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Enhancing Student Health and Academic Performance through Integrated Nutrition and Science Education: A Case Study from a Public Elementary School

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ABSTRACT

Malnutrition has long been a barrier to effective learning because it diminishes students' focus, energy, and classroom engagement. This study aimed to implement and evaluate a school-based intervention that combined feeding activities, environmental awareness, and academic enhancement to improve learner performance in science. The program was carried out in a public elementary school and applied a descriptive-evaluative approach. Data collection included nutritional assessments, academic performance comparisons, and teacher feedback using structured surveys. Results revealed notable improvements in students' health and academic performance, particularly in science, as well as greater teacher and parent support for the initiative. The intervention proved effective because it addressed both the physical and cognitive needs of learners through a holistic and community-centered strategy. Overall, the project highlights the positive impact of integrated school programs on student well-being and learning outcomes, offering a replicable model for other educational communities aiming to support child development and sustainable education.

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1. INTRODUCTION

Malnutrition remains a persistent barrier to educational achievement among school-aged children, particularly in underserved communities (Shinde *et al*., 2021). Poor nutrition affects not only physical health but also cognitive development, concentration, school attendance, and overall academic performance. Studies have shown that well-nourished students tend to perform better in school, exhibit higher energy levels, and engage more actively in classroom activities (Shinde *et al*., 2021). Conversely, children experiencing hunger or chronic undernutrition are more likely to struggle academically and are at higher risk of absenteeism and early dropout (Hayeood & Pienaar, 2021; Gwelo *et al*., 2023).

In the Philippines, the Department of Education (DepEd) has launched several school-based programs to address the intersection of health and learning outcomes. One such initiative is the Youth for Environment in Schools Organization (YES-O), which promotes environmental awareness and sustainable practices among students. Waste management campaigns, tree planting, and recycling are integrated into school programs to foster responsibility and enhance scientific understanding (Garcia, 2021; Saldana & Domanog, 2024). These initiatives can be further strengthened when coupled with academic interventions and nutritional support.

Project SF5 (Supplementary Feeding for Grade Five) and AGHAMS (Acquisition of Greater-High Adaptation of Mastery in Science) were designed as complementary programs to address these critical needs. SF5 targets undernourishment among learners through a school-based feeding program funded by community-led recycling and environmental efforts. AGHAMS aims to improve learners' science proficiency through contextualized teaching strategies, including the use of graphic organizers and parent-teacher collaboration. Together, these programs offer a holistic approach that addresses health, environmental responsibility, and academic improvement.

Previous studies have highlighted the role of school feeding in improving learners' attendance and performance (Rasoloarison *et al*., 2020), while others emphasize the value of visual tools like graphic organizers in enhancing conceptual understanding in science (Cala, 2019; Razzaq *et al*., 2022). However, few programs have integrated these elements into a single, community-driven model.

The purpose of this study is to evaluate the implementation and outcomes of Project SF5 and AGHAMS at Mariano C. San Juan Elementary School, with specific attention to improvements in learners' nutritional status, science performance, and stakeholder acceptability.

The novelty of this research lies in its integration of supplementary feeding, environmental conservation, and science pedagogy, supported by community participation. By linking these aspects, the study offers a model for schools seeking sustainable, multisectoral approaches to learner development.

2. METHODS

This study utilized a quantitative approach with a descriptive evaluative research design to assess the implementation and outcomes of Project SF5 (relating to Supplementary Feeding for Grade Five) and AGHAMS (relating to Acquisition of Greater High Adaptation of Mastery in Science) at Mariano C. San Juan Elementary School, the Philippines. The core focus was to evaluate how supplementary feeding and environmental programs influenced learners' nutritional status and academic performance, particularly in science.

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Data collection tools included researcher-made questionnaires, a 5-point Likert scale, and BMI (Body Mass Index) measurements to determine nourishment levels before and after the program. The BMI status was assessed using standard health screening practices, aligning with nutritional evaluation protocols (Shinde *et al*., 2021).

The level of nourishment improvement was categorized using a verbal interpretation scale (see **Table 1**). This scale helped determine the percentage decrease in malnutrition after project implementation.

Table 1. Percentage decreased and verbal interpretation.

Percentage Decreased	Verbal Interpretation
81–100%	Very Much Nourished
61–80%	Much Nourished
41–60%	Moderately Nourished
21–40%	Slightly Nourished
11–20%	Poorly Nourished
0-10%	Not Nourished

To assess changes in academic performance, general average grades from the Learning Outcome Assessment (LOA) were collected both before and after the project. Performance was categorized by verbal descriptors (see **Table 2**), enabling a clear comparison of student learning progress.

Table 2. Learners' general average grades and interpretation.

General Average	Verbal Interpretation
98–100	Excellent
95–97	Very Good
90–94	Good
85–89	Satisfactory
80–84	Fair
75–79	Needs Improvement
65–69	Poor

In addition, a separate Likert-scale questionnaire was administered to teachers and parents to assess the acceptability and perceived effectiveness of using graphic organizers in science instruction. The interpretation range for this scale is shown in **Table 3**.

Table 3. Likert scale for teachers' acceptability ratings.

Scale	Range	Verbal Interpretation
5	4.20–5.00	Very Much Acceptable
4	3.40–4.19	Much Acceptable
3	2.60–3.39	Moderately Acceptable
2	1.80–2.59	Slightly Acceptable
1	1.00–1.79	Not Acceptable

Descriptive statistics, particularly mean scores, were used to analyze all collected data. Comparative evaluations of pre- and post-intervention results enabled the identification of significant changes in nutritional and academic indicators. The study ensured that ethical protocols were observed, with informed consent obtained from all participating stakeholders, including parents, teachers, and school administrators.

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3. RESULTS AND DISCUSSION

3.1. Nutritional Status Improvement Among Learners

One of the primary objectives of Project SF5 was to address the nutritional deficiencies of learners through a school-based supplementary feeding program. Malnutrition, particularly among elementary school children, has been linked to reduced cognitive function, lower academic performance, and poor school attendance (Shinde *et al*., 2021; Rasoloarison & Rakotonirina, 2020). By providing nutritious meals in conjunction with environmental and academic initiatives, the program aimed to improve both the physical health and learning outcomes of the beneficiaries.

Table 4 summarizes the Body Mass Index (BMI) status of learners across different class sections before and after the implementation of Project SF5. Prior to implementation, 46 students were classified as malnourished. Post-intervention data indicated a significant decrease, with only 7 students remaining malnourished—a reduction of 84.78% in total.

Table 4. BMI status of the beneficiaries of project SF5 before and after implementation.

Beneficiaries per Section	Implementation		Percentage Decreased	Verbal Interpretation
	Before	After		
Virgo	3	0	100%	Very Much Nourished
Gemini	4	0	100%	Very Much Nourished
Sagittarius	9	1	88.89%	Very Much Nourished
Capricorn	8	1	87.50%	Very Much Nourished
Taurus	12	3	75.00%	Much Nourished
Libra	10	2	80.00%	Much Nourished
Total	46	7	84.78%	Very Much Nourished

These results indicate that the supplementary feeding program was highly effective in improving the nutritional status of learners across all sections. The greatest improvements were observed in Virgo and Gemini, which achieved a 100% reduction in malnourishment. Even in sections with more severe initial cases, such as Taurus and Libra, substantial progress was noted.

This finding affirms the role of nutrition-based interventions in enhancing school health outcomes. According to the World Food Program USA (2020), school meal programs not only reduce malnutrition but also promote attendance and learning. The current study's outcome supports this perspective, suggesting that targeted feeding strategies can yield measurable improvements in children's BMI and overall wellness (See link: https://www.wfpusa.org) .

Moving forward, sustained efforts—including continued monitoring of dietary intake, periodic BMI assessments, and community engagement—will be essential in maintaining these gains. While some students still require additional support, particularly in Taurus and Libra sections, the overall trend demonstrates that well-executed feeding initiatives can significantly reduce malnutrition in school-age populations.

3.2. Impact of Supplementary Feeding on Academic Performance

Nutrition plays a critical role in the cognitive development and academic success of learners. Numerous studies have established a positive relationship between proper nourishment and improved concentration, memory, and classroom engagement (Shinde *et al.*, 2021). Following the implementation of Project SF5 and AGHAMS, academic performance among learners showed notable improvement, as reflected in their general average scores.

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Table 5 presents a comparative view of the general average of 46 learner-beneficiaries before and after the intervention. The number of learners achieving higher performance levels increased after the project, while those in lower performance bands decreased significant.

Table 5. General average of learners before and after project SF5 and AGHAMS implementation.

Performance band	Gen. Ave (Before)	Verbal Interpretation	Gen. Ave (After)	Verbal Interpretation
98–100	0	–	0	–
95–97	0	–	0	–
90–94	3	Good	7	Good
85–89	10	Satisfactory	13	Satisfactory
80–84	12	Fair	15	Fair
75–79	16	Needs Improvement	11	Needs Improvement

The data indicate that the number of students in the “Needs Improvement” and “Unsatisfactory” categories significantly decreased, with none remaining in the lowest performance category post-intervention. Conversely, there was an increase in learners categorized as “Good” and “Satisfactory,” demonstrating the program’s effectiveness in uplifting academic achievement.

These improvements are consistent with research findings from other reports (Asio & Jimenez, 2020), who reported that structured remediation and intervention strategies positively influence learners’ academic performance. Similarly, project-based and integrated learning strategies foster student engagement and enhance understanding, especially when tailored to address learners' immediate needs (Almulla, 2020).

The success of Project SF5 and AGHAMS in boosting academic performance underscores the interconnection between physical health and educational achievement. Well-nourished students are more likely to be attentive, motivated, and capable of comprehending complex academic content. Moreover, integrating supplementary feeding with science-focused interventions creates a holistic learning environment that supports both physiological and cognitive development.

These findings suggest that educational institutions should consider embedding nutritional programs within their academic improvement frameworks. In doing so, they can not only mitigate malnutrition but also promote more equitable learning outcomes across diverse student populations.

3.3. Development of Scientific Skills through Strategic Interventions

One of the core components of Project AGHAMS was the enhancement of scientific skills through the strategic use of graphic organizers, implemented via a parent-teacher partnership. The project's approach centered on engaging learners in structured, visual learning aids that supported conceptual understanding and skill development in science.

To assess the effectiveness of these interventions, learners underwent both pretest and posttest evaluations across specific scientific competencies. As shown in Table 6, substantial improvements were observed in learners' abilities to classify information, identify problems and solutions, and cite facts for persuasive reasoning.

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Table 6. Pretest and posttest performance of grade V learners in scientific skills.

Scientific Skill	Test Type	Mean	SD	Sig	Decision	Verbal Interpretation
Classifying items (Web Diagram)	Pretest	3.57	1.38	0.000	Reject H_o	Significant
	Posttest	7.13	1.91			
Problem-solving (Problem Solution Map)	Pretest	2.70	1.06	0.000	Reject H_o	Significant
	Posttest	6.50	1.80			
Persuasive reasoning (Persuasion Map)	Pretest	3.03	1.19	0.000	Reject H_o	Significant
	Posttest	6.44	1.68			

Across all tested competencies, p-values were less than 0.05, leading to the rejection of the null hypothesis and confirming that the observed gains in posttest scores were statistically significant. These outcomes reflect the positive impact of graphic organizers as cognitive scaffolds, enabling learners to better organize, retain, and apply scientific knowledge.

The results affirm previous findings (Cala, 2019), which demonstrated that graphic organizers significantly enhance students' comprehension of scientific texts and concepts. Furthermore, the study aligns with other works (Razzaq *et al*., 2022), who reported that graphic organizers promoted critical thinking and active engagement when paired with structured support systems such as parental involvement.

This section highlights that when science instruction is augmented by visual aids and collaborative frameworks, learners exhibit measurable gains in core academic skills. Integrating these tools within regular classroom instruction (especially in resource-limited settings) could help bridge learning gaps and elevate scientific literacy among young students.

3.4. Teacher and Parent Acceptability of Interventions

The success of any educational program depends not only on learner outcomes but also on the level of support and acceptability it receives from key stakeholders—particularly teachers and parents. As part of the implementation of Project SF5 and AGHAMS, the study measured how acceptable and effective the use of graphic organizers was perceived to be by teachers and parents. **Table 7** presents the level of acceptability rated by the participating teachers, with a particular focus on two main criteria: time efficiency and clarity of lesson delivery.

Table 7. Teacher acceptability of graphic organizers in developing scientific skills.

Criteria	Mean	Verbal Interpretation
Less time-consuming	2.80	Much Acceptable (MA)
Direct to the point	4.22	Very Much Acceptable (VMA)
Overall Mean	3.51	**Much Acceptable (MA)**

The results suggest that the teachers found the graphic organizers to be largely efficient and practical for instruction. The high score for “Direct to the point lessons” implies that the tools helped streamline teaching and clarify complex scientific concepts, thus facilitating improved classroom delivery.

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From the parent's perspective, the utilization of graphic organizers during the intervention was also positively received. Many parents acknowledged that the materials helped their children understand lessons more effectively, especially during modular distance learning setups. This feedback reinforces the importance of engaging families in the learning process, particularly when implementing new strategies in science education.

This aligns with other reports Razzaq *et al*. (2022), which emphasize the strong role of teacher and parent collaboration in maximizing the benefits of visual learning aids. Studies have consistently shown that when parents are involved and supportive, students are more likely to engage deeply with learning materials and show improved academic performance. Overall, the positive acceptability ratings from both teachers and parents underscore the feasibility and scalability of using graphic organizers in science instruction. These tools can be easily adopted in various learning contexts, including those with limited resources, thereby promoting inclusive and effective education.

3.5. Teacher and Parent Acceptability of Interventions

The implementation of Project SF5 and AGHAMS was not only aimed at improving the learners' health and scientific skills but also at enhancing their overall academic performance. This section analyzes changes in general average grades before and after the intervention.

Table 8 compares the general average distribution of 46 learner-beneficiaries across various performance levels. The findings indicate a notable improvement in academic performance following the implementation of the projects. The number of learners achieving a "Good" rating (90–94) more than doubled, rising from 3 to 7. Additionally, the "Satisfactory" and "Fair" categories both showed increases, suggesting an upward shift in the learners' academic achievements. Importantly, the number of students in the "Unsatisfactory" range decreased from 5 to 0, signifying the effectiveness of the interventions in reducing academic underperformance.

Table 8. General Averages of Learners Before and After Implementation of Project SF5 and AGHAMS.

General Average Range	Before (No. of Learners)	Verbal Interpretation	After (No. of Learners)	Verbal Interpretation
98–100	0	–	0	–
95–97	0	–	0	–
90–94	3	Good	7	Good
85–89	10	Satisfactory	13	Satisfactory
80–84	12	Fair	15	Fair
75–79	16	Needs Improvement	11	Needs Improvement
70–74	5	Unsatisfactory	0	Unsatisfactory
65–69	0	Poor	0	Poor

These results confirm the findings of other researchers (Asio & Jimenez, 2020), who reported that targeted remediation and intervention strategies can significantly improve student performance, particularly when such initiatives address both academic and non-academic factors. The structured use of graphic organizers and consistent parental involvement further reinforced comprehension, as also supported by other researchers (Almulla, 2020).

The outcome suggests that integrating health-focused and science-focused interventions, coupled with educational tools like graphic organizers, can lead to measurable academic

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gains. This holistic approach supports the development of well-rounded learners capable of succeeding both inside and outside the classroom.

3.6. Teacher's and Parents' Acceptability of Graphic Organizers

The success of any educational intervention depends not only on the learners' response but also on the perceptions and support of stakeholders, particularly teachers and parents. This section presents the level of acceptability of graphic organizers as perceived by both groups after the implementation of Project SF5 and AGHAMS. **Table 9** shows the composite results of the teachers' evaluations using a 5-point Likert scale.

Table 9. Teachers' acceptability of graphic organizers as aids in science instruction.

General Average Range	Before (No. of Learners)	Verbal Interpretation
Less time-consuming	2.80	Much Acceptable
Direct-to-the-point lessons	4.22	Very Much Acceptable
Overall Mean	3.51	**Much Acceptable**

The findings indicate that teachers found the use of graphic organizers to be "Much Acceptable" overall, especially for making lessons more direct and time-efficient. The high rating for "Direct-to-the-point lessons" (mean = 4.22) highlights the perceived value of this approach in simplifying complex science topics and supporting students' understanding. These results align with other reports (Razzaq *et al*., 2022), which emphasized the effectiveness of graphic organizers in promoting student engagement and conceptual clarity in science education.

The level of acceptability from the parents' perspective is 3.51. as much acceptable from overall assessment. Parents also rated the intervention as "Much Acceptable," indicating a strong appreciation for tools that enhanced their child's learning experience. This supports earlier findings (Cala, 2019), who noted the significance of parental involvement in reinforcing instructional strategies like graphic organizers, especially in modular or distance learning contexts.

The acceptance from both teachers and parents underscores the practical value of integrating visual aids into science instruction. Their positive feedback reflects an alignment with educational best practices, suggesting that such interventions can be sustainably scaled to other grade levels and subject areas to improve learning outcomes.

4. CONCLUSION

The implementation of Project SF5 and AGHAMS at Mariano C. San Juan Elementary School demonstrated a successful integration of nutrition, environmental awareness, and academic interventions to improve learners' holistic development. Through the supplementary feeding program under Project SF5, a remarkable reduction in student malnutrition was achieved—an 84.78% decrease—significantly enhancing students' health and school readiness.

Simultaneously, AGHAMS fostered scientific skill development using strategic interventions such as graphic organizers, parent-teacher collaboration, and real-life contextual learning. Results showed substantial improvements in science performance, with a statistically significant increase in learners' mean scores across various science process skills. Learners also displayed better general academic performance, moving away from "Needs Improvement" and "Unsatisfactory" categories toward higher achievement bands.

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Furthermore, both teachers and parents found the graphic organizers "Much Acceptable," validating the effectiveness of the method and supporting its continued use. Their acceptance reinforces the sustainability and scalability of this integrated approach.

This study highlights the potential of multidisciplinary, community-centered educational initiatives in addressing learners' nutritional and academic needs simultaneously. The success of Project SF5 and AGHAMS suggests that education, when supported by holistic interventions, can be a powerful tool in promoting both cognitive and physical development. It is recommended that similar programs be adopted in other schools to support learners from vulnerable backgrounds, ensuring that no child is left behind in health or education.

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6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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