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"Fill My Plate" Educational Action: Improving Nutritional Literacy and Healthy Habits Among Madiun Gen Z

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ABSTRACT

This community service–based study aimed to improve nutritional literacy and promote balanced dietary habits among Generation Z adolescents through an interactive "Fill My Plate" (Isi Piringku) educational action. The program was conceptually grounded in adolescent developmental theory and empirically aligned with Sustainable Development Goal 3 (Good Health and Well-being), addressing the growing challenges of malnutrition, anemia, and obesity among Indonesian youth. The intervention was conducted offline at State Vocational High School 4 Madiun, East Java, targeting vocational students whose daily learning activities involve relatively high physical demands. A quantitative pre-experimental design with a one-group pre-test and post-test approach was employed to assess changes in students' nutritional knowledge. Data were collected using validated nutrition knowledge questionnaires administered before and after the intervention. The educational action integrated multimedia presentations, visual demonstrations, interactive nutritional games, and guided group discussions based on the "Fill My Plate" framework. The results demonstrated a substantial improvement in students' nutritional literacy, as reflected by a marked increase in mean knowledge scores from the pre-test to the post-test. Beyond cognitive gains, participants showed an enhanced ability to practically apply balanced meal composition and portioning principles in daily contexts. High levels of engagement during the activities further indicated that interactive and visual-based learning strategies are highly effective for Gen Z learners. These findings suggest that periodic, school-based interactive nutrition education plays a critical role in strengthening adolescents' dietary literacy and fostering healthy habits as a preventive strategy against nutrition-related health risks. The study offers a replicable and scalable educational model for vocational schools to support the development of a healthy, productive future workforce. Longitudinal studies are recommended to evaluate the sustainability of behavioral changes in actual dietary intake.

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INTRODUCTION

Adolescence represents a critical developmental window marked by rapid physical growth, hormonal fluctuations, and psychological maturation that collectively increase nutritional demands (Muharramah et al., 2023). Adequate nutrition during this stage is fundamental to supporting optimal growth trajectories, cognitive development, and long-term metabolic health. However, adolescents particularly in developing countries are increasingly confronted with complex nutritional challenges that compromise the quality of future human capital (Anis Ervina et al., 2024).

In Indonesia, adolescent nutrition is characterized by a persistent double burden of malnutrition, where undernutrition coexists with overweight and obesity. National Basic Health Research data indicate that 25.7% of adolescents aged 13–15 years experience stunting, while 16.0% are classified as overweight or obese (Hartanti et al., 2024). These conditions are not merely anthropometric issues but are strongly associated with impaired cognitive performance, reduced physical capacity, and increased risk of non-communicable diseases (NCDs) later in life. More recent evidence further demonstrates that Indonesian adolescents face a triple burden of malnutrition, encompassing undernutrition, overnutrition, and micronutrient deficiencies, particularly anemia (Ministry of National Development Planning RI/Bappenas RI, 2021).

At the regional level, the situation is equally alarming. In East Java, nearly 42% of adolescent girls were reported to suffer from anemia, a condition that undermines physical endurance, learning concentration, and future reproductive health (Susnita & Iftitah, 2024). This phenomenon threatens not only individual well-being but also the intergenerational cycle of nutrition, as adolescent anemia is a well-established predictor of adverse maternal and child health outcomes. Compounding this issue, Generation Z adolescents exhibit dietary behaviors heavily influenced by digital culture and social media trends, prioritizing convenience, visual appeal, and fast food consumption over nutritional quality (Meti Kurniawati et al., 2024).

Despite extensive government programs and nutritional campaigns, these indicators remain largely unchanged, suggesting that conventional, top-down approaches may be insufficient. Vocational high school students represent a particularly vulnerable yet underexplored subgroup. Their learning environment often involves physically demanding practical workshops that increase daily energy expenditure, making balanced nutrition even more critical. However, structured and context-specific nutritional education remains limited within vocational education settings, resulting in gaps in dietary literacy, stamina, and learning focus during both theoretical and practical sessions.

Recent studies emphasize that nutritional literacy—defined as the ability to access, understand, and apply nutrition-related information—is a key determinant of healthy eating behavior among adolescents (Aini & Ilmiya, 2024). Adolescents with higher nutritional literacy demonstrate better food choices, improved dietary balance, and greater resilience against unhealthy food marketing. Empirical evidence consistently shows that nutrition education interventions can significantly improve knowledge and attitudes toward balanced diets (Muharramah et al., 2023; Soumokil, 2025).

However, the effectiveness of such interventions is highly dependent on pedagogical design. Passive classroom-based education often yields limited behavioral change, whereas interactive and demonstration-based approaches—including visual aids, gamification, and hands-on activities—have been shown to enhance cognitive retention and practical understanding (Soumokil, 2025; Anis Ervina et al., 2024). The "Fill My Plate" (Isi Piringku) framework represents a strategic evolution of dietary guidelines, translating abstract nutritional recommendations into a simple, visual, and actionable daily practice. This model aligns well with adolescents' preference for visual learning and practicality, making it particularly suitable for Generation Z learners.

International and national studies increasingly highlight the importance of contextualizing nutrition education within adolescents' lifestyle realities, including physical activity demands, socio-economic constraints, and future career aspirations (Hartanti et al., 2024). Nevertheless, most existing research focuses on general senior high schools or community settings, with limited attention to vocational schools where physical workload and energy requirements differ substantially. Moreover, community service-based nutritional programs are often reported descriptively, lacking rigorous evaluation designs such as pre-test and post-test assessments that can substantiate educational impact.

Although prior research confirms the positive role of nutrition education in improving adolescent dietary knowledge, several critical gaps remain. First, subject engagement remains underexplored, as most interventions rely on passive information delivery rather than interactive, skills-oriented demonstrations based on the "Fill My Plate" concept. Second, contextual specificity is lacking; no empirical studies have examined the effectiveness of interactive nutritional education among vocational high school students in Madiun, a demographic with distinct physical and occupational demands.

Third, from a methodological perspective, many community-based nutrition programs employ descriptive or event-based reporting, limiting causal inference regarding educational effectiveness. Robust pre-test and post-test designs that measure knowledge improvement and behavioral intention are still scarce. Fourth, there is a notable absence of studies integrating psychological and aspirational dimensions, particularly how nutritional knowledge aligns with vocational students' future employment readiness, physical fitness requirements, and lifestyle goals. These gaps indicate an urgent need for targeted, interactive, and evaluative nutritional interventions tailored to vocational education contexts.

Based on these gaps, the present study and community service initiative aims to examine the effect of interactive "Fill My Plate" nutrition education on improving nutritional knowledge among students at State Vocational High School 4 Madiun. Specifically, this project seeks to enhance students' understanding of balanced meal composition, portion control, and affordable healthy food choices through sensory-based demonstrations, peer discussions, and visual learning strategies.

The novelty of this study lies in several dimensions. First, it targets vocational Generation Z students, a population often overlooked in nutritional research despite their strategic role as the future workforce. Second, it adopts a localized intervention

context in Madiun, allowing for contextual relevance and practical applicability. Third, it utilizes the Isi Piringku framework as a behavioral change tool, moving beyond theoretical knowledge toward daily dietary practice. Fourth, the study employs a pre-test and post-test design, providing empirical evidence of educational impact rather than descriptive outcomes alone.

By strengthening nutritional literacy among vocational students, this initiative contributes to preventive public health efforts, supports workforce productivity, and aligns with national development agendas, including SDG 3 (Good Health and Well-being) and Indonesia Emas 2045. Ultimately, this study is expected to inform the development of scalable, adaptive nutrition education models for vocational institutions across East Java and beyond, reinforcing nutrition as a foundational life skill rather than merely a health message.

METHODS

This research is a quantitative research-based community service activity using a pre-experimental approach with a one-group pretest-posttest design. This design was chosen to empirically evaluate the effectiveness of an educational intervention on improving participants' nutritional knowledge and literacy in a controlled school environment (Raut et al., 2024). The pretest-posttest approach is considered relevant in health education research because it can capture cognitive changes directly before and after the intervention, particularly in adolescent populations (Muharramah et al., 2023; Hartanti et al., 2024).

The research variables consist of two types. The independent variable is interactive nutrition education based on the "Fill My Plate" guidelines developed by the Indonesian Ministry of Health as a contextual adaptation of the balanced nutrition guidelines. The dependent variable is the level of adolescent nutritional knowledge and literacy, which includes understanding of balanced food composition, portion sizes, dietary diversity, and awareness of the triple burden of malnutrition (Aini & Ilmiya, 2024; Anis Ervina et al., 2024).

The activity was conducted on August 4, 2025, at SMKN 4 Madiun, specifically for classes APH 1 and APH 2 of the Hospitality Expertise Program. This location was purposively selected due to the characteristics of vocational students who engage in high levels of physical activity, making energy needs and nutritional understanding crucial aspects in supporting academic performance and work readiness (Meti Kurniawati et al., 2024). The study population included all Gen Z students at SMKN 4 Madiun, with a purposive sample of 54 students who participated in the intensive education session.

The research instrument was a 10-item multiple-choice nutrition knowledge test, structured based on adolescent nutritional literacy indicators and content validated by health and nutrition education experts. The use of a digital-based instrument, Google Forms, was chosen to increase efficiency and accuracy of data collection, and to align with the digital-native characteristics of Generation Z (Soumokil, 2025).

The educational intervention was implemented through four structured stages. The first stage was a pretest to measure students' initial knowledge regarding balanced

nutrition, adolescent hydration, and "Isi Piringku" (My Plate) proportions. The second stage involved delivering core material using a combination of PowerPoint presentations, educational videos, and visual plate models that emphasized the issue of dietary diversity and the phenomenon of the triple burden of malnutrition among Indonesian adolescents (Bappenas RI, 2021). The third stage involved an interactive group game-based activity, namely a plate-arrangement game simulation that represented real-life everyday consumption situations. This approach adopted the principles of experiential learning and gamification, which have been shown to increase student engagement and cognitive retention (Soumokil, 2025; Raut et al., 2024). The final stage was a posttest and evaluation of participant responses to identify changes in knowledge and student receptivity to the educational messages.

Data analysis was conducted using descriptive statistics, including mean values, percentages, and gain score calculations to assess knowledge gains before and after the intervention. Data processing was performed using Microsoft Excel, commonly used in educational research and school-scale community service (Aini & Ilmiya, 2024). This method allows for clear interpretation of the effectiveness of the intervention and provides an empirical basis for the development of an adaptive nutrition education model in vocational schools.

RESULTS AND DISCUSSION

Result

The community service project implemented an offline nutritional education program at State Vocational High School 4 Madiun, involving 54 students from the Hospitality (APH) department. The initiative aimed to equip participants with a comprehensive understanding of balanced nutrition, specifically through the "Fill My Plate" (Isi Piringku) framework, while emphasizing the role of nutrients in supporting optimal growth during adolescence. The characteristics of the participants are detailed in Table 1.

Table 1
Target Participant Characteristics in Nutritional Education

Characteristic	Category	Frequency	Percentage Increase (%)
Age	15 years	1	1.8
	16 years	25	46.3
	17 years	26	48.2
	18 years	2	3.7
	Total	**54**	**100**
Class	APH1	28	51.8
	APH2	26	48.2
	Total	**54**	**100**
Gender	Male	22	40.7
	Female	32	59.3
	Total	**54**	**100**

The community service team initiated activities with school-level socialization followed by a digital pre-test to establish a baseline of knowledge regarding "Isi Piringku"

and hydration. Post-intervention, students were evaluated using a post-test to measure cognitive gains across several nutritional domains. The comparative analysis of these scores is presented in Figure 1.

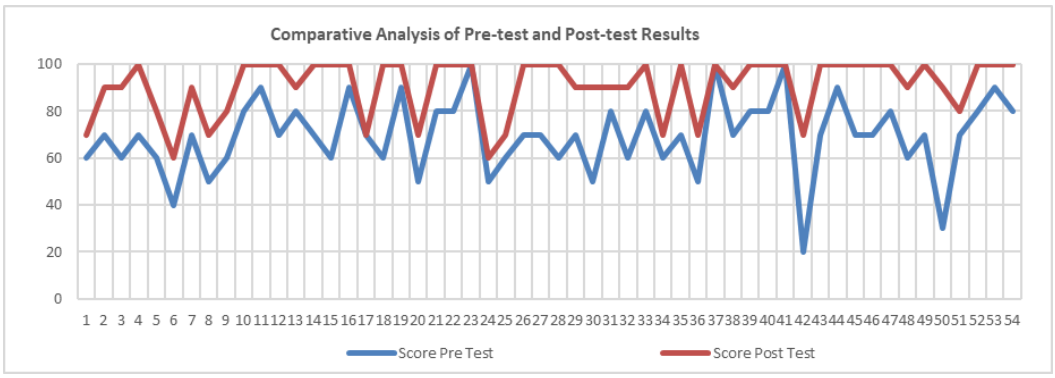

Figure 1.
Comparative Analysis of Pre-test and Post-test Results

The evaluation revealed a significant increase in knowledge, where the average pre-test score of 69.44 rose to a post-test average of 90.92. This reflects a substantial gain of 21.48 points after the interactive learning session. Descriptive statistics indicate that the educational intervention effectively improved participants' understanding of anemia risks, nutritional deficits, and portioning skills.

Table 2
Descriptive Statistics of Nutritional Knowledge Scores

Variable	Statistic	Pre-Test	Post-Test
Knowledge Score	Mean	69.44	90.92
	Std. Dev	8.12	4.55
	Min	50	80
	Max	85	100
	Improvement	**-**	**30.9**

The data confirms that the use of audiovisual and interactive methods—highly preferred by Gen Z—facilitated better information absorption (Urba et al., 2024). The percentage improvement for overall nutritional literacy was calculated at 30.9%, confirming that the "Isi Piringku" action contributed significantly to the students' cognitive development.

Table 3
Evaluation of Community Service Activity Responses

Aspect of Evaluation	Very Good (%)	Good (%)	Adequate (%)
Material Mastery	46.29	48.15	5.56
Practical Demonstration	50.00	44.44	5.56
Interaction with Participants	74.07	25.93	0
Use of Language	59.25	40.75	0
Overall Benefit	88.88	11.12	0

The table above illustrates that the majority of participants (88.88%) found the activity extremely beneficial. This high satisfaction rate is a key indicator of the

program's success in meeting the students' needs. The practical aspect, which received a 50% "Very Good" rating, proved to be a vital component of the learning process.

Discussion

Pre-test results showed that vocational high school students' nutritional knowledge before the intervention was still in the moderate category, with an average score of 69.44. This finding indicates that although students have a basic awareness of health, they lack a practical understanding of balanced nutrition, particularly regarding portion size and food diversity, which are relevant for preventing stunting and anemia. This condition aligns with national findings that Indonesian adolescents often understand the concept of "healthy eating" normatively but fail to apply it in their daily lives (Anikasari & Anggoro, 2023; Aini & Ilmiya, 2024).

This low level of practical knowledge is closely related to the influence of the digital environment and the consumer culture of Generation Z. Social media fosters visual preferences for aesthetically appealing (instagrammable) foods that are low in nutritional value, often sacrificing nutrient density for appearance (Meti Kurniawati et al., 2024; Gani et al., 2025). This consumption pattern is exacerbated by the high access to fast food in urban environments and vocational schools, which tend to prioritize convenience over nutritional quality (Fauziah et al., 2023). Therefore, suboptimal pre-test scores reflect the urgent need for contextual, visual, and applicable nutrition education interventions in the school environment.

After the interactive educational intervention, there was a significant increase in post-test scores to 90.92, a 21.48-point increase. This surge indicates that vocational high school students are highly responsive to experiential learning approaches. The integration of visual presentations, educational videos, and plate-arrangement games has proven effective in enhancing conceptual understanding while building motor and visual memory related to balanced nutritional composition. These findings corroborate previous research suggesting that demonstration-based learning and gamification have a stronger impact than conventional lecture methods in adolescent health education (Soumokil, 2025; Supriadi & Priyanti, 2024).

From a learning theory perspective, the success of this intervention can be explained by a multisensory learning approach, where information is delivered through a combination of visual, auditory, and kinesthetic stimuli. This approach has been shown to improve knowledge retention and transfer of learning to real-world contexts, especially for students with active learning characteristics, such as vocational students (Latifah et al., 2025). Furthermore, the use of incentives and low-level competition in group games increases students' intrinsic motivation, which plays a key role in changing attitudes and behavioral intentions (Raut et al., 2024).

These changes are reflected not only in cognitive scores but also in students' attitudes and awareness of daily food choices. Qualitative observations and feedback indicate that some students are beginning to pay attention to the composition of their lunch boxes and are indicating an intention to choose healthier snacks in the school

cafeteria. These findings support the knowledge–attitude–practice (KAP) model, which states that increased knowledge is a crucial prerequisite for changing health attitudes and practices (Muharramah et al., 2023; Nugraheni, 2024). Although long-term behavioral changes cannot yet be directly measured, these early indications demonstrate the potential for sustainable impact of the intervention.

The implications of this research are highly relevant for adolescent health and human resource development. Improving nutritional literacy among vocational high school students directly contributes to preventing the double and triple burden of malnutrition, particularly anemia and obesity, which remain highly prevalent in East Java (Nurwijayanti & Agustin, 2025). This intervention also serves as a preventative measure against non-communicable diseases such as hypertension and diabetes, the root causes of which often stem from unhealthy eating habits from adolescence (Anikasari & Anggoro, 2023).

In the context of sustainable development, this activity aligns with Sustainable Development Goal (SDG) 3, which aims to ensure healthy lives and promote well-being for all ages. School-based nutrition education, particularly in vocational high schools, holds strategic value because vocational students are prospective workers who are expected to possess stamina, fitness, and high productivity. Without an adequate foundation in nutritional literacy, Indonesia's potential demographic bonus risks being underutilized (Fauziah et al., 2023).

However, program sustainability remains a major challenge. Nutrition literacy cannot be developed through a single intervention but requires the support of school policies, teacher involvement, and synergy with families and the surrounding community (Nugraheni, 2024). The recommendation to establish "Balanced Nutrition Ambassadors" among students is a strategy relevant to the characteristics of Generation Z, who are responsive to peer-led education. Research shows that peer-based education is more effective in influencing social norms and health behaviors in adolescents than authoritative approaches (Gani et al., 2025).

Overall, the results of this discussion confirm that the interactive "Fill My Plate" educational program at SMK Negeri 4 Madiun successfully increased nutritional knowledge and fostered healthy behavior intentions in students. This model is applicable, easily replicated, and adaptable to the vocational school context. With continued strengthening through school policies and community-based approaches, this intervention has the potential to become an effective framework for integrating health literacy into vocational education, while supporting the vision of a healthy, productive, and highly competitive Golden Indonesia 2045 (Soumokil, 2025).

CONCLUSION

The implementation of interactive nutrition education based on "Fill My Plate" for Generation Z students at State Vocational High School 4 Madiun has proven effective in significantly improving their understanding and literacy of balanced nutrition. Empirically,

initial conditions indicated that students' nutritional knowledge was still inconsistent, with only about one-third of participants categorized as having good knowledge. This finding confirms that basic health awareness has not been accompanied by practical skills in understanding food diversity, meal portions, and hydration needs appropriate to the age and activity characteristics of vocational students.

Following the intervention, there was a substantial increase in students' nutritional literacy, as reflected in a jump in the average pre-test score from 69.44 to 90.92 in the post-test. This 21.48-point increase indicates that an educational approach based on interaction, visualization, and multimedia is highly effective for Gen Z learners who are responsive to hands-on learning experiences. Conceptually, these results reinforce the importance of practical nutrition learning for bridging the gap between knowledge and healthy behavior intentions.

Thus, the "Fill My Plate" educational program not only impacts cognitive development but also has strategic implications for the sustainability of health promotion in schools through the formation of peer-based Balanced Nutrition Ambassadors. This model has the potential to be replicated in other vocational schools as part of preventative efforts to improve the quality of healthy and productive human resources.

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