardening in America.....	1
Purpose and Focus .....	1
A Historical Overview of School Gardening.....	2
School Gardening in the Twentieth Century .....	5
Roots in Progressive Education .....	8
Social and Political Agendas in Garden Education .....	10
Gardening Curricula and Teacher Training .....	12
School Gardening in Practice.....	15
Gardening in General Education and Agricultural Education .....	20
National Proliferation of School Gardening .....	21
A Survey of South Dakota School Gardens.....	26
Methods and Data Collection.....	26
Results and Findings .....	29
Further Discussion .....	39
APPENDIX.....	43
REFERENCES .....	49

## LIST OF FIGURES

Figure 1. Map of South Dakota School Gardens in This Study.....	30
Figure 2. Months When School Gardens Were Used.....	33
Figure 3. Kinds of Plants in School Gardens.....	35
Figure 4. Academic Subjects Connected to School Gardens.....	36
Figure 5. Grade Levels of Students that Participated in School Gardens.....	38

## LIST OF TABLES

Table 1. School Garden Features Reported by Participants.....	31
Table 2. Positive Changes Observed in Students in School Gardens.....	38

ABSTRACT

SCHOOL GARDENING IN AMERICA AND A SURVEY OF SOUTH DAKOTA  
SCHOOLS

AMINAH HASSOUN

2021

School gardening has a longstanding history in American education, dating as far back as the mid-1800s. Despite fluctuations in popularity throughout the twentieth century, school gardens have grown into an established method for hands-on teaching. This paper builds upon a historical framework of school gardening in American public education with particular focus on the connections between school gardens and agricultural education. This study offers a descriptive portrait of contemporary K-12 school gardens in South Dakota. Schools across the state were surveyed about their gardens to gain a better understanding of garden-based teaching in practice both in general education and agricultural education.

Keywords: school gardens, gardening, garden-based learning, agricultural education

## **School Gardening in America**

The school garden is an extension of the classroom. Gardens have been used throughout history in education as a pedagogical tool to enliven classroom-based teaching and enrich student learning and development. Gardens have been used to teach through hands-on practice and experiential learning across general-education and agricultural education, connected to core subjects, academic outcomes, and the social-emotional development of students. The widespread appeal of school gardening is historically relevant in American public education. School gardening emerged in waves across history, with an ebb and flow in popularity, appeal, and application for more than a century. School gardens were widely popularized by the early twentieth century and persisted in education through recurring movements for gardening that grew and spread in rural and urban schools across the country. Over the years, gardens were planted across the country to meet different educational objectives, at times imbued with social and political motives (Kohlstedt, 2008; Burt, 2016; and Ralston, 2011).

### **Purpose and Focus**

A historical overview of school gardening in America during the twentieth century is presented in this paper, followed by a descriptive analysis of present-day school gardens in South Dakota. The purpose of this study was to dig into the historic roots of school gardening and contextualize contemporary applications of school gardening in general education and agricultural education.

The following literature review includes primary and secondary sources that were gathered from academic databases, including education journals and government publications. Relevant sources were identified using keywords related to school



gardening and garden-based education. The following key search words were used to gather relevant academic sources on the subject: school gardens; history of school gardens/gardening; agricultural education; elementary agriculture, garden-based education; and gardens/gardening in agricultural education. The primary and secondary sources that were reviewed for this study focused on the period between the mid-nineteenth century to the late-twentieth century in the United States.

The central questions that guided this research study were:

1. What is the relationship between agricultural education and school gardening?
2. How does the history of school gardening in America compare to contemporary applications of school gardening in South Dakota?

The scope of this research paper is limited to the historical development of school gardening and agricultural education. Additional research on school gardening and garden-based education is still needed to gain a deeper understanding of the implementation of gardening in agricultural education and its impact on student learning and development.

### **A Historical Overview of School Gardening**

Garden-based education—as a hands-on teaching method—is arguably as old as agriculture itself. Gardening has been formally used as an agricultural teaching method since the mid-1800s when school gardening started to gain recognition in education, sparking a movement across public education in America (True, 1929; Burt, 2016; Hillison, 1998; Jewell, 1907; and Nearing, 1915). While this paper does not capture the full scope of gardening education, it offers a brief history of modern school gardens within American public education primarily over the last century.

School gardens were a prominent fixture in most European schools by the middle of the nineteenth century, just as gardening was beginning to make its debut in schools in the United States (Jewell, 1907; Leake, 1915; and True, 1929). Garden-based education and school gardens were widely implemented across schools in many European countries. By 1869, Austria mandated that every school was required to have an educational school garden. Other countries, including Germany, France, Belgium, Russia, England, and Sweden quickly passed similar laws to establish school gardens as an essential component in education (Burt, 2016). Prominent thinkers also cited their support of garden-education, including Comenius, Rousseau, Pestalozzi, and Froebel—who coined the term “kindergarten” in 1840 to reflect the “practice of using gardens to develop preschoolers’ intelligence through learning about nature” (Burt, 2016, p. 298). School gardens were transplanted in the United States with support from progressive reformers in public education, like John Dewey, who advocated for school gardens as a “natural” space for learning and development of students (Dewey, 1903).

For decades leading up to the Morrill Land Grant College Act of 1862 in the United States, the early movement for agricultural education was largely grassroots and sporadic in its development from state to state, mostly localized and rudimentary in its efforts (True, 1929). The United States dramatically expanded in geography from 1820 to 1860, with 20 new states added in that time. This brought American settlers face-to-face with the immediate challenge of adapting to new environments and developing agricultural practices to sustain the growing nation. As a response, rural communities garnered support from local stakeholders, like farmers organizations and horticultural and agricultural societies, to promote agricultural education and establish farm and work

schools to train new farmers. According to True (1929), early farm-schools during this time were “premature developments” in agricultural education that focused on manual training and the teaching of farm work, “because there was not yet a body of knowledge relating to agriculture [that] could be successfully used in secondary schools” (p.35). The slow development of agricultural education in secondary schools caused it to nearly disappear from public education by the start of the Civil War until about 1880 (True, 1929). The primary focus of public education during this early period, solidified in the Land Grant Act of 1862 and subsequent federal legislation in 1887 and 1890, was to develop public universities and agricultural colleges; these institutions were needed to educate and train farmers and rural teachers, teach agricultural sciences, and develop American agricultural practices, all of which were invariably needed to teach agriculture at the lower grade levels.

However, by 1880 there was already a growing demand for agricultural education at primary and secondary schools. Agricultural colleges could not adequately meet the need for agricultural instruction at the lower grades, not while they were newly developing their institutions and educational programs. Furthermore, secondary schools teaching the college-preparatory curriculum struggled to retain students, who dropped out of school to work in factories and industrial trades. College advancement was widely unattainable for many rural youths, who were more likely to work in agricultural industries as farmers and laborers without a formal education in agriculture. It was against this backdrop that rural agricultural education expanded with the development of secondary agricultural schools in rural communities—schools that specialized in teaching foundational agriculture, vocational training, and agricultural sciences to older youth.

These efforts to expand rural and agricultural education were eventually formalized on a national scale with the Smith-Hughes Act of 1917.

### **School Gardening in the Twentieth Century**

The first wave of a widespread gardening movement in American public education occurred between 1900 and 1920. This era of expansion in school gardening stands out from preceding decades (1862-1890). The school-garden movement in the early twentieth century is deeply rooted in rural agricultural education that was focused on training and teaching the next generations of farmers in America. Gardens were introduced in schools as a practical method for teaching elementary and vocational agriculture. According to Leake (1915), “public school agriculture began with the school-garden movement [...] in the United States to introduce the subject in the elementary schools [that] dates from about 1900, although the value of the subject was recognized as early as 1824” (pg. 10). Aside from the context of agricultural education, schools in the United States also began sprouting gardens to beautify and develop schoolyards and build local infrastructure. Gardens grew simultaneously out of calls for revitalization and development of both rural and urban schools, in addition to their educational value and local community impact.

Many historians have reported on school gardens in American education as a movement (Jewell, 1907; True, 1929; Hillison, 1998; Kohlstedt, 2008; Burt, 2016). The first wide-spread school gardening movement in the early 1900s emerged in relation to nature-study, progressive education, and the development of agricultural education in rural schools. School gardening in the early twentieth century was tied to perspectives in nature-study, i.e. “using the study of nature as an educational tool” (Burt, 2016, p. 298).

According to Kohlstedt (2008), school gardens were “initially an expression of the nature-study movement that introduced science into the public schools” (p. 59). Changes in the social and educational objectives of schools, developments in public education during this period, and the growth of agricultural education in rural communities allowed gardening to deepen its roots in education with greater purpose as an effective teaching method with numerous benefits to student learners.

School gardening grew into parallel trajectories in general education and agricultural education, in both urban and rural schools. According to some early sources, school gardens may have been initially “confined to the cities” and were a “forerunner of the demonstration field” in school-based agricultural education (Bricker 1914, p. 130). School gardens took shape everywhere, in rural and urban schools, in many forms depending on their context because they were regarded as an effective teaching tool that promoted hands-on learning and met the developmental needs of students. Gardens were outdoor learning spaces that connected the classroom curricula to real life. Both school-based gardens and home-garden projects were used in agricultural education curricula, and both are referenced in early literature as examples of effective hands-on teaching methods for practical learning and to teach industry-related skills in agriculture. School gardens during the twentieth century were a reiteration of practical methods already in use for elementary agriculture and experiential learning in rural farm-schools.

There were different roles for school gardens in rural and urban settings based on the different educational needs of students and the community that each garden served. Corbett (1905) suggested that students in rural (i.e. agricultural) communities should receive more specialized teaching in applied farming and agricultural sciences, both in

elementary and secondary schools. Furthermore, Corbett (1905) wrote that a garden planted at or near a school was more appropriate for urban communities because in towns and cities residents had more limited access to land than students in the countryside. In rural communities, schools were encouraged to teach gardening in the form of a home-based project because the extra effort of a school garden would be redundant in an agricultural community, where farmland could be more easily accessed by students, and because a school garden might impede work on the family farm. Instead of a focus on agriculture and crop production, which was appropriate for rural schools, urban schools were encouraged to grow vegetable and flower gardens for more general purposes, either as individual or community plots that could be used for demonstrations to teach practical gardening methods, and that could be incorporated into general education topics from art to science. In this sense, the different types of school gardens differentiated the kinds of garden-based learning that could take place depending upon their unique contexts, whether rural or urban, and depended largely on the local needs of schools, students, and communities that they served.

Gardens were planted in both rural and urban schools in large part due to the versatility of gardening as an effective teaching tool that could be transformed to fit specific social contexts and educational objectives. In rural communities, school gardens were planted not only to beautify and develop schoolgrounds and celebrate country life, but as a response to calls to engage learners through direct learning experiences and nature-study that were directly connected to outdoor environments. Gardens in rural schools were used to teach practical skills in gardening as a foundation for agriculture and vocational training. Still, gardens were grown in schools all over the country

including major cities, where they were able to grow exponentially in popularity at the turn of the twentieth century.

By 1906, the Department of Agriculture had estimated there were over 75,000 school gardens across the United States (Marsh, n.d., para.1). Hemenway (1903) described the budding school-garden movement in the United States as a “recent” development that was “gaining ground rapidly” (p. xiv). The widespread appeal of school gardening from 1890 to 1910 was in large part due to the rapid urbanization of American cities and increased immigration and rural migration to cities. Gardens were a response of urban schools to address growing concerns over social welfare and meeting the needs of urban communities. Gardens were perceived by schools as a way to make education more appealing to students in an effort to improve student retention rates. Gardens were a “natural” learning space that was outdoors and offered a reprieve for students from the classroom and excessive time spent in indoor urban environments (Davis, 1905). Advocates for educational reform of urban schools and public education in the cities championed gardening as a teaching method that could achieve both educational and social objectives—that school gardens could benefit everyone, including students, schools, and the entire community.

### **Roots in Progressive Education**

School gardens were used as a strategy by urban schools to reach the masses; this growth in popularity fueled the school gardening movement as it grew more connected to progressive education. Progressive pedagogies like garden-based learning “focused not only on experiential, hands-on education but valued social skills development, problem solving and critical thinking, and social responsibility” (Burt, 2016, p. 298). John Dewey

advocated for school gardens, because “students would benefit from integrating intellectual (classroom) and practical (gardening) elements of learning” (Burt, 2016, p. 298). Progressive educators promoted gardens for their educational value—not just for their aesthetic appeal or beautifying schoolyards.

In an early article, titled “Democracy in Education,” Dewey (1903) wrote a reform-minded criticism of the “undemocratic suppression” (p. 199) of individuality in the education system, which he saw as a product of the systematized, standardized learning structures that were forming in American public education. Dewey (1903) wrote that active hands-on learning experiences gave students agency in the learning process and formed a direct tie to the learning material, which was enriched in context and practical application to the student’s immediate life. This is the backdrop that supported gardening as an active learning method. Dewey (1903) was also concerned for the social welfare of America’s public education system in his appeals for the democratization of education and pedagogy. According to Dewey, the central role of schools should be focused on “three motives: affection, social growth, and scientific inquiry” (Dewey, 1903, p. 204). Dewey’s support for school gardens falls in line with progressive views on the central purpose and function of schools and education to promote learning and development of the entire child. The movement for school gardens is rooted in progressive education and teaching through hands-on, experiential learning methods that are conducive to the entire development of the student learner (i.e. intellectual, emotional, social, and physical).



## **Social and Political Agendas in Garden Education**

Much of the widespread success and spread of school gardening is owed to the numerous educational benefits to learners. However, Kohlstedt (2008) points out that several underlying social and political influences are also present in the school gardening movement between 1890 and 1920, including “fears about poorly educated immigrants in major cities, concern about rural out-migration from declining farm communities, and heightened attention to nature conservation and preservation” (p. 64). During this period of massive population increase and geographical expansion of the United States, schools were charged with educating and “Americanizing” the increasingly diverse populations of new immigrants. In urban areas, schools competed against factories and industries to keep youth in school. School gardening programs were part of a larger effort in cities to attract students and deliver relevant education with the skillset to compete in a growing world. Comparatively, gardens were a strategy for rural schools to rejuvenate their communities in the wake of a rural economic recession at the turn of the century (1890s) that caused widespread rural-to-urban migration across the country and jeopardized rural communities and agricultural industries. Gardens were a response for schools to meet the growing challenges of staying relevant and incorporating real-life experiences into the elementary school curricula.

The socio-political motivations for the school garden movement over the decades have carried a “complex mix of pedagogical, practical, aesthetic and even moral baggage” (Kohlstedt, 2008, p. 65). This is especially true in how school gardens have been historically implemented in ways that have perpetuated grave inequalities, especially concerning race and gender. In terms of gender-bias, girls were typically

excluded from receiving the same education in agricultural sciences and crop production as their male peers; instead, garden-based education for girls was differentiated on the basis of gender and focused more on domestic gardening and horticultural landscaping (Kohlstedt, 2008). In the case of African-American and Native-American students, school gardening was more “practical and didactic, explicitly to provide food for their school and to establish character” (Kohlstedt, 2008, p. 71). For example, school gardens at boarding schools for Native-American students were heavily production-oriented, operating as work programs that subjected students to intensive agricultural labor and punitive disciplinary measures. As Kohlstedt (2008) notes, “the vocabulary of nature study in these settings was quickly transformed into a kind of manual training for a life in crop farming” (p. 71). Although many of these schools claimed their aim was to teach students practical skills and prepare them for mainstream American life, they also carried out a harmful pedagogy against marginalized students.

Unlike the school gardens of mainstream American schools, gardening programs for racialized (Black and Indigenous) and marginalized (i.e. orphans, incarcerated youth, etc.) students subjected youth to intense agricultural labor touted as a “character-building” practice. Many of these school gardens served ulterior political motives and were used mainly to produce food for students at these institutions. As Robison (1911) wrote, “agricultural work of some sort [was] coming to hold a large place in the occupational instruction of many orphanages, corrective institutions, and other charitable enterprises,” and that it was “a question in the case of some of these how far the work is consciously used as an instrument for the education of higher mental processes, and how exclusively it [was] confined to routine manual labor incidental to the operation of lands

belonging to the school” (p.11). The jarring contrast in socio-political and educational motives in agricultural and garden-based education depending on context is important to acknowledge and recognize the harm caused through inequalities in public education.

### **Gardening Curricula and Teacher Training**

Teacher training and adequate teaching materials are two major developments in the school gardening movement that aided in its widespread growth. Early teaching manuals were published as resources for teachers that were “enthusiastic and realize[d] the purpose and advantages of the school-garden movement, but who have not had the agricultural advantages and training to understand the best methods of making and conducting a garden so as to get good results from an agricultural and horticultural standpoint” (Hemenway, 1903, p. xi). The school garden movement had indeed already been on the cusp of a widespread, national movement; systems in education were shifting to accommodate and promote the emerging method of gardening. Early teaching materials and garden manuals offered professional development to teachers in an effort to support the movement. Garden manuals, planning and planting guides, advised teachers of best practices and offered a curriculum of lessons and teaching material pertaining to gardening and garden education.

In 1905 the United States Department of Agriculture (USDA) published a 40-page teaching manual called *The School Garden* (Corbett, 1905) to help schools successfully incorporate gardens into their curriculum. This teaching guide reflects the government’s acceptance of gardening as an educational method and highlights the national appeal that school gardening had already achieved by the turn of the twentieth century. Corbett (1905) advocated for the “value of school garden work” because

learning and working in a garden teaches students practical life-skills. Corbett (1905) encouraged schools to incorporate gardens into their curriculum to teach practical skills to grow food and cultivate crops. There are a myriad of curriculum guides and school-garden manuals that were published to support schools and educators in developing their school garden programs, pointing to both the widespread popularity of school gardens during this time and the efforts of leaders in public education to spread the practice of school gardening (see Hemenway, 1903; Corbett, 1905; Jackson & Daugherty, 1913; Nolan, 1918).

Bricker's works, *The Teaching of Agriculture in the High School* (1911) and *Agricultural Education for Teachers* (1914), are additional examples of pedagogical textbooks and teachers' reference guides that made a strong appeal for school gardens. Bricker (1911) outlined the differences in agricultural education at the elementary and secondary levels to give the curriculum definition and direction. Bricker (1911) suggested that school gardens were instructive in elementary education, to teach the basics of practical gardening skills as a foundation for future learning in agriculture. Bricker (1911) also advocated for the use of experimental field work in secondary agricultural education to increase the depth of knowledge in agricultural sciences for older students. The notion of a garden for garden-based learning included a greenhouse, garden, field, or "experimental plots in connection with the school so that the scientific principles studied may be demonstrated in actual practice," where students could focus on learning agriculture and "elementary scientific principles applied to farming and farm life—and practice in application" (Bricker, 1911, p. 10-11).

In other agricultural teaching manuals, educators advocated for experimental gardens as outdoor laboratories as a necessity for schools (Jackson & Daugherty, 1913). Nolan's (1918) book on *The Teaching of Agriculture* was written with the stated purpose of attempting to standardize secondary agricultural education, which he recommended should be taught through vocational instruction, "to contribute to the practical education of the farmer" (p. 31). For Nolan (1918) a garden, as an outdoor laboratory, was an effective tool in teaching agronomy and horticulture. Bricker (1914) wrote in favor of vocational training of students—that "the processes and methods of farm and garden work and its management must be taught by insisting upon the actual performance by the pupils themselves" (p. 77). Bricker (1914) also urged agricultural educators to adopt scientific methods and ideas in their teaching, citing soil conservation as a primary reason to give due diligence to the development of effective and responsible teaching methods in agricultural education. It was considered imperative for teachers to be skilled and knowledgeable in agricultural sciences and methods to be effective teachers and lead students in applied learning.

Adequate teacher training in agriculture and gardening appeared numerous times in the reviewed literature as a significant factor in the success of a school garden or gardening programs (Nolan, 1918). Inadequate teacher training in agriculture and lack of experience in gardening were cited as major challenges, since teachers who were not trained in elementary agriculture were attempting to garden and impart agricultural teaching in public schools (Bricker, 1914). Because both the content and methods of agriculture had to be taught to teachers, formal training proved to be very difficult, according to Bricker (1914). The "rapidly growing demand for teachers who are able to

give satisfactory instruction in elementary agriculture” was identified as a problem for the state normal schools (i.e. teacher training colleges) that were charged with the new task of training elementary school teachers to teach gardening (Davis, 1910). A related concern was the need for more developed standards in agriculture education and standards in pedagogy for teacher training in agriculture.

According to a study cited by Davis (1910), 60 to 100 percent of normal-school graduates went on to teach in rural schools; of the 28 normal schools cited by Davis (1910), twenty schools were offering instruction in agriculture and fifteen required it (p. 377). Davis (1910) projected that “agricultural instruction in state normal schools has on the whole kept pace with the growth of the general interest in the subject” in many states, including South Carolina, Vermont, and Nebraska (p. 378). In a report by the National Education Association in 1907, 61 of the 91 state normal schools (67%) that were surveyed were offering courses in agriculture, though only eight of those schools were using a school garden as part of their teacher-training curriculum (Davis, 1910, p.378). Furthermore, “the number of [normal] schools offering such courses” in agriculture increased from 20 percent in 1906 to more than 50 percent in 1909” (Davis, 1910, p. 379). By 1918, teacher-training courses in agricultural education were by then considered to be effective and produced “good teachers both technically and professionally trained to teach in elementary and secondary schools” (Nolan, 1918, p. 162).

### **School Gardening in Practice**

School gardens were believed to benefit student learning and development and promote health to the surrounding community. In addition to teaching the applied practice of growing food and plants, educational gardens incorporated active teaching and

hands-on learning through interactions with nature, plants, and natural objects that enlivened student learning with tangible experiences. The benefits of learning outdoors were emphasized with school gardening as a means to counteract the confines of the classroom. Gardens were connected to many different academic objectives and a range of subjects including science, math, and literature, and focused on development of the whole child—a principle derived from progressive education.

Bennett (1906a.) wrote an appeal calling for land to be set aside for school gardens in the cities. Bennett points to the George Putnam grammar school in Boston as the first school garden, where several gardens were planted at the school from 1890 to 1900. Bennett (1906a.) also wrote that “several other cities had started small gardens, principally in school yards; but until the summer of 1902 the name “school garden” was practically unknown to the general public” (p. 344). School garden work was linked to “indoor studies of nature, drawing, arithmetic, and geography,” in addition to science and “manual training,” (Bennett, 1906 a., p. 345). There were “no less than thirty-five cities and towns” with school gardens by 1904, including at elementary and normal schools (Bennett, 1906 a., p. 345). In a second essay in the *Journal of Education*, Bennett (1906 b.) wrote in support of school gardens in cities for their many benefits, including providing a safe space for schoolchildren during the summer months, and for “all the benefits of manual training...for putting into practice all the abstract lessons of the classroom” (p. 374). Bennett (1906 b.) wrote that “in cities and towns backyard improvement follows rapidly in the path of the school garden” (p. 375). Bennett primarily wrote from an urban perspective and identified the school garden with a nature-study

focus in general education, pointing to the positive impacts that school gardens had on the local community.

Similarly, Harbourt (1909) echoed the reverberating socio-economic benefits of school gardens across local communities. While Harbourt's (1909) accounts mention agricultural field trips as a method used to supplement classroom learning, he does not explicitly mention an on-site school garden as a method used at the school for teaching. Harbourt (1909) reported that after four years of teaching agriculture to students at the high school in Andover, Ohio, local farmers had also benefitted from the information taught to students and had adopted practices that improved their farms. The improvement to the town's greenspaces and family lawns were also on the list of extended benefits of agricultural education that served an entire community.

In another study that involved visiting 40 schools across Massachusetts, Jenks (1909) reported that 6 agricultural schools, 4 high schools, and 3 special/private schools were offering courses in agriculture; and that 3 out of 4 schools were doing "home or school garden work or both" to teach practical agriculture or another subject connected to the classroom curriculum (p. 93). Jenks (1909) points out that the "practical work of an agricultural nature" was occurring both "in city and in rural [school] districts, both in large and in small schools," with no uniformity in subjects or teaching methods and "distinctly different types of work" (p. 93). Jenks (1909) also suggested that school gardens should be model demonstration sites. School gardens in rural areas were planted mostly for schoolyard decoration to encourage students to take up home gardening projects, while school gardens in the cities were mostly incorporated to supplement



classroom learning in elementary schools, though not exclusively for the purpose of teaching agriculture.

Gregory (1911) reported on 10 years of school gardening in Cleveland, Ohio—an effort that was started by the local interest of neighbors to improve and beautify their yards, lots, and community relations. The garden movement that was sweeping through Cleveland’s schools at the time had reached only a fraction (10%) of the city’s schoolchildren, along with their families and the extended community (Gregory, 1911, p. 255); however, gardening was still credited with improving the quality of learning in schools. As Gregory (1911) wrote, “some experiments with classes in this city have demonstrated that this outdoor occupation [i.e. gardening] has increased their [i.e. students] efficiency in school work more than 30 percent” (p. 255). Gardening was considered “a vital element in the actual class work of pupils” (Gregory, 1911, p. 255), so much so that the school garden was incorporated into several subjects in nature-study to math, geography, and art.

In a qualitative study on agricultural education by Robinson (1911), a sample of 355 high schools that taught agriculture revealed that 33 schools included experimental work in their curriculum, either in the form of teacher demonstrations or individual project-work by students. Robinson (1911) advocated for vocational agricultural training so that students could learn practical skills and argued that agricultural education required “a proper mastery of principles” that involved “participation in the operations” of practical agriculture (p. 4). The attention on practical work in agricultural education involved hands-on application through experience in gardening, field demonstrations, and science experiments. According to a report from the USDA cited by Robinson (1911),

“instruction in the rudiments of agriculture [was] required in the elementary schools of Alabama, Arkansas, Florida, Georgia, Louisiana, Maine, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, South Dakota, Texas, West Virginia, and Wisconsin” (p.10). Robison (1911) wrote about some of the “typical high schools teaching agriculture” across the country, including several schools that had a school garden and those that incorporated home-gardening projects into their curriculum. In Robinson’s study (1911), 37 schools reported having a school garden at the school, 9 of which were connected to a specific class and used for agricultural training or vocational study; and 36 schools reported that at-home gardening projects were used as an instructional method. Robinson (1911) highlighted some of the similarities and differences between these schools, their implementation of gardening, curricula and objectives, the types of agricultural work performed by students, and other characteristics of the school gardens that were included in his study. Of the schools surveyed by Robison (1911), 8 reported that access to land (i.e. the lack of land or inability to access land) was the main obstacle for not having a garden at their school.

In a comparative study, Leake (1915) identified some of the differences between school gardens in rural schools (for elementary agricultural education) and school gardens in urban areas. Leake (1915) highlighted major cities like Memphis, Los Angeles, Philadelphia, and Minneapolis, to document the “extensive systems of school gardens” (p. 75) in those cities, some that boasted more than 60 urban school gardens. The home-garden was also regarded as an effective strategy to increase agricultural capacity and learning across urban communities. Leake (1915) suggested that urban schools should expand the practice of gardening beyond the schoolyard: to “use the home

plot as an adjunct to the school garden, and those that do not [have a school garden] should use the home plot as a substitute” (p. 75).

In a descriptive study on the use of land by high schools for agricultural education, Merritt (1915) surveyed 385 high schools that were receiving state funds for agriculture education, of which 257 schools (66%) reported having land in use for agricultural instruction (p. 1). In Merritt’s (1915) study, of the 257 schools that reported having a garden, more than half (159) were “school farms” under 6 acres, 40 were “school-garden sized” of one acre or less of land, and 58 schools used over 20 acres of land for instruction (p. 2). It is apparent in Merritt’s (1915) study that large-scale parcels of land were used for agricultural instruction and smaller school gardens (generally about one acre or less) were used for other educational purposes (i.e. general education).

### **Gardening in General Education and Agricultural Education**

During its phase of development as a national movement, roughly from 1900 to 1920, school gardening develops two main branches that were not mutually exclusive of one another. One form of school gardening was used mainly to achieve objectives in general educational and for the purpose of incorporating natural objects into the classroom. School gardens in general education were extensions of the classroom, as outdoor learning spaces for hands-on education, and implemented into a variety of subjects to support classroom learning. For example, school gardens could grow live plants and provide other natural materials for object-study in the classroom, science experiments, observations, and teaching demonstrations.

Another major objective of school gardening that primarily took shape was for the purpose of teaching elementary agricultural education and the practice of foundational

methods of gardening. In these schools, gardening was used as a project-based teaching method for upper elementary-level students (4<sup>th</sup> - 5<sup>th</sup> grade) to learn basic agricultural principles through hands-on gardening and practical growing experience. Garden-based education was relevant at the secondary level, too. Many of the secondary-level agriculture education curricula from this period cited gardening as an effective method for teaching applied agricultural sciences and other related subjects, and practical farming skills as foundational career and technical education (CTE) in secondary agriculture—a basis for high school students for either continued education in agriculture or employment in a professional trade in the field of agriculture. Differentiated learning from school to school is a key feature of school gardening—considering not only local contexts (urban or rural), but also the ages of students, educational objectives, and the types of gardening or farm work performed by students.

### **National Proliferation of School Gardening**

The versatility and adaptability of school gardening has been cited by many early writers on the subject as a major reason for the widespread, national proliferation of gardening by the 1920s. The lasting appeal and reemergence of gardening throughout American history and education reflects the ability and willingness of educators to continue re-casting gardening as an effective method to achieve a variety of educational and social objectives.

During World War I, school gardening was politicized and widely promoted and funded by the federal government. Gardening became an expression of civic pride and patriotism. With the formation of the United States School Garden Army, schools encouraged youth to grow food locally in community- and school-based gardens to boost

local food security and offset the labor and food shortages as a result of the war. A similar campaign would later re-appear with Victory Gardens during World War II. The School Garden Army campaign was aimed at recruiting youth to participate in school gardening as a patriotic and civic contribution to the war effort. The organized effort helped drastically grow the gardening movement in schools by 1920 and integrated gardening into the academic curriculum, while also increasing public support for gardening. School gardens declined somewhat after WWI through the Great Depression “primarily due to unsustainable expansion due to the war effort, followed by sudden withdrawal of funding” as priorities in government spending and funding changed after the war (Wake, 2015, para. 9). According to Trelstad (1997), “cumulative effects” of the changes to society had a major impact on school gardens following WWI, “such as the growth of the suburb as a living concept and movement of gardens from school to home as a family activity,” along with “the reliance of the [school garden] movement on teachers skilled in gardening and the lack of substantive professional support to integrate gardens meaningfully into curriculum learning” (Wake, 2015, para. 9). These factors all contributed to the start of a gradual decline in school gardening over the next two decades through the Great Depression. However, by World War II, “a resurgence in the public’s interest in school gardens emerged resulting from a federal campaign promoting Victory Gardens...focused on the production of vegetables to prevent food shortages” (Burt, 2016, p. 306). Although the larger focus of Victory Gardens was on home gardening, “schools planted gardens to supplement school lunches” (Burt, 2016, 307). It is apparent that gardens in schools during WWI and WWII were meant for larger socio-political purpose than education alone; gardens were branded with American patriotism to encourage

communities to do their part to sustain themselves by growing their food locally amid wartime food and labor shortages.

After World War II, school gardening decreased significantly as public appeals for other causes shifted focus to other more important social, economic, and civil rights issues. The post-war focus in education followed advances in science and technology and shifted government funding toward STEM and science education. The political climate after WWII also pushed for renewed support for traditionalist values and teaching methods and a rejection of the progressive-era objectives in public education. Furthermore, “technological advances related to food and agriculture in the 1940s and 1950s also likely influenced the deemphasis on school gardening” (Burt, 2016, p. 308). The industrialization of agriculture and food production also affected objectives and priorities in education. For example, as “processed and packaged food, frozen food and fast food became highly marketable to consumers,” interest in gardening decreased and school “garden plots were replaced with playgrounds and athletic fields” (Burt, 2016, p. 308-309). Gardening was rebranded by other causes that allowed for a few exceptions to the decline of gardening after 1950. During the Civil Rights Era in the 1960s, social movements that aimed at “reducing disparities related to race and poverty” had connected school gardening as “peripherally attached to these issues, as child nutrition became a focus of schools” (Burt, 2016, p. 309). In the 1960s and ‘70s, community- and urban-gardening were at the center of a growing local foods movement that formed in response to and rejection of the post-war industrial food system. Additionally, “gardening was reframed as a progressive approach to teaching environmental awareness” (Burt, 2016, p. 309).

As a result of the decades of steady decline in school gardening and agricultural education after WWII, the Department of Agriculture (USDA) recognized the need to reincorporate agricultural learning in American schools and improve agricultural literacy. In 1981 the USDA established a taskforce committee to create learning standards about the food system, sparking a new movement to integrate agricultural literacy into the general education curriculum. This led to the USDA's Agriculture in the Classroom Initiative and the development of many "state-run gardening and agriculture-related programs designed by each state to meet their own educational needs" (Burt, 2016, p. 310). According to Burt (2016), the new wave of the school garden movement that reemerged in the 1990s is a "coupling of multiple streams of social attention focused on changing food systems, the deteriorating health of Americans, and the push for educational reform [and] fueled even more attention to school gardening" (p. 310). National and local efforts to promote school gardening in the 1990s and early 2000s has been part of a "strategy for schools to provide more nutritious foods and teach nutrition education, framing school gardens as a hands-on teaching tool to enrich students' academic experience as well" (Burt, 2016, p. 312). In 2015, the National Farm-to-School Census Report by the USDA, surveyed 18,104 public, private, and charter schools in 50 states about their farm-to-school activities, in which over 7,000 (38%) reported having an edible school garden on-site where students learned about food and gardening. Schools reported using educational gardens for targeted learning about health and nutrition, the environment and natural sciences, and agricultural literacy, among many other topics.

Despite its fluctuations in popularity, gardening was never fully abandoned by schools. Contemporary movements for garden-based education were linked to different

social causes including environmental education, agricultural literacy, sustainable local foods, and efforts to address childhood obesity, nutrition, and school food. School gardens are a “mainstay in the United States as a result of their fluidity and unique ability to attach to important social, health, and political issues” (Burt, 2016, p. 297). School gardening continues to be relevant today in the form of edible schoolyards and outdoor classrooms across the country with newfound purpose of improving public health, promoting agricultural literacy, and providing access to healthy food for students, families, and schools. The diversity of school gardens in their implementation and impact over the decades has been a major factor in the widespread applicability and adaptability of gardening as a tool or method capable of capturing an array of different educational goals and objectives.



## **A Survey of South Dakota School Gardens**

The framework for this study relied on a historical literature review of primary and secondary sources to gain an understanding of the historical developments and evolution of school gardening in the United States, as a basis for understanding its contemporary applications. The historical research and literature review of school gardens and garden-based education revealed a strong relationship between school gardening and agricultural education. In this section, data and findings from a survey of school gardens in South Dakota are presented to inform the reader about the contemporary context and applications of gardening in education. The central objective of this descriptive study was to better understand how school gardens in South Dakota are related to teaching in K-12 education. The results of the survey are highlighted below.

### **Methods and Data Collection**

For this study, a 30-question survey was developed and distributed electronically to 152 teachers and educators, each representing a distinct school, that were geographically dispersed across the state of South Dakota. A definition for a “school garden” was provided to all participants at the beginning of the survey. A “school garden” was defined as: a space for growing plants, either indoors or outside, that is used for teaching and student learning. The inclusion of classroom-based or indoor gardens in this definition was intentional, considering South Dakota’s climate and the likelihood that school gardens could be built in protected indoor spaces because of the winter weather during most of the academic school year. This definition was used to establish a baseline understanding for participants and to allow for as many different variations and kinds of school gardens to be included in the sample and study.

The survey focused specifically on questions about the characteristics of the school garden, the subjects taught in connection to gardening, student and teacher involvement, and the impact of gardening on students. The survey questions were informed by the researcher's own professional experience working in school gardens and with the South Dakota State University Extension 4-H Program, as well as through themes that were identified in the historical literature that was reviewed in this study. The survey instrument is included in the Appendix for reference.

Participants in the study were identified through a convenience sample of e-mail addresses posted publicly on education websites. The electronic survey questionnaire was e-mailed to one teacher or contact at each school. A total of 152 contacts were invited to take the survey through a link they received by e-mail. The list of contacts included: 40 general-education teachers (including school administrators, principals, counselors, etc.) across the K-12 education system, whose email addresses were listed on the South Dakota Department of Education website ([doe.sd.gov](http://doe.sd.gov)); and 108 agriculture-education teachers (i.e., FFA advisors/teachers) who were listed in a directory on the South Dakota Future Farmers of America (FFA) website ([www.sdaged.org](http://www.sdaged.org)). Additionally, survey participants were asked to provide references and contact information of any additional teachers with a school garden who should be invited to take the survey. This snowball strategy led to an additional 4 survey participants. It is important to note that while there was a concerted effort made to contact at least one school from each school district across the state, not every school or school district is represented in this study.

Only those participants who responded fully to the survey questionnaire were counted in the final data set. There was a 26% completion rate for the online survey. Of

the 152 total educators who were contacted to participate in the study, 41 respondents completed the survey and were counted as participants. The electronic survey was distributed to participants through the QuestionPro online platform, which tracked contact information and emails that were sent, including reminder emails to those who had not yet completed the survey. Four e-mails (the initial survey invitation plus three reminders) were sent over an eight-month period, from September 2019 to May 2020, to give ample time for participants to respond to the survey over the course of the school year. The QuestionPro tool was also used to track survey responses and data that was collected. Survey responses were tagged with each participant's unique computer I.P. address to ensure that each survey response was a distinct participant representing a distinct school. The dataset was filtered to include responses from all participants who completed the survey in its entirety, excluding any incomplete or partially completed surveys. The total sample of participants in this study is 41 school-garden educators. The 23 participants that reported a school garden at their school represented a broad range of schools, including: 19 public schools, three private schools, and five Reservation schools; five elementary schools, eight K-12 schools, and 10 middle/high schools. The largest demographic of participants (18) that reported a school garden was agricultural teachers.

The central purpose of this study and survey was to capture descriptive details and information about school gardens in South Dakota. The data that was collected about these school gardens included: the garden's physical characteristics (i.e. area, features, types of plants/crops grown, etc.), the gardening curriculum and subjects or classes that were taught in connection to the garden, the educational objectives, grade levels of students that were involved in the garden, and other details about the garden like its

sources of funding, and how many teachers or staff were responsible for maintaining the garden. Additionally, a secondary motive for the survey instrument was to understand what potential barriers or challenges existed for schools that do not have a school garden. The survey was designed through a logic model, which redirected respondents who answered “no” to the question about having a school garden, to a shorter survey about the challenges that prevented them from having a school garden. The major challenges that educators cited as reasons they could not, or did not, have a school garden were: lack of funding (15%), lack of adequate space (12%), limited teacher availability (19%), and lack of gardening experience or difficulty maintaining a garden (18%).

### **Results and Findings**

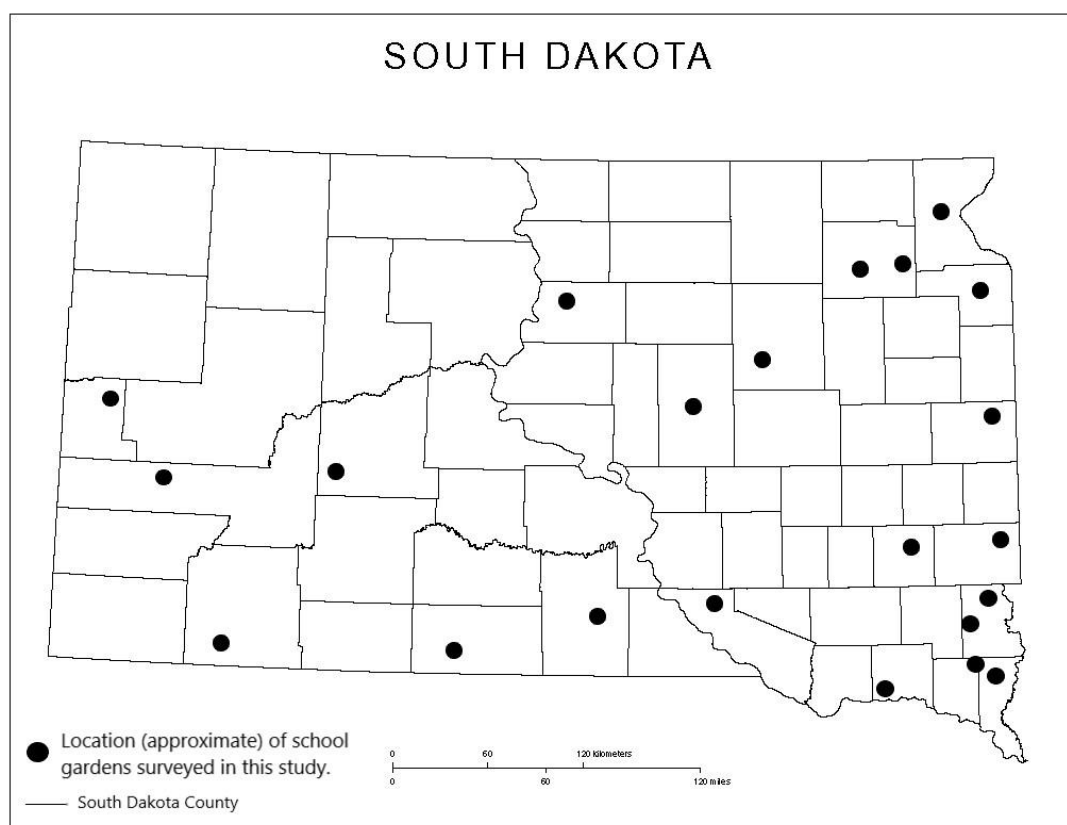
The results of the survey showcase the features and functions of school gardens in South Dakota schools. There was a total of 41 participants in the study: 23 respondents reported having a garden, while 18 reported they did not have an educational garden at their school. See Figure 1 for a map with the approximate locations of each school garden that was reported in this study. Most of the school gardens (91%) were located on the school’s campus, including a 40-acre land lab and a hydroponics lab. None of the respondents reported garden-based instruction in the form of home-garden projects.

Most of the school gardens in this study were less than 10,000 square feet (86%) in size, 16 of which were 2,500 square-feet or less. This finding reveals that a majority of school gardens are relatively small in size with few exceptions. Only a slight majority (59%) of school gardens were located outdoors. Nine schools reported indoor “gardens” and growing spaces that included indoor planters, grow stations, and hydroponics systems. Survey respondents also reported on the different garden features that were

present at their school gardens. In Table 1 an aggregated number of different school garden features are listed. These features account for both indoor and outdoor school gardens. A review of this list reveals that the most common features were a dedicated teaching space, pots and planters, raised beds, indoor grow-stations, greenhouse structures and hydroponics units. Some of the less-common features in school gardens were also identified, including rainwater collection, irrigation systems, and interpretative or educational labels. This finding highlights potential areas for improvement to the efficacy, sustainability and impact of school gardens.

**Figure 1**

*Map of South Dakota School Gardens in this Study*



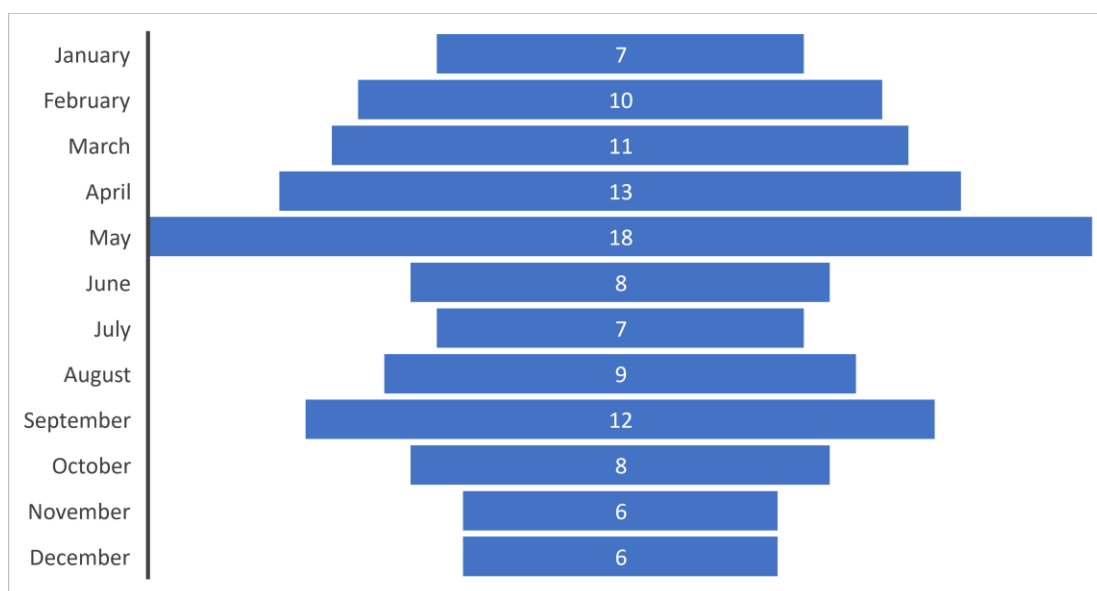
**Table 1***School Garden Features Reported by Participants*

<b>Garden Feature</b>	<b>Count (<i>n</i>=23)</b>
Raised beds	11
Greenhouse	10
Outdoor classroom (teaching space)	8
Pots & planters	8
Indoor grow stations	8
Hydro/Aquaponics	5
Compost bins	5
Tool shed/storage	5
Pathways & accessibility paths	5
In-ground beds or planting areas	4
Benches, tables, or other seating	4
Perennial plants & shrubs	3
Season-extension & hoop house(s)	3
Rainwater collection	2
Fencing around the garden	2
Irrigation system	1
Animals (chickens, ducks, pigs, etc.)	1
Interpretive signs/educational labels	1
Tree orchard	1
Natural playground	1
Theme garden or specialized area	1
Other	1
Automated watering	0
Beehives	0
Weather monitoring station	0

School gardens were reportedly used most during the months of April (13), May (18), and September (12) (see Figure 2). It is not surprising that school gardens in South Dakota were less utilized during the summer and winter months, since schools are typically out-of-session over the summer and because the climate in winter is generally not conducive to gardening. However, gardens were still in use throughout the year by several schools (see Figure 2), with an overall average usage of five months during the year. At least five school gardens in the study were used for nine months or more over the course of the entire school year. As previously indicated in Table 1, there were ten schools that reported a greenhouse structure as part of their school garden, which may be how these gardens were able to operate throughout the school year during the colder months of winter. Over the summer months at least seven schools continued to maintain and use their gardens. Fifteen survey respondents reported that one teacher was designated as primarily responsible for maintaining and caring for the school garden during the school year and over the summer, assisted by students who helped with watering the garden during the summer. Additionally, most of the school gardens (67%) had only one teacher or staff at the school that was responsible for the garden even though at some schools there were, at most, five or more classes of students that were involved in learning activities in the school garden. This finding points to another area of improvement and the need for more support for garden-education teachers to help maintain, grow, and sustain school gardens.

**Figure 2**

*Months when School Gardens were used in South Dakota*



*Note.* Data are the reported months when school gardens were used ( $n=23$ ).

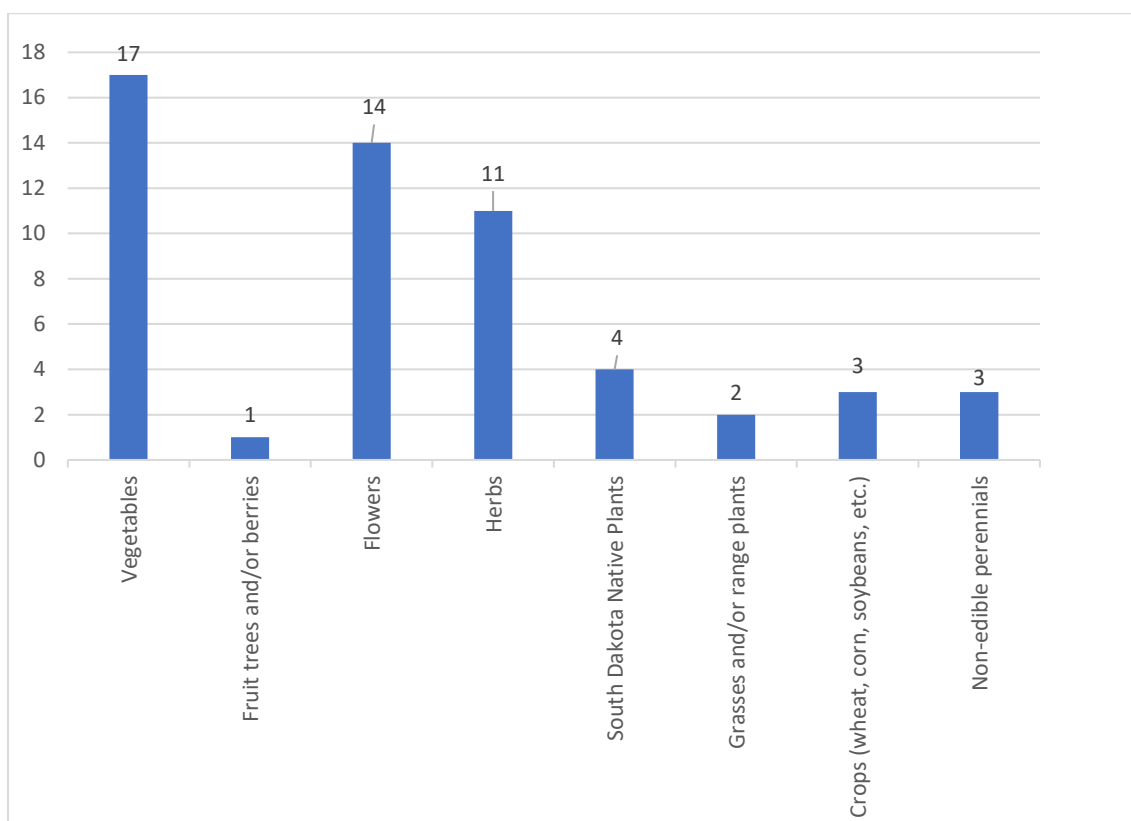


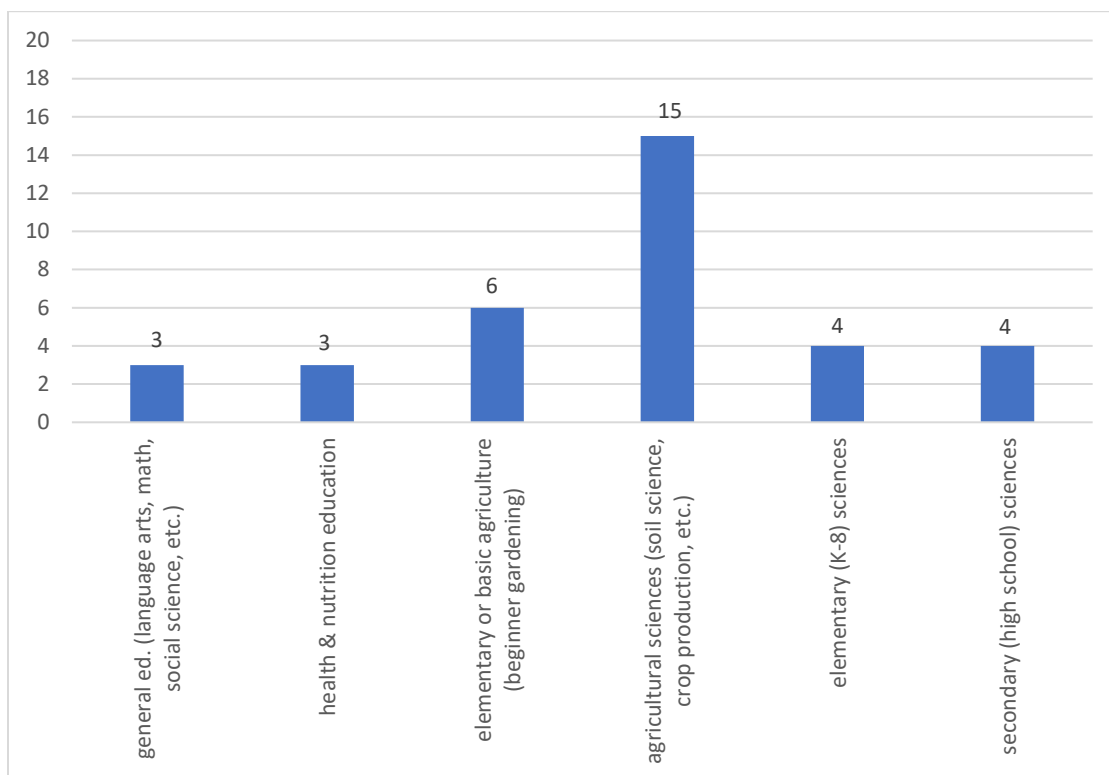
Based on the results of the survey, none of the school gardens in the study was equipped with an automated watering system and only one garden had an irrigation system of any kind (see Table 1). This finding highlights another potential area for improvement for school gardens by incorporating more efficient watering methods to improve the garden's operations and function and reduce the task of maintaining the school gardens. School-garden teachers should consider using more efficient watering methods like drip-line irrigation and automated timers in their school gardens, not only to help reduce the workload on teachers, but also to teach students about water-efficient irrigation methods and the technical aspects of constructing, maintaining, and monitoring irrigation systems in a garden or agricultural field.

School gardens were primarily used to grow vegetables (31%), flowers (25%), and herbs (20%) (see Figure 3). The food and produce that was grown in the gardens was mainly used in classroom instruction (39%), eaten by students at the school (30%), and distributed to students, teachers, and the local community (30%). Agricultural sciences (42%) and beginner or elementary gardening (17%) were the main subjects that were taught in connection to school gardens. Other general-education subjects were also taught using school gardens, including health and nutrition, elementary (K-8) sciences, and secondary (grades 9-12) sciences (see Figure 4). Survey participants were also asked to identify the main purpose of their school garden in an open-response-type question. Common themes in these responses about the purpose of the school garden included: hands-on learning, experiential learning, growing plants, learning about food and crop production, agricultural sciences, health and nutrition, and life skills.

**Figure 3**

*Kinds of Plants in School Gardens in South Dakota*

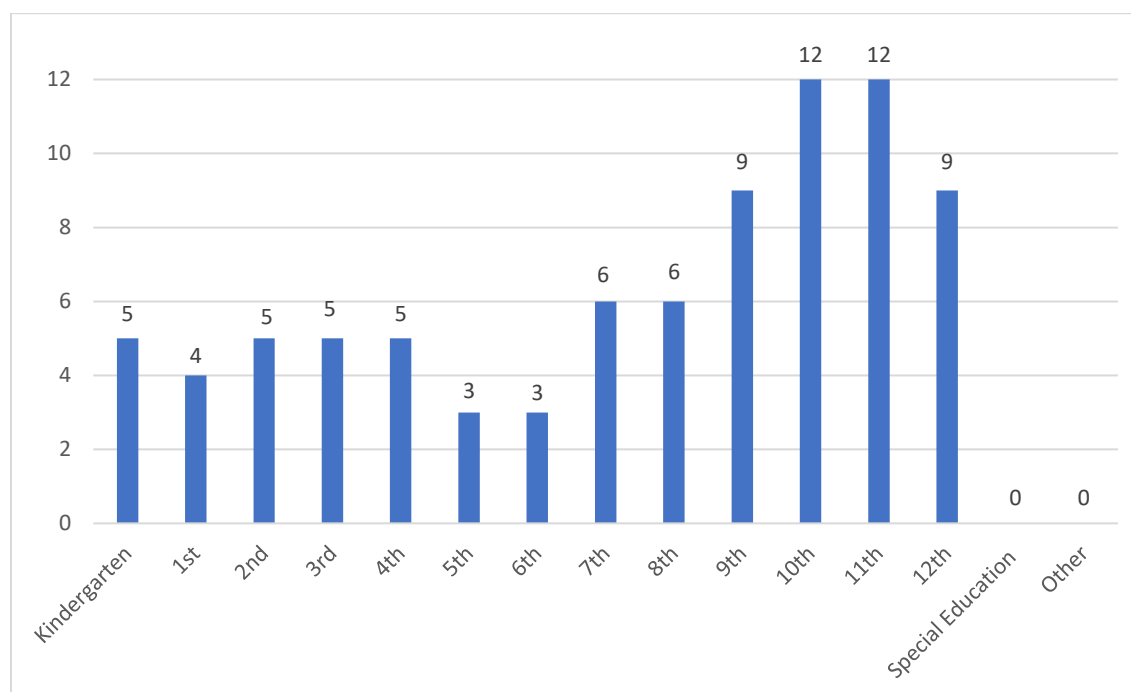


**Figure 4***Academic Subjects Connected to School Gardens*

Survey respondents also reported on key information about the students that were involved in garden-based learning in the school garden, including their grade levels and any positive outcomes that were observed in student learners. Across the state, students of all grade levels experienced learning in school gardens, however, more school gardens were used for secondary education to teach students at higher grade levels (see Figure 5). Given that the majority of respondents were teachers from upper grade levels, and 78% of the school gardens in the study were used by agricultural education teachers (i.e. FFA advisors) this finding is not surprising and may be skewed. However, this finding is significant because it shows that gardens are applicable to both elementary and secondary education. It also highlights which students are not participating in garden-based learning as often as others. For example, there was a significant decline in the number of school gardens that engaged learners in upper elementary/middle school grades levels (see Figure 5). Additionally, none of the school gardens in the study were reportedly used to teach special education classes. These findings are in line with the accounts of historical school gardens in elementary education (for both general education and elementary agriculture) and as a method to teach secondary agricultural sciences. The majority (78%) of school gardens in the study had approximately 50 students or less that were directly involved in learning in the garden; two schools in the study had gardens that were used by 100 students or more at the school. Survey respondents also reported on some of the positive changes they observed in students who participated in garden-based learning activities. Table 2 shows a list of the positive changes that teachers observed in students who participated in school gardens.

**Figure 5**

*Grade Levels of Students that Participated in School Gardens in South Dakota*

**Table 2**

*Positive Changes Observed in Students in School Gardens*

Positive Change Observed	Count (n)
Gardening skills and knowledge	13
Appreciation for the outdoor environment/nature	9
Attitudes and perceptions toward healthy foods	7
Academics & learning outcomes	6
Nutritional choices (i.e. eating more healthy foods)	5
Community engagement & leadership skills	5
Social engagement with peers & other students	5
Morale, attitude, or behavior at school	4
Social skills and/or behaviors	3
Other ("agriculture awareness")	2

### **Further Discussion**

The success of multiple school garden movements in America over the last century is a mark of the versatility and adaptability of school gardens to address a variety of educational objectives. The effectiveness of garden-based education is evident in the positive outcomes on student learning and social-emotional development (Williams & Dixon, 2013; California School Garden Network, 2006). School gardens have widely varied depending on their local context, purpose, objectives, physical characteristics, audience, and other key features. School gardens have been incorporated into a wide spectrum of elementary and secondary education with particular interest in supplementing classroom-based learning and enriching the learning experience with active, hands-on experiences. School gardens and garden-based education offer many benefits to students, in addition to providing beautification of schoolyards and the potential to foster local community engagement to improve health and wellbeing.

Over more than 150 years, school gardens have been used as an educational tool to enhance teaching and learning, increase depth of knowledge, and make learning more meaningful to students. In addition to enriching classroom-based teaching, educational school gardens provide direct opportunities for hands-on and experiential learning in natural sciences, agriculture, health and nutrition, and a myriad of other academic subjects and life-skills. Garden-based learning benefits student academic achievement and practical skills development in gardening and impacts the social or behavioral development of students. The variety of ways in which gardens have been implemented across the K-12 curricula is a testament to gardening as an effective teaching method that has numerous applications to education and beneficial outcomes for students. Successive

plantings of school gardens over the decades and across the country, and the continued use of gardening in schools today, has sustained the school gardening movement.

School gardens are a mainstay in American education and have seen an influx in more recent decades due to renewed efforts to teach about health and nutrition and connect students to natural environments and real-life learning experiences. The historic rise of school gardening in American education is owed in part to the changing tides of America's social and political history (Kohlstedt, 2008). The popularity of school gardening is a result of many factors and reflects the pedagogical shift toward hands-on and active learning methods. The whole-child approach at the center of progressive education and garden-based learning has persisted in public education to provide meaningful learning experiences and benefit the academic, physical, emotional, and socio-behavioral development for all students.

School gardens in all forms continue to be used as a teaching method for the benefit of student learning and development and serve as effective hands-on teaching tools that enhance student learning. School gardens and garden-based learning have been shown to have a positive impact on the academic achievement of students and depth of knowledge achieved in core subjects (Williams & Dixon, 2013). The survey results in this study indicate that school gardens in South Dakota have had positive impacts on students, including improved skills development and learning. Further research is still needed on the effectiveness of garden-based education and its impacts on secondary students' academic achievement in agricultural, however, there is significant evidence that gardens are effective in achieving positive outcomes for student learning in general education. Gardening has also been shown to positively affect the social and behavioral

development of students, and improve food literacy, nutrition, and healthy-eating behaviors of students and their families.

The results of this study on South Dakota school gardens confirmed there is a strong continuation of historical trends in school gardening as a teaching method employed in *both* agricultural education and general education. School gardening and garden-based teaching methods were historically implemented across the K-12 curriculum, to teach both elementary and secondary students. School gardens and garden-based education were historically applied to secondary education especially for agricultural learning and vocational training (Dadisman, 1921; Bricker, 1911; Gregory, 1911; Harbout, 1909; Myers, 1923; Oliver, 1953; Robison, 1911; Thomas, 1920). Based on the findings of this study, school gardens in South Dakota were connected to subjects in both general and agricultural education and were used across the K-12 curriculum. South Dakota's school gardens were deeply connected to agricultural education and more commonly used at the secondary level. This finding highlights South Dakota's rural context and the impact of school gardening in agricultural education, echoing the historic ties of school gardens to agricultural education and rural development. School gardens continue to be used to teach students a variety of subjects and skills, however, a defining purpose of school gardens and garden-based education today is to teach elementary gardening and agricultural sciences. Garden-based education is central to the experiential learning outcomes in agricultural education.

Contemporary research on school gardens supports the implementation of garden-based experiential learning components in high school and middle school agricultural education programs. As Cramer & Ball (2019) emphasized, gardening must continue to



be implemented in education so that students can fully benefit from experiential learning; and school gardens must remain at the center of garden-based learning as the physical location for teaching garden lessons. By “preserving the school garden as context, in addition to teaching gardening content further aligns effective elementary garden-based learning with its parallel in secondary agricultural education” (Cramer & Ball, 2019, p.49). Garden-based learning in elementary schools has the potential to bridge the gap between general and agricultural education and prepare students for more advanced learning in secondary agricultural education. School gardens have the potential to provide students with valuable learning opportunities and hands-on experiences to develop practical skills in agriculture and other subjects. School gardens are a necessary extension of the classroom, as field-based experimental laboratories and natural tools for effective teaching that facilitate experiential learning in agriculture, science, and education all-around.

## APPENDIX

### Survey of School Gardens in South Dakota

Please answer the following questions about your school garden.

For this study, a *school garden* is defined as: a space for growing plants, either indoors or outside, that is used for teaching and student learning.

1. Is there a school garden of any kind at your school?
  - a. Yes
  - b. No [if no, skip ahead to Question 23 and continue to the end of the survey]
  
2. Where is your school garden located?
  - a. On school grounds or school property
  - b. Not at the school
  - c. At a local community-garden site
  - d. As home-garden projects at each student's homes
  
3. Is the school garden located indoors or outside?
  - a. Indoors (e.g. in the classroom, grow stations, indoor aquaponics, planters near windows, etc.)
  - b. Outdoors (e.g. raised beds or in-ground, greenhouse, high tunnels, etc.)
  
4. What is the approximate size of your school garden's growing space?
  - a. 2,500 sq. ft. or less
  - b. 25,01 – 5,000 sq. ft.
  - c. 5,001 – 10,000 sq. ft.
  - d. ¼ acre – ½ acre (10,890 – 21,780 sq. ft.)
  - e. ½ acre to 1 acre
  - f. Between 1 – 5 acres
  - g. More than 5 acres
  - h. Unknown
  
5. Are any of these features included in your school garden? Mark all that apply.
  - a. Outdoor classroom (teaching space)
  - b. Benches, tables, or other seating
  - c. Fencing around the garden
  - d. Greenhouse
  - e. Season-extension hoop-houses
  - f. Drip-line irrigation
  - g. Automated watering system
  - h. Hydro-/Aquaponics
  - i. Beehives
  - j. Animals (chickens, ducks, pigs, etc.)
  - k. Tool shed or storage

- l. Raised beds
- m. In-ground beds or planting areas
- n. Pots & planters
- o. Pathways & accessibility paths
- p. Interpretive signs/educational labels
- q. Rainwater collection
- r. Weather monitoring station
- s. Outdoor kitchen (food-prep station)
- t. Sink or wash station
- u. Compost bins
- v. Tree orchard
- w. Classroom or indoor grow-stations
- x. Perennial plants & shrubs
- y. Natural playground
- z. Theme garden or specialized area
- aa. Other:\_\_\_\_\_

6. During which month(s) of the year is the school garden used? Mark all that apply.

- a. January
- b. February
- c. March
- d. April
- e. May
- f. June
- g. July
- h. August
- i. September
- j. October
- k. November
- l. December

7. Who is responsible for maintaining the school garden during the summer?

8. How many teachers or staff are involved in the school garden?

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5
- f. More than 5

9. Which kinds of plants are grown in the school garden? Mark all that apply.

- a. Vegetables
- b. Fruit trees and/or berries

- c. Flowers
- d. Herbs
- e. South Dakota Native Plants
- f. Grasses and/or range plants
- g. Crops (wheat, corn, soybeans, etc.)
- h. Non-edible perennials
- i. Other:\_\_\_\_\_

10. How is food that is produced in the garden used? Mark all that apply.

- a. In classroom instruction or student learning activities
- b. For cooking and nutrition education classes
- c. Informally picked and eaten by people in the garden
- d. Sent home with students and/or students
- e. Incorporated into school meals served in the cafeteria
- f. Donated or sold locally
- g. Other:\_\_\_\_\_
- h. N/A – No edible food is produced in the garden

11. Does your school participate in the National Farm to School Program?

- a. Yes
- b. No

12. Is your school garden connected to a particular subject, program, or class?

- a. Yes
- b. No

13. What subjects are taught in connection with the school garden? Mark all that apply.

- a. General education (language arts, math, social science, etc.)
- b. Health & nutrition education
- c. Elementary or basic agriculture (i.e. beginner gardening)
- d. Agricultural sciences (e.g. soil science, crop production, etc.)
- e. Elementary (K-8) sciences
- f. Secondary (9-12) sciences
- g. Other:\_\_\_\_\_
- h. N/A

14. How many classes are involved with the school garden?

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5 or more
- f. Unsure

15. What grade level(s) of students participated in learning activities in the school garden during the school year? Mark all that apply

- a. Kindergarten
- b. 1st grade
- c. 2nd grade
- d. 3rd grade
- e. 4th grade
- f. 5th grade
- g. 6th grade
- h. 7th grade
- i. 8th grade
- j. 9th grade
- k. 10th grade
- l. 11th grade
- m. 12th grade
- n. Special Education
- o. Other:\_\_\_\_\_

16. About how many students use the school garden or participate in learning activities in the garden?

- a. 1-10
- b. 11-25
- c. 26-50
- d. 51-100
- e. More than 100
- f. Unsure/unknown

17. Which of the following positive changes, if any, have you observed in students who have participated in the school garden? Mark all that apply.

- a. Improved gardening skills/knowledge
- b. Improved attitudes or perception toward healthy foods
- c. Improved nutritional choices (i.e. eating more healthy foods)
- d. Improved social skills and/or behaviors
- e. Appreciation for outdoor environment and/or nature
- f. Increased community engagement & leadership skills
- g. Improved academics & learning outcomes
- h. Improved morale, attitude, or behavior at school
- i. Improved social engagement with peers & other students
- j. No changes were observed
- k. Other:\_\_\_\_\_

18. What are the main educational objectives of your school garden?

19. What curricula or teaching resources, if any, do you use in the school garden for garden-based learning?
20. What evaluations or assessments, if any, do you use to measure the impact of your school garden?
21. Which of the following extra-curricular activities, if any, does your school garden serve? Mark all that apply.
- a. After school programs
  - b. Community outreach events
  - c. Student clubs (e.g. 4-H, FFA, etc.)
  - d. Service-learning projects
  - e. Community gardening workshops
  - f. Recess or playground activities
  - g. Summer school program
  - h. Other: \_\_\_\_\_
  - i. None
22. What sources of funding have been used for your school garden?
- a. School or district funds
  - b. State or national government grants (e.g. USDA, DOE)
  - c. Non-governmental/non-profit organizations grants
  - d. Local community sponsors
  - e. School fundraisers
  - f. Other: \_\_\_\_\_
  - g. N/A

**Skip to Question 25-28.**

Respond to Questions 23 & 24, *only* if you DO NOT HAVE A SCHOOL GARDEN.  
Continue to the following questions through to the end of the survey.

23. To your knowledge, has there previously been a school garden at your school?
- a. Yes
  - b. No
  - c. Unsure
24. Does your school plan to start a school garden?
- a. Yes, we are currently planning to start a garden
  - b. There is interest, but no plans to start a garden
  - c. No, there is no interest to start a school garden

25. What challenges, if any, does your school face with having (or starting) a school garden? Mark all that apply.

- a. Lack of adequate funding
- b. Lack of adequate space
- c. Lack of gardening materials
- d. Lack of instructional materials or gardening curriculum
- e. Lack of staff or teacher availability
- f. Lack or volunteer support
- g. Lack of administrative or district support
- h. Lack of teacher's knowledge or experience with gardening
- i. Difficulty incorporating the garden into core academic subjects
- j. Difficulty maintaining the garden during the summer
- k. Difficulty maintaining a garden during the winter (weather conditions)
- l. Gardening requires too much time commitment from teachers and staff
- m. Other reason: \_\_\_\_\_

26. Participant's Contact Information (**Optional**)

The information collected is confidential and will not be reported or shared

Your Name:

Title/Role:

School:

Phone #:

Email Address:

27. Would you be willing to participate in a follow-up interview about your school garden?

- a. Yes
- b. No

28. Are there any teachers at other schools that you know of who have a garden at their school? Please provide their contact details to refer them as a participant for this study.

Teacher's Name:

School:

Email Address:

Thank you for completing this survey!

## REFERENCES

- Alice, R. S. & Henry, R. D. (1979). Developing an on-campus environmental garden. *The American Biology Teacher*, 41(1), 18-20. <https://www.jstor.org/stable/4446447>
- Bennett, H. C. (1906a). The school garden. *The Journal of Education*, 63(13), 344-346. <https://www.jstor.org/stable/42809740>
- Bennett, H. C. (1906b). The school garden. *The Journal of Education*, 63(14), 374-376. <https://www.jstor.org/stable/42809769>
- Blakeslee, A. F. (1910). The botanic garden as a field museum of agriculture. *Science*, 31(801), 685-688. <https://www.jstor.org/stable/1635579>
- Branom, M. E. (1919). The project method in education. The Gorham Press.
- Bricker, G. A. (1911). The teaching of agriculture in the high school. The Macmillian Company.
- Bricker, G. A. (1914). Agricultural education for teachers. American Book Company.
- Burt, K. G. (2016). A complete history of the social, health, and political context of the school gardening movement in the United States: 1840-2014. *Journal of Hunger & Environmental Nutrition*, 11(3), 297-319. <https://doi.org/10.1080/19320248.2016.1157542>
- California School Garden Network (2006). Gardens for learning: Creating and sustaining your school garden. [http://www.csgn.org/sites/default/files/CSGN\\_book.pdf](http://www.csgn.org/sites/default/files/CSGN_book.pdf)
- Corbett, L. C. (1905). Farmers' bulletin no. 218: The school garden. Government Printing Office.
- Cramer, S. E. & Ball, A. L. (2019). Wild leaves on narrow STEMs: Exploring formal and non-formal education tensions through garden-based learning. *Journal of*



*Education*, 60(4), 35-52. <https://doi.org/10.5032/jae.2019.04035>

Dadisman, S. H. (1921). Methods of teaching vocational agriculture in secondary schools. R.G. Badger.

Davis, B. M. (1905). School gardens for California schools: A manual for teachers. Superintendent State Printing.

Davis, B. M. (1910). Agricultural education: State normal schools. *The Elementary School Teacher*, 10(8), 376-387.

<https://www.journals.uchicago.edu/doi/pdfplus/10.1086/453972>

Dewey, J. (1903). Democracy in education. *The Elementary School Teacher*, 4(4), 193-204. <https://www.jstor.org/stable/992653>

Galloway, B. T. (1905). School gardens: A report upon some cooperative work with the normal schools of Washington, with notes on school-garden methods followed in other American cities. U.S. Government Printing Office.

Gardens for public schools. (1879, August 24). The Sun.

<https://chroniclingamerica.loc.gov/lccn/sn83030272/1879-08-24/ed-1/seq-4/>

Gregory, W. M. (1911). The school gardens of Cleveland, Ohio. *The Journal of Education*, 73(10), 255-257. <https://www.jstor.org/stable/42818083>

Harbourt, S. A. (1909). Agriculture in the high school. *The Journal of Education*, 70(16), 430-431. <https://www.jstor.org/stable/42812389>

Hayden-Smith, R. (2014). Sowing the seeds of victory: American gardening programs of World War I. McFarland & Company, Inc.

Hemenway, H. D. (1903). How to make school gardens, A manual for teachers and pupils. Doubleday, Page & Company.

- Heuchling, F. G. (1944). Childrens' gardens in Chicago. *The American Biology Teacher*, 6(5), 103-107. <https://www.jstor.org/stable/4437481>
- Hillison, J. (1998). Agriculture in the classroom: Early 1900s style. *Journal of Agricultural Education*, 39(2), 11-18. <https://doi.org/10.5032/jae.1998.02011>
- Hirschi, J. S. (2015). Ripe for change: Garden-based learning in schools. Harvard Education Press.
- Jackson, C. R., & Daugherty, L. S. (1913). Agriculture through the laboratory and school garden: A manual and text book of elementary agriculture for schools. Orange Judd Company.
- Jenks, F. B. (1909). Practical agriculture in rural schools. *The Journal of Education*, 70(4), 93-94. <https://www.jstor.org/stable/42813831>
- Jewell, J. R. (1907). Agricultural education, including nature study and school gardens. Government Printing Office.
- Kern, O. J. (1919). Outline studies on the school garden, home and garden and vegetable growing projects. University of California College of Agriculture.
- Kohlstedt, S. G. (2008). "A better crop of boys and girls": The school garden movement, 1890-1920. *History of Education Quarterly*, 48(1), 58-93. <https://www.jstor.org/stable/20462206>
- Latter, L. R. (1906). School gardening for little children. Swan, Sonnenschein & Company.
- Leake, A. H. (1915). The means and methods of agricultural education. Houghton Mifflin Company.
- Marsh, E. (n.d.). The school garden. U.S. Department of Agriculture, National

Agricultural Library. <https://nalgc.nal.usda.gov/school-garden>

Merritt, E. (1915). Bulletin of the U.S. department of agriculture no. 213, the use of land in teaching agriculture in secondary schools. Government Printing Office.

Myers, C. E. (1923). Effectiveness of vocational education in agriculture: A study of the value of vocational instruction in agriculture in secondary schools as indicated by the occupational distribution of former students. Government Printing Office.

Nearing, S. (1915). The new education: A review of progressive educational movements of the day. Row, Peterson & Company.

Nolan, A. W. (1918). The teaching of agriculture. Houghton Mifflin Company.

Oliver, M. H. (1953). The school garden: An outdoor laboratory for teaching. *The American Biology Teacher*, 15(1), 5-8. <https://www.jstor.org/stable/4438446>

Ralston, S. J. (2011). It takes a garden project: Dewey and Pudup on the politics of school gardening. *Ethics and the Environment*, 16(2), 1-24.  
<http://www.jstor.org/stable/10.2979/ethicsenviro.16.2.1>

Robison, C. H. (1911). Agricultural instruction in the public high schools of the United States. Teachers College, Columbia University.

Shinn, E. H. (1945). How teachers may promote summer garden projects. *The American Biology Teacher*, 7(8), 184-185. <https://www.jstor.org/stable/4437639>

Stimson, R. (1915). The Massachusetts home project plan of vocational agricultural education. Paper presented at the Harvard Teachers' Association, Cambridge, MA.

Stimson, R. W. (1919). Vocational agricultural education by home projects. The Macmillan Company.

- Thomas, R. H. (1920). Vocational agriculture in high schools. *The High School Journal*, 3(3), 72-74. <https://www.jstor.org/stable/26290502>
- Thomas, R. H. (1922). Vocational agriculture in North Carolina schools. *The High School Journal*, 5(5), 123-125. <https://www.jstor.org/stable/40361393>
- Thomas, R. H. & Walters, H. J. (1920). Some definite achievements in vocational agriculture. *The High School Journal*, 3(6), 174-176. <https://www.jstor.org/stable/40359169>
- True, A. C. (1929). A history of agricultural education in the United States, 1785-1925. US Government Printing Office.
- U.S. Department of Agriculture (2015). The farm to school census. <https://farmtoschoolcensus.fns.usda.gov/about>
- Wake, S. J. (2015). 'Same, same, but different': A comparison of rationales between historic and contemporary school garden development. In M. Ignatieva et al. (Eds.), Proceedings from History of the future: 52nd World Congress of the International Federation of Landscape Architects (pp. 666-671). Polytechnic University Publishing House. <https://hdl.handle.net/10652/3373>
- Williams, D. R. & Dixon, P. S. (2013). Impact of garden-based learning on academic outcomes in schools: Synthesis research between 1990 and 2010. *Review of Educational Research*, 83(2), 211-235. <https://doi.org/10.3102/0034654313475824>