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IMPACT OF SCHOOL GARDEN ON THE TEACHING AND LEARNING OF AGRICULTURAL SCIENCE IN PEKI COLLEGE OF EDUCATION, GHANA

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Peki College, garden, agriculture, skills, perception, teaching and learning.

ABSTRACT

A school garden is an innovative teaching tool and a strategy that incorporates hands-on activities and integrates other disciplines. It is an outdoor living laboratory for real-life learning experiences, which allows for active students' participation in the learning process. The purpose of this study was to examine the impact of a supervised school garden program on students of agricultural science at Peki College of Education (PKCE) in the Volta Region of Ghana. Data was gathered using a structured questionnaire, interviews, and personal observation. The data collected was analyzed using descriptive statistics such as the mean, frequency counts, and percentages. The results found that the garden program provided the student teachers of agriculture with positive new experiences and hands-on learning, which enhanced their academic performance. Participants also learned many useful and life-changing gardening skills, including garden planning, seed nursing and transplanting, pest and disease detection and control, recording, and record keeping. In addition, the school garden project has helped change the negative perceptions student teachers of agriculture held about farming as a lucrative profession.

1.0 Introduction

A school garden, in most cases, is an area of land that is most often within the school compound or nearby for cultivation of ornamental and edible plants such as leafy vegetables, root vegetables, fruits, and herbs. In some cases, animals such as fowl, rabbits, goats, and sheep are kept. Gardens, in general, provide many benefits. They add beauty to our environment, provide fresh fruits and vegetables, clean the air, as well as provide a therapeutic setting (Klemmer et al., 2005; Marsh, 2021).

School gardens come in several shapes and sizes, with the common aim of growing plants and, in some cases, rearing animals. According to Cooke (2007) and Opitz (2017), school gardening is one such approach through which students learn to appreciate agriculture and the consumption of healthy foods such as fruits and vegetables. One of the most important things about vegetable gardening is the understanding and appreciation of where the food we eat comes from. Edible gardens: apart from making students familiar with crop production processes, they often eat the produce that they have grown themselves. This experience often increases the appeal of eating vegetables and develops a better understanding of nutrition (Oostindjer et al., 2017).

The garden engages students by providing a dynamic environment in which they observe, discover, experiment, nurture, and learn (Williams, 2018). According to Eugenio-Gozalbo (2020), the school garden can be compared to a living laboratory where lessons are drawn from real-life experiences rather than textbook examples. This hands-on learning activity allows students to become very active participants in the teaching and learning process.

Vegetable gardening provides learners with many opportunities for learning new things (Rector, 2021). Caring for a living thing, watching it grow gradually, and reaping the benefits helps students develop positive life traits like patience, respect, pride, and, most importantly, commitment (Rector, 2021). These lessons are lifelong and will forever remain with students throughout their lives. It is worth noting that gardening does not only help learners to develop an appreciation for the natural world but also promotes understanding and motivation for studying natural science (McCarty 2010; Passy 2014), since learners enjoy the practical work associated with it while learning subjects such as agricultural science.

Since gardening activities are dependent on fine and gross muscle movement of the body, they help promote children's physical development through manual labour associated activities such as weeding, digging, and general garden maintenance (Bradley & Skelly, 2000; Cairns, 2017). These activities promote good health among students and teachers as a few calories are often burned during garden work. One of the most relevant and exciting things school gardens offer youth is the development of an appreciation for the natural environment and a high sense of interconnectedness that students may not experience in other subject areas of education. This means that practical agriculture through gardening could enhance the teaching and learning of other subjects apart from agricultural science (Trendov, 2018).

Alongside lessons in core academics, gardening teaches vital life skills (Kallhoff, 2017). Planning a garden requires teamwork, patience, and perseverance (Rector, 2021). Although these skills are rarely tested or recorded, the lessons learnt from them will stick with students throughout their lifetime. Therefore, the effort to formally evaluate the educational impacts of the school garden program on student teachers cannot be misplaced.

1.2 Statement of the Problem

Agriculture has also been a major source of livelihood for the rural poor, contributing approximately 22% of Ghana's GDP, employing more than 50% of the labour force and providing over 70% of the food needs of the country (Danso-Abbeam & Baiyegunhi, 2020). In spite of its great potential, agriculture is still left to the elderly or uneducated youth (Njeru, 2017). Interestingly, the study of agriculture as a subject in schools as well as taking up agriculture as a vocation has been declining over the years (Twumasi et al., 2019). Despite the many roles agriculture plays in the economy of Ghana, the study of agriculture as a subject has been faced with declining enrolments at both the secondary and post-secondary levels. This unfortunate situation is born out of the wrong perception that agriculture is non-academic and young school leavers who are farmers are failures in life. This wrong misconception students hold about agriculture education and farming could best be cured through the effective use of school gardening programs.

Fortunately, the undergraduate students of Peki College of Education, offering agricultural science, have always engaged in gardening as part of their academic project with the focus of providing a hands-on learning experience for student teachers in agriculture through an outdoor learning laboratory. However, no formal evaluations on the educational impact of the school garden program on the student teachers' academic, non-academic, skills and perception have been done prior to this study.

1.3 Purpose of the study

The purpose of this study was to assess the impact of a supervised school gardening project on the teaching and learning achievement, skill acquisition, and other benefits of student teachers of agricultural science at Peki College of Education (PKCE), in the Volta region of Ghana.

1.3 Objectives

The specific objectives were:

1. To determine if student teachers gain any academic benefits from the school garden after working in it.
2. To determine if student teachers gain any non-academic benefits from the school garden after working in it.
3. To assess specific gardening skills acquired by student teachers after working in the school garden.
4. To assess the student teacher's wiliness to take up farming after graduation.

1.4 Research questions

1. What are the academic benefits for students after working in a school garden?
2. What are the non-academic benefits students derive from working in the school garden?
3. What specific gardening skills did the school garden offer students?
4. Are student teachers' wiling to take up farming after graduation?

1.5 Significance of the study

The significance of this study is to show the academic and non-academic benefits that students derive from working in school gardens and also to appreciate the source of food they eat. The study found that students have developed positive attitudes and experience through the hands-on learning provided by gardening activities. Evidence from class exercises and researcher observations during lessons revealed that students were able to handle many units in their course outline with ease, including pest and environment, life cycle, sanitation and habitat, temperature and plant growth. The researcher found that the garden project did not only

provide the participants with new experiences and hands-on learning but also corrected the wrong misconception students hold about prospects in farming as a profession.

2.0 Review of literature

2.1 The evolution of school gardens in Ghana

School gardens in Ghana can be traced to the 17th century when formal education started in the Castles and Forts of the colonial masters, which were referred to as the Castle schools. Ornamental plants were grown primarily to beautify the school environment. After Ghana's independence from the British in 1957, conscientious efforts were made by governments to institutionalize gardening, leading to the creation of the Ministry of Parks and Gardens and Tourism through the enactment of the 1961 Local Government Act 54. Apart from its core mandate to improve the rapid development of the horticultural potential of the urban and rural sectors of the country, it is also responsible for providing horticultural training and extension services to students and pupils from universities and second cycle institutions through institutionalized gardening (Dept of Parks & Gardens, 2018).

The surge in urbanization after independence saw the destruction of much green vegetation to make way for increasing industrialization and population. This development across the world culminated in the birth of the garden city model in the late 19th century by Ebenezer Howard as a way of conserving a greater portion of the natural environment in order to create what was described as a mixture of town and rural life in an urban setting (Howard, 1902). Some major cities of quick recall where garden city principles have been effectively applied include Letchworth and Welwyn (first sets of garden cities in the UK), Singapore, Melbourne (Australia), Putrajaya (Malaysia), and Kumasi (Ghana).

This model was adopted by Ghana to ensure that all open spaces in urban areas, be they public or privately owned, are covered by natural vegetation and green landscapes. This policy adherence made one of the Ghanaian cities, Kumasi, gain the famous accolade as the Garden City of West Africa in the 1960s (Asare, 2013; Mensah, 2014; Narh, 2020), a demonstration of how much Ghanaians appreciate the value of gardens.

However, one quick critical question which comes to mind in relation to gardening is; *do our schools still prioritize gardening in recent years, knowing the benefits that are derived from it?* The numerous benefits attached to the garden city model, such as enhancing the health, convenience, and beauty of cities, cannot be wholly disjointed from school gardening programs. Unlike the city garden model, which deals primarily with the growing of ornamental plants, the school garden comprises both ornamental plants and edible plants. A school garden may be as small as just a few pots of flowers or herbs growing in the corridor or entrance of the school or as large as a quarter-to-half-acre plot of vegetables and fruits in the schoolyard ((Belčáková, 2018).

2.2 Academic benefits

School gardens are useful in enhancing academic instruction. The academic achievement of learners is the basic focus of all education providers in the country. Their primary objective is to make sure students at all levels of learning perform satisfactorily as defined by Ghana Education Standards. A school garden is a perfect tool to provide hands-on learning experiences for any academic subject (Williams, 2018). Science is one of the subjects that is mostly linked to gardens in content and practice. A garden can be used as a laboratory by teachers in introducing students to many scientific methods through plant-related experiments.

Also, topics such as weather, insects, soil, and other environmental issues can conveniently be studied in a garden. In addition to science, the garden provides opportunities to teach other useful subjects such as mathematics, history-social science, English-language arts, and visual and performing arts (Trendov, 2018). Concepts that seem abstract in the classroom come alive in a garden setting (Eugenio-Gozalbo, 2020).

2.3 Non-Academic benefits

There are a number of reasons for the value of school gardens. A major one among them is its use as an outdoor "learning laboratory," which is an aesthetically pleasing space for children to play, and most recently, as a place to promote the consumption of fresh produce (Klemmer, et al., 2005). Garden projects also draw on skills and interests not necessarily associated with high achievement in the regular classroom. It offers students opportunities for outdoor exercise while teaching them useful life skills such as handling of tools, planting and post-planting care (Cairns, 2017).

Studies have shown that students who are allowed to learn in an outdoor environment such as a garden have improved environmental attitudes, positive work ethic, increased students' self-esteem and attitudes toward school, patience and responsibility, improved teamwork and relationships, strengthened school spirit, and a positive attitude towards the protection of the environment, especially among younger students (Kallhoff, 2017).

2.4 Nutrition and health

School gardens are a useful tool used for teaching children about nutrition and how to make healthier food choices (Schreinemachers et al., 2015; Oostindjer et al., 2017). Results of a study published in the January 2002 issue of the Journal of the American Dietetic Association have clearly shown how combining learning activities in a school's vegetable garden with nutritional lessons gives teachers a chance to effectively incorporate science into the curriculum, with the added advantage of students becoming more willing to try different vegetables (Shapiro, 2007; April, 2019). Edible gardens provide students with the opportunity to become familiar

with different vegetables and the willingness to eat what they produce since they have more information on them, resulting in an increase in students' interest and love of eating vegetables (Schreinemachers et al., 2017).

Many schools of thought suggest that a properly organized and supervised school garden program should basically focus on improving students' nutrition through the promotion of (a) positive attitudes toward fresh produce by providing experiences of eating high-quality, fresh produce, some of which they may have helped to grow; (b) knowledge of the health benefits of more nutritious eating and the health risks of less nutritious eating; and (c) peer and family norms that are supportive of healthy eating (Blair, 2009; Rector, 2021).

2.5 3 Perceptions of gardening and the farming profession

Notwithstanding the fact that the service and industry sectors in recent times have overtaken agriculture as the leading contributor to Ghana's GDP, agriculture still remains a key to solving the unemployment problem and the overall development of the economy (Darfour and Rosentrater, 2016).

Despite the enormous contribution of agriculture to Ghana's economy, many youths in recent years have developed a cold attitude towards farming as a profession. Naamwintome and Bagson (2013) observed that young people in Ghana, the powerhouse of agricultural growth and development, are distancing themselves from agriculture despite the efforts by successive governments to attract them into the sector by creating employment while producing food for the increasing population. This was also supported by Leavy and Smith (2010), who reported that many young people are not choosing to pursue livelihoods in the agricultural sector, especially as farmers. To them, farming is too drudgery and does not pay well compared to other sectors of the economy.

There is evidence of the poor attitude and perception towards agriculture in Ghana. In fact, the apparent turning away of rural youths from farming, especially in rural Africa, has resulted in an astronomical rise in youth unemployment in recent times. Many of the misconceptions are borne out of poor education, lack of appreciation and inadequate communication about agriculture. The concept of a school garden is an appropriate learning tool that can be used to properly orient and re-orient learners to develop an appreciation for agriculture and the wiliness to take up agriculture as a full-time or part-time vocation.

3.0 Methodology

3.1 The research area

The paper focused on student teachers of agriculture at the Peki College of Education (PKCE) in the Volta region of Ghana. Peki is the largest and oldest traditional town in the South Dayi District in the Volta Region of Ghana. It lies between latitude 6*32'00" N and longitude 14'00" E. The school garden for this study was located within the school compound, with a total land area of about 425m^2.

3.2 Population and sample size

The population of the study was all the final year (level 400) and third-year (level 300) students offering agricultural science during the 2019/2020 academic year. There were 18 final-year students and 13 third-year students, making a total population of 31 students targeted for the study. These two-year groups were selected because the researcher at that time was teaching those two classes, and that made it more convenient. Also, they were specifically selected because they study agriculture and the researcher was interested in collecting information from students offering agriculture with respect to their participation in gardening activities.

3.3 Data collection and analysis

A structured questionnaire was used as a data collection instrument for this study. It is comprised of two main sections, A and B. Section A was used to obtain data on demographic characteristics of respondents such as age, sex, and place of residence, while Section B was used to elicit information on the benefits and skills students of agricultural science derived from the gardening program, their perception towards agriculture, and their willingness to take up farming after graduation. Also, observations by the researcher were utilized to improve the data collected. The collected data was analyzed using descriptive statistics such as mean, frequency counts, and percentages. The results were then presented in tables (Tab. 1,2 & 3) and graphs (Fig. 1 & 2).

4.0 Results and discussion

4.1 Demographic characteristics of respondents/students

The demographic characteristics of the respondents/students were assessed as shown in Table 1. The Agricultural science students of Peki College of Education used in this study were generally young, with 58.1% of students within the ages of 18–25 years. The average age was 23 years. Most of the students (74%) were male, while 25.8% were female. Also, 61.3% of the students come from urban areas. From garden attendance records and personal observation, male and female students showed similar lesson attendance and enthusiasm. Also, the results indicated all the respondents were over 18 years of age, an indication that they are mature and can make future decisions.

Table 1: Demographic characteristics of students of agriculture from PKCE, Ghana.

Demographic characteristics	Frequency	Percentage (%)
Sex:		
Male	23	74.2
Female	8	25.8
Total	31	100.0
Age (Years)		
18-25	18	58.1
Above 25	13	41.9
Total		100.0
Place of Resident		
Rural	19	61.3
Urban	12	38.7
Total	31	100.0

Source: Field data, 2020.

4.2 Academic benefits students derived from participating in school garden

Table 2 below shows all the benefits students derive from working in the school garden. A majority (29%) of the 31 respondents established that school gardens provided the opportunity to understand concepts that were taught in class. According to 25.8 percent of the students, the gardening program makes learning very interesting and lively.

From personal observation, students really enjoyed gardening activities as they offered them the opportunity to learn new things and to feel first-hand what had been taught theoretically in class. According to Williams (2018), the benefits of experiential learning allow for a better understanding of concepts because the hands-on approach provides meaningful and tangible experiences that last a lifetime. Real-life garden experiences contribute greatly to students' understanding and retention of new science knowledge, which in the long term increases students' science achievement scores (Williams, 2018; Eugenio-Gozalbo, 2020).

The results of the improvement in academic achievement by students are expected because of the benefits from increased retention, improved attitudes about agriculture, and engagement in the learning process (Acker and Gasperini, 2009). In addition. when gardens and nutritional information are combined together as a curriculum, student knowledge is greater than that of students who solely receive nutrition lessons (Orenes et al. 2022).

Table 2: Academic benefits students of agriculture from PKCE, Ghana, derived from working in school garden

Academic benefits	Frequency	Percentage (%)
Concepts taught in class easily understood	9	29.0
Learning become very interesting and lively	8	25.8
Healthy social habit	3	9.7
Tool for learning other subjects	4	12.9
Build classroom relationships, improve teamwork	2	6.5
Improvement in science grades	5	16.1

Source: Field data, 2020.

4.3 Distribution of None academic benefits of gardening to students

Apart from the academic benefits, the school garden provides quite a number of non-academic benefits to students. The results in Table 2 showed the non-academic benefits students derived from the school garden program. 29% of the respondents (the highest percentage) stated that the program promotes good nutrition and exercise. Also, 19.4% of the students maintained that the program taught them patience and responsibility, while 3.2% (at least) stated it had instilled in them positive work ethics.

Garden projects draw on skills and interests not necessarily associated with high achievement in the regular classroom. Physical strength, visual-spatial skills, or experience in building are some of the important skills that can be acquired through outdoor programs such as gardening. The best place to exercise and acquire useful skills like patience, perseverance, commitment, and all the positive work ethics is the garden (Kallhoff, 2017)

Table 3: Percentage distribution of none-academic benefits students of agriculture from PKCE, Ghana, derived from working in school garden.

None academic benefits	Frequency	Percentage (%)

Improve self-esteem and positive attitudes toward school	4	12.9
Increase group cohesion	4	12.9
Improve environmental attitudes	2	6.5
Promote good nutrition and exercise	9	29.0
Teach patience and responsibility	6	19.4
Instill a positive work ethic	1	3.2
Perseverance and commitment	5	16.1
Total	**31**	**100**

Source: Field data, 2020.

4.4 Specific gardening skills acquired by students from the school garden

Figure 1 shows the specific skills student teachers of agriculture have acquired from actively participating in the school garden activities. From the results, 29% (the highest) of the participants said they have acquired skills in seed nursing and transplanting; 24% in recording and record keeping; and 14% in garden planning and weed control, respectively. These skills are practical in nature and can best be acquired by students through practical outdoor activities like gardening. Introducing a school garden can have many benefits for students. Students spend more time outdoors after a lot of time in the classroom, through which they will also become equipped with precious real-life skills (Hirschi, 2017; Rector, 2021). After spending their best years in a school with a gardening program, it's likely that almost all students will continue to nurture this love of nature throughout their life.

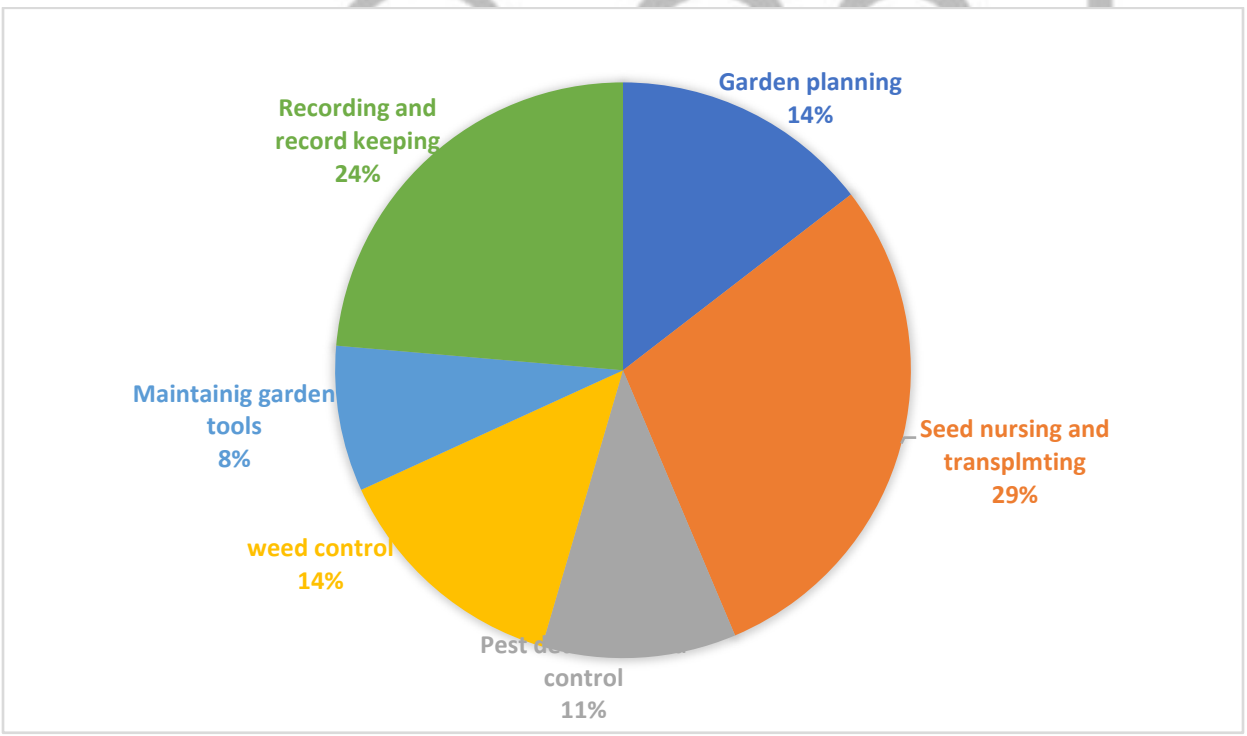

Figure 1: Specific gardening skills acquired by students of agriculture from PKCE, Ghana, for working in a school garden.
Source: Field data, 2020.

4.5 Students' grading of the school garden program

Figure 2 shows students' evaluations at the end of the school garden activities. Out of the 31 students involved in the program, 84% saw the program as "very useful." Also, 15% stated it was "useful", whilst 2% saw it as "not useful", with 1% of the respondents "undecided." Apart from the garden being used as a learning tool, it is also a very important place to break the usual classroom boredom. It is a place to have fun and freely play with nature. The students' evaluation of the school garden as very useful was not surprising as the researcher observed the excitement on their faces when the harvested vegetables (carrots, cabbages, and lettuce)

were shared among them. This satisfaction could be borne out by the fact that their efforts have paid off. It is therefore important to note that through gardening, students can learn not only what they should eat but also obtain a greater appreciation for how food is grown (Malberg, 2018).

Additionally, 89% of the students interviewed were willing to take up farming as a part-time job, while 11% were willing to take up farming as a full-time job. The willingness of student teachers to take up farming as a productive job after graduation, either part-time or full-time, was a positive development. The school garden program has a positive effect on their perception and appreciation of agriculture (Opitz, 2017). School gardens are a tool where pupils can attain life skills that are relevant to the everyday challenges of nutrition, food security, and poverty (Blair, 2009; Oostindjer et al., 2017).

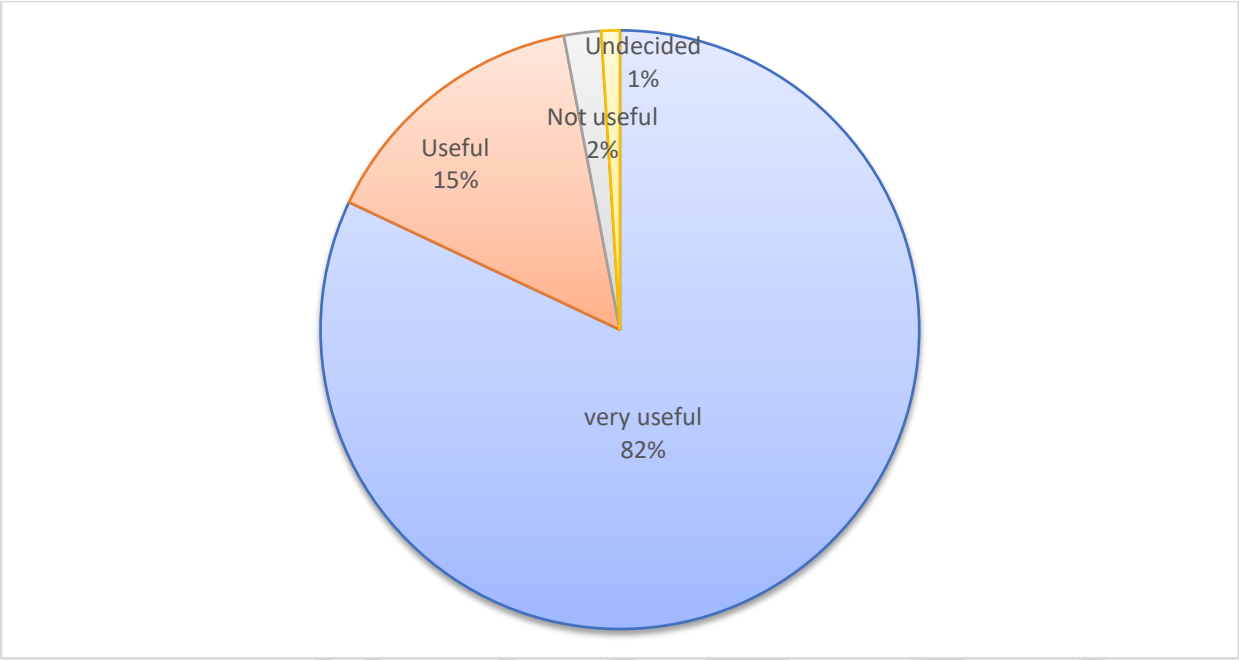

Figure 2: The grading of school gardening programs by students of agriculture from PKCE
Source**:** Field data, 2020.

5.0 Conclusion and recommendation.

Agricultural students at Peki College of Education who participated in the school garden project for the 2019/2020 academic year were generally young, with an average age of about 23 years. All students have indicated that they have benefited greatly from the school garden activities both academically and non-academically. 84% of the students saw the program as "very useful" in enhancing their knowledge not only in agriculture but in other subject areas as well. In addition, students learned many useful and life-changing gardening skills such as garden planning, seed nursing and transplanting, pest and disease detection and control, weed control, garden tool maintenance, recording, and record keeping. Notwithstanding the negative comments and perceptions students interviewed hold about the prospects of farming prior to the garden program, 89% of the students re-interviewed were willing to take up farming as a part-time job, while 11% were willing to take up farming as a full-time profession in future.

School gardening is a very useful tool in teaching and learning, not only in agriculture but in many other disciplines as well. The use of gardens as a tool for learning has evolved through the ages, changing with the educational policies, philosophies, and values of recent times. It is important to see gardening in schools as a means of educating children through an integrated approach and recognizing that the unique potential of every individual child can be realized not only through core academics but also through other stable establishments such as school gardens. In view of this, teachers should be educated and encouraged about the many ways to incorporate a garden into their curriculum.

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