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RESEARCH ARTICLE

IMPACT OF SCHOOL GARDEN PROGRAMS ON STUDENTS' KNOWLEDGE OF PLANT NUTRITION AND GROWTH

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ABSTRACT

School garden programs have become an effective strategy for promoting experiential learning and improving students' understanding of plant-related concepts in science education. This study aimed to determine the impact of school garden programs on students' knowledge of plant nutrition and plant growth among Grade 7 students of Lian National High School at Malaruhatan Annex A during the School Year 2025-2026. Specifically, the study described the respondents' profile in terms of age and sex, assessed their perceptions of the impact of school garden programs in terms of students' experience, behavior, and performance tasks, and determined whether a significant difference existed in their perceptions when grouped according to profile variables.

The study employed a descriptive quantitative research design using a survey questionnaire adapted from previous studies on garden-based learning. The respondents consisted of fifty (50) Grade 7 students who actively participated in school garden activities. Data were analyzed using frequency, percentage, weighted mean, and t-test to determine the respondents' profile, level of perceptions, and differences across variables.

Results revealed that the majority of respondents were 13 years old (44%), and most

were female (54%). In terms of students' experience, respondents agreed that participation in school garden programs helped them better understand plant nutrition and plant growth, with a composite mean of 3.27. Similarly, respondents agreed that gardening activities positively influenced their behavior by promoting responsibly and environmental awareness (composite mean = 3.37). In terms of performance tasks, respondents also agreed that garden-based learning improved their ability to perform plant-related activities, such as planting and monitoring plant development (composite mean = 3.23). Furthermore, statistical analysis showed no significant difference in the perceptions of the respondents when grouped according to age and sex, as all computed p-values were greater than the 0.05 level of significance.

The findings suggest that school garden programs provide meaningful hands-on learning experiences that enhance students' understanding of plant nutrition and growth while fostering positive environmental attitudes and practical skills. Based on the results, learning activities were developed to strengthen the integration of garden-based learning in science education.

INTRODUCTION

School garden programs are school-based activities where students plant, grow, and take care of vegetables, herbs, and ornamental plants inside the school compound. These programs combine hands-on gardening with lessons about science, nutrition, and the environment. Through working in the garden, students can learn about where food comes from, how plants grow, and what plants need to stay healthy like water, sunlight, and nutrients in the soil.

Knowing about plant nutrition and growth is important because it helps students understand basic biology and how to grow food for themselves and their families. When students understand plant needs (such as nitrogen or phosphorus) and how roots absorb nutrients, they can become more responsible with food, healthier eaters, and even help their

families grow vegetables at home. School gardens also make learning more fun and can improve interest in science subjects. Despite clear benefits, many schools have trouble keeping garden programs active. Issues include limited time in the school schedule, lack of funds for seeds and tools, insufficient teacher training on garden lessons, and irregular maintenance when students or staff are absent.

Another issue is that even when gardens exist, the link between garden activities and what students actually learn about plant nutrition and growth is not always measured. This means schools might run gardens but not know whether students' knowledge about nutrients, fertilizers, and growth stages really improves.

One significant problem is the lack of sufficient data identifying which components of school garden programs contribute most effectively to students' learning. In particular, it remains unclear whether hands-on planting activities, classroom-based lessons, or family involvement outside the school setting has the greatest influence on students' knowledge and understanding of plant nutrition.

Another problem is unequal access: some schools in rich or urban areas may have well-resourced gardens while schools in poorer or crowded areas do not. This creates unequal learning opportunities and may mean some students don't get the same chance to learn about plant growth and nutrition.

Consider a public high school where Grade 7 students participate in planting and maintaining a small vegetable garden. The teacher guides the students in testing the soil, explains the importance of compost, and instructs them to monitor and record the growth of the plants. Through these activities, some students may observe that plants in one garden bed grow healthier due to the proper application of compost and regular watering, while other plants may experience problems caused by pests. This classroom-garden setting provides a practical basis for assessing the students' knowledge and understanding of plant nutrition and growth gained through their participation in the school garden program.

The Philippines supports school garden programs through several official issuances that promote school gardens for nutrition, learning, and greening the campus — for example, The Gulayan sa Paaralan Program (GPP) began its operation in Philippine schools through DepEd Order No. 6 s. 2016 to establish school garden programs for nutrition education and gardening skills. The Masustansyang Pagkain para sa Batang Pilipino Act (Republic Act 11037) supports school garden implementation for feeding programs through fresh vegetable production. These policies guide schools to include gardening in their programs and encourage using garden produce for feeding programs and learning activities.

LITERATURE REVIEW

Impact of School Garden Programs on Students' Knowledge of Plant Nutrition and Growth

Numerous studies showed that by offering real-world applications of scientific ideas, school garden programs greatly improve students' understanding of plant nutrition and growth. Blair (2009) as retrieved 2026, for example, concluded that garden-based learning enhanced students' comprehension of photosynthesis, nutrient cycles, and soil health with quantifiable improvements in science test scores after conducting an evaluative evaluation of 15 studies.

Similarly, Graham et al. (2005) as retrieved 2026 assessed a California program in which students participated in gardening activities and found that, in comparison to standard classroom education, students' knowledge of plant growth mechanisms, such as root absorption of nutrients, increased. In their evaluation of a gardening program in Texas, Klemmer et al. (2005) as retrieved 2026 found out that science attitudes and knowledge, including ideas like the functions of macronutrients in plant development, had improved.

Morris and Zidenberg-Cherr (2002) as retrieved 2026 focused on nutrition education integrated with gardens, showing that fourth-graders exhibited improved comprehension of how nutrients like nitrogen and phosphorus support plant growth. Lastly, Smith and

Motsenbocker (2005) as retrieved 2026 analyzed a Louisiana initiative, revealing that hands-on gardening led to deeper knowledge of plant physiology, with students better articulating growth stages and nutritional needs.

The perceptions of the respondents on the impact of school garden programs on students' knowledge of plant nutrition and growth

Although some pointed out difficulties such resource limitations, student perceptions frequently emphasize the transformative role that school gardens play in fostering knowledge. In a survey of middle school students and teachers, Ratcliffe et al. (2011) as retrieved 2026 discovered that 85% of respondents valued practical learning above rote memorization and thought gardens were an excellent way to teach plant nutrition.

Although some voiced worries regarding scalability, Ozer's (2007) as retrieved 2026 interviewed with stakeholders in urban schools revealed favorable opinions of gardens' impact on knowledge retention. Aguilar O.M et al. (2008) as retrieved 2026 conducted a hands-on method of environmental education through a youth gardening initiative for students in grades 3 to 5, analysis revealed that children with prior gardening experience outperformed those without experience.

According to participant comments from a Minnesota study, Heim et al. (2009) as retrieved 2026 found out that gardens improved participants' understanding of nutrient roles.

Finally, Parmer et al. (2009) as retrieved 2026 conducted focus groups with second-graders and teachers, showing that respondents viewed gardens as intuitive tools for grasping plant nutrition, with high satisfaction rates despite logistical hurdles.

Students experience

Student experiences in school gardens often emphasize enjoyment and hands-on discovery, contributing to deeper learning about plant nutrition and growth. According to

Lineberger and Zajicek's (2000) as retrieved 2026 observations of Texas students' experiences, gardening activities resulted in good attitudes toward science, with students reporting "aha" moments in their comprehension of nutrient absorption.

In their study of youth programs, Robinson-O'Brien et al. (2009) as retrieved 2026 highlighted instances in which students' direct involvement raised their curiosity about plant life cycles. Blair (2009) as retrieved 2026 provided in-depth qualitative reports of kids taking pleasure in planting and soil testing, which strengthened understanding of growth elements.

According to a survey conducted by Klemmer et al. (2005) as retrieved 2026, experiential components like watering and harvesting improved participants' understanding of nutritional science and gave them a sense of success. Lastly, Smith and Motsenbocker (2005) as retrieved 2026 documented Louisiana students' reflections, where hands-on tasks were linked to memorable experiences that solidified concepts of plant development.

Behavior

According to Ratcliffe et al. (2011) as retrieved 2026, who examined behavioral changes, School gardens have an indirect impact on students' understanding of plant nutrition and growth by encouraging behaviors like greater vegetable consumption and environmental responsibility. Garden programs increased vegetable intake and improved knowledge of nutritional requirements for plant health.

According to Heim et al. (2009) as retrieved 2026, after gardening, Minnesota students showed better eating habits, which correlated with their understanding of nutrient-rich soils. According to Parmer et al. (2009) as retrieved 2026, students' desire to try planting was one of the behavioral changes that improved their understanding of development behaviors.

According to Ozer (2007) as retrieved 2026, gardens encourage sustainable behaviors that support plant care, such as composting. Lastly, Aguilar O.M et al. (2008) as retrieved 2026 that children who need to learn about their natural surroundings have the ideal

experience when a garden is used in the classroom.

Performance task

Performance tasks in school gardens, such as planting and monitoring experiments, assess and build knowledge of plant nutrition and growth. Smith and Motsenbocker (2005) as retrieved 2026 used tasks like designing growth experiments, showing improved performance in understanding nutrient deficiencies.

Lineberger and Zajicek (2000) as retrieved 2026 evaluated hands-on tasks, where students' ability to explain growth improved through practical assessments. Graham et al. (2005) as retrieved 2026 incorporated tasks like soil testing, leading to better task performance and knowledge retention.

Morris and Zidenberg-Cherr (2002) as retrieved 2026 measured performance via pre/post-tests on nutrition tasks, with gardens enhancing scores. Finally, Klemmer et al. (2005) as retrieved 2026 assessed science tasks, finding that garden activities correlated with higher performance in plant-related concepts.

Profile of the respondents

Age

The impact of school gardens on knowledge of plant nutrition and growth varies by age, with younger students showing more pronounced gains. Morris and Zidenberg-Cherr (2002) as retrieved 2026 focused on fourth-graders (ages 9-10), finding significant knowledge improvements in elementary students. The study reported significant improvements in knowledge of plant nutrition and growth among elementary students. Younger children exhibited more pronounced gains, likely due to their developmental stage allowing for greater absorption of new concepts through hands-on gardening activities, without the preconceptions that might hinder older students.

Ratcliffe et al. (2011) as retrieved 2026 studied middle schoolers (ages 11-14), noting moderate effects that built on prior learning. The research found moderate effects on knowledge, attitudes, and behaviors related to vegetable consumption. These gains built on prior learning, indicating that older students benefit from cumulative experiences but may not show as dramatic improvements as younger ones, possibly because they enter with more baseline knowledge or skepticism. The study suggests gardening reinforces existing views rather than fundamentally transforming them.

Aguilar O.M et al. (2008) as retrieved 2026 surveyed elementary school children in grades 3 through 5, which typically corresponds to ages approximately 8 to 11 years old and found no overall significant differences in environmental attitudes between gardening participants and controls. However, it highlighted that children with prior gardening experience (potentially younger or more exposed) scored higher on these measures. The program fostered positive attitudes in both groups, suggesting that early exposure can lay a strong foundation for environmental stewardship, with younger kids potentially more malleable to attitude shifts.

Sex

Gender differences in the impact of school gardens on knowledge of plant nutrition and growth are minimal but notable, with girls sometimes showing stronger engagement. Robinson-O'Brien et al. (2009) as retrieved 2026 reviewed programs, found that girls reported higher gains in knowledge of nutrition-related concepts, such as understanding plant-based foods and their health benefits. Gender differences were minimal overall, but girls' stronger engagement in programs that linked gardening to dietary education suggested they viewed gardening as more personally relevant, potentially leading to better retention of nutritional information.

Lineberger and Zajicek (2000) as retrieved 2026 observed that girls in Texas programs exhibited more positive attitudes toward plant growth tasks, including enthusiasm for hands-on activities like planting and monitoring. Boys also participated and improved, but girls'

attitudes were notably stronger, possibly due to greater interest in the caregiving aspects of gardening, which aligned with observed gender norms in educational settings.

Blair (2009) as retrieved 2026 noted slight gender variations, with girls more likely to connect school gardening experiences to personal health knowledge, such as linking plant growth to nutrition and well-being. This deeper integration of views was attributed to girls' tendencies to reflect on holistic benefits, while boys showed similar but less pronounced connections, often focusing more on the physical or competitive elements of gardening.

Significant difference on the perception of the respondents on the impact of school garden programs on the students' knowledge of plant nutrition and growth when profile is considered.

Several studies support the findings of the present research regarding the impact of school garden programs on students' experience, behavior, performance tasks, and the lack of significant differences when grouped according to profile variables such as age and sex. In relation to students' experience, the results showed that learners agreed that gardening activities improved their understanding of plant nutrition and growth through hands-on learning. Robinson-O'Brien et al. (2009) as retrieved 2026 found that participation in gardening activities increases students' interest and knowledge in nutrition and plant development, as hands-on experiences make learning more engaging and meaningful.

In terms of behavior, the findings revealed that students developed responsibility, cooperation, and environmental awareness through gardening activities. According to Kanosvamhira (2025) study, showed that school garden programs promote positive attitudes such as teamwork, accountability, and environmental responsibility among students. Likewise, Chan et al. (2022) concluded that garden-based learning improves not only students' knowledge but also their attitudes and practices related to sustainability, further supporting the behavioral improvements observed in the present study.

With regard to performance tasks, this research indicated that students agreed that

gardening activities enhanced their ability to perform tasks related to plant nutrition and growth. According to, Aragon & Manzano (2025), who reported that school gardening programs improve students' practical skills and academic engagement by allowing them to apply theoretical knowledge in real-life situations.

Furthermore, the results showed that there is no significant difference in students' perceptions when grouped according to age and sex. Chan et al. (2022) emphasized that school garden programs improve students' knowledge, attitudes, and practices regardless of demographic characteristics, suggesting that experiential learning minimizes differences among learners.

The findings of the present study, confirmed that school garden programs enhance students' learning experience, behavior, and performance while showing that profile variables such as age and sex do not significantly affect students' perceptions. These studies validate the effectiveness of garden-based learning as an inclusive educational approach that benefits all students.

RESEARCH QUESTIONS

Survey Questionnaire

Directions:

Please read each item carefully and answer honestly. There are no right or wrong answers. All responses will be kept confidential and will be used for research purposes only.

Part I. Profile of the Respondents

Please check (✓) the appropriate answer.

1. **Age:** _____

2. **Sex:**

☐ Male

☐ Female

Part II. Perceptions on the Impact of School Garden Programs

Scale:

Rating	Description
4	Strongly Agree
3	Agree
2	Disagree
1	Strongly Disagree

A. Student's Experience

No.	Statement	4	3	2	1
1	I enjoy participating in school garden activities.	☐	☐	☐	☐
2	I understand that Gardening activities help me understand how plants grow.	☐	☐	☐	☐
3	I learn better when lessons are done in the garden.	☐	☐	☐	☐
4	I understand that working in the garden makes science lessons more interesting.	☐	☐	☐	☐
5	I understand plant nutrition better through hands-on gardening.	☐	☐	☐	☐

B. Behavior

No.	Statement	4	3	2	1
6	I take care of plants responsibly during garden activities.	☐	☐	☐	☐
7	I follow proper instructions when planting and watering plants.	☐	☐	☐	☐
8	I understand that Gardening activities taught me the importance of caring for plants.	☐	☐	☐	☐

No.	Statement	4	3	2	1
9	I show more concern for the environment after joining garden activities.	☐	☐	☐	☐
10	I apply what I learn about plant care at home or in school.	☐	☐	☐	☐

C. Performance Task

No.	Statement	4	3	2	1
11	I can explain what plants need to grow properly.	☐	☐	☐	☐
12	I can identify basic plant nutrients such as nitrogen and phosphorus.	☐	☐	☐	☐
13	I can complete gardening tasks like planting and watering correctly.	☐	☐	☐	☐
14	I can observe and record plant growth during garden activities.	☐	☐	☐	☐
15	I can apply my knowledge of plant nutrition in performance tasks.	☐	☐	☐	☐

METHODOLOGY

The present study utilized the descriptive research design, utilizing a survey-style questionnaire to collect the necessary data. The respondent conducted an informed interview with the Grade 7 students about the analyzing the factors influencing the achievement of students.

The descriptive method of research is appropriate since the aims of this study is to describe a situation in a particular place and time. Quantitative correlational research emphasized objective measurements and the statistical, mathematical, or numerical analysis of

data collected through polls, questionnaires and surveys or by manipulating pre-existing statistical data using computational techniques. Quantitative method shall also be utilized as the researcher will elicit opinions and numerical data from the respondents through survey questionnaire.

According to Creswell (2014) as retrieved 2026, descriptive research allows the researcher to gather information about the current status of a phenomenon and describe it systematically and accurately. This design is appropriate for the study because it focuses on identifying the profile of the students and their perceptions regarding the impact of school garden programs on their knowledge of plant nutrition and growth.

Similarly, McCombes (2023) explained that descriptive research is suitable when the objective is to describe variables without manipulating them, which aligns with the purpose of this study.

FINDINGS

1. Profile of the respondents

1.1 **Age.** There were eighteen (18) or 36 percent of the respondents were the age of 12, twenty-two (22) or 44 percent of respondents were the age of 13, seven (7) or 14 percent of respondents were the age of 14, two (2) or 4 percent of respondents were the ages of 15, and one (1) or 2 percent of respondents were the age of 16. This demonstrates that the majority of respondents were the age of 13.

1.2 **Sex.** There were twenty-three (23) or 46 percent of the respondents were males. Twenty-seven (27) respondents, or 54 percent, were females. This indicates that most of the number of respondents were females.

2. Perceptions of the respondents on the impact of school garden programs on students' knowledge of plant nutrition and growth.

2.1 Student's Experience. The respondents agreed in student's experience with composite mean of 3.27 (0.711). This is due to the fact that students experiencing the hands-on is a huge help to attain knowledge.

2.2 Behavior. The respondents agreed in terms of impact of school garden programs on students' knowledge of plant nutrition and growth with regards to Behavior with composite mean of 3.37 (0.687). This highlights that students' behavior during garden activities has an effect on their way of learning especially their motivation to do the activities.

2.3 Performance tasks. the respondents agree in terms of impact of school garden programs on students' knowledge of plant nutrition and growth with regards to Performance task with composite mean of 3.23 (0.713). This highlights that performance task is essential after garden activities to measure the students' knowledge and to know if the garden activity is effective.

3. Significant difference on the perceptions of the respondents in the impact of school garden programs on students' knowledge of plant.

There is no significant relationship between the respondents' profile and the impact of school garden programs on students' knowledge of plant nutrition and growth. The computed p-value of 0.268, 0.517, and 0.640 for Age; 0.114, 0.645 and 0.227 for Sex in the variables such as students' experience, behavior, and performance task are all greater than the significant value at 0.05 level of significance. Therefore, the null hypothesis is failed to reject. All of these explain that students have positive view when performing garden activities.

4. Learning activities.

The Guided Learning Activities was crafted by the researcher based on the results of the study.

CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

1. School garden programs provide meaningful hands-on learning experiences that help students understand important concepts related to plant nutrition and plant growth.
2. The gardening activities help improve students' behavior toward environmental responsibility, cooperation, and appreciation for plants and nature.
3. Performance tasks in gardening activities allow students to apply scientific knowledge in real-life situations, which enhances their understanding of plant growth and nutrient requirements.
4. The perceptions of the respondents regarding the impact of school garden programs do not significantly differ when grouped according to age and sex. This means that the benefits of school garden programs are experienced similarly by students regardless of their demographic profile.
5. School garden programs can therefore serve as an effective educational strategy in teaching science concepts related to plant nutrition and plant growth.

RECOMMENDATIONS

Based on the findings and conclusions of the study, the following recommendations are proposed:

1. **Students** should actively participate in school garden activities in order to develop a deeper understanding of plant nutrition, plant growth, and environmental awareness.
2. **Teachers** may incorporate more **garden-based learning activities** in science lessons to make learning more interactive, practical, and engaging for students.
3. **School administrators** should continue to support and improve school garden programs by providing necessary resources such as gardening tools, seeds, and training for teachers.
4. **Schools** may integrate gardening activities into the curriculum to strengthen students' scientific knowledge and promote sustainable practices.

5. **Future researchers** may conduct further studies on school garden programs involving a larger number of respondents or different grade levels to further validate and expand the findings of this research.

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