

Enhancing Nutritional Literacy Through Visual-Based Intervention in Elementary School

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Abstract.

Establishing healthy eating habits during childhood is crucial for long-term well-being, yet many elementary school students struggle to distinguish between nutritious and unhealthy food options. Traditional teaching methods often fail to engage young learners effectively on this topic. This study aims to explore the implementation and effectiveness of using flashcards as an interactive instructional tool to teach healthy and unhealthy food concepts to fifth-grade students at SDI Mohammad Hatta. A qualitative research design was employed to gain a deeper understanding of the learning process. Data were gathered through participatory classroom observations, semi-structured interviews with the students, and open-ended questionnaires administered to 25 fifth-grade participants. The collected data were analyzed using thematic analysis, focusing on student engagement, comprehension, and behavioral intentions. The findings revealed that the integration of flashcards significantly enhanced students' enthusiasm and active participation during the health lesson. The visual and gamified nature of flashcards helped students easily categorize various food items, improving their conceptual understanding of nutrition. Furthermore, qualitative responses indicated a positive shift in students' attitudes, with many expressing a strong intent to reduce junk food consumption and choose healthier snacks. In conclusion, flashcards serve as an effective, low-cost, and engaging pedagogical tool for nutrition education in elementary schools.

Keywords: Healthy Food, Flashcards, Nutrition Education, SDI Mohammad Hatta and Junk Food.

I. INTRODUCTION

The school age period (5-12 years) is a stage of life in which children undergo continuous physical growth alongside the development of cognitive and learning abilities. During this period, children require adequate nutrient intake, including micronutrients such as iron, zinc, calcium, vitamin A, and vitamin D, to support height growth, bone formation, and daily bodily functions. Prolonged nutritional deficiency at school age can impede physical growth and lead to conditions such as underweight and stunting (Ernawati et al., 2023). In addition, meeting nutritional needs plays a role in maintaining children's immune function. Insufficient nutrient intake can increase susceptibility to infectious diseases, resulting in children falling ill more frequently (Ernawati et al., 2023). This, in turn, can disrupt school attendance and daily activities. Over the long term, nutritional status during school age is associated with health quality and work capacity in adulthood. Growth and developmental disturbances occurring during childhood may persist into adulthood and affect physical capacity as well as cognitive function (Ernawati et al., 2023).

Although adequate nutrition plays an important role in supporting the growth and development of school-age children, the nutritional status of children in Malang continues to reflect a range of concerns.

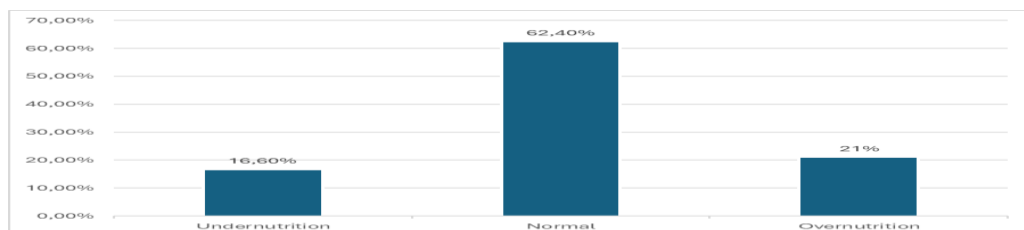


Fig. 1. Prevalence of Undernutrition, Normal Nutritional Status, and Overnutrition

Data from Pratama et al. (2026) reveal that the nutritional situation among school-age children in Lowokwaru District, Malang City, reflects a double burden phenomenon, whereby undernutrition and overnutrition occur simultaneously. Of 210 students, 16.6% were categorized as undernourished, while 21% fell under the overnutrition category, encompassing overweight and obesity (Pratama et al., 2026). The remaining 62.4% had normal nutritional status (Pratama et al., 2026).

When comparing the two groups, the proportion of children with overnutrition was higher than those with undernutrition. This reflects a shift in the pattern of nutritional problems among school-age children in urban areas such as Lowokwaru. Urban environments provide broader access to a wide variety of foods, including processed foods and street snacks that are high in sugar, fat, and energy. At the same time, consumption of nutrient-rich foods such as vegetables and fruits has not consistently become part of children's daily eating habits. These conditions shape children's daily dietary patterns and serve as one of the key determinants of their nutritional status. Children with balanced diets that include complex carbohydrates, protein, healthy fats, and adequate fruit and vegetable intake tend to have normal nutritional status (Pratama et al., 2026), while those with unbalanced diets are more likely to be overweight or obese (Pratama et al., 2026). Beyond daily dietary patterns, nutrition knowledge also plays a role in shaping children's nutritional status. Nutrition knowledge is understood as an early stage that influences how children perceive food and make daily dietary choices. Children who understand that meals should consist of carbohydrate sources, protein, vegetables, and fruits in appropriate portions tend to have better dietary practices (Masluhiya K & Maemunah, 2024). As such, nutrition education plays an important role in helping children recognize and develop food choices that better meet their nutritional needs.

Nutrition education interventions in school settings are not solely the responsibility of teachers and families, they can also be reinforced through the involvement of university students in community service activities integrated into coursework. Through service-learning, students do not merely study nutrition concepts theoretically but also apply them directly through educational activities tailored to the age characteristics and school environment of the target population. The involvement of students as peer educators enables nutrition messages to be communicated in simpler, more accessible language that is closer to children's everyday experiences, thereby supporting children's understanding of food choices that better align with their daily nutritional needs (Murimi et al., 2017).

Based on the nutritional concerns among school-age children in Malang City and findings from prior studies indicating a relationship between dietary patterns, nutrition knowledge, and children's nutritional status, this study aimed to improve nutrition understanding as a foundation for developing more appropriate eating habits at school age. This study aims to describe students' understanding of balanced nutrition, particularly regarding meal composition consisting of carbohydrate sources, protein, vegetables, and fruits in appropriate portions, and to examine how this understanding relates to children's daily eating habits.

More specifically, this study focuses on fifth-grade students at SDI Mohammad Hatta, Malang City, with 27 students as respondents. The selection of fifth-grade students was based on the consideration that children at this age have sufficient cognitive ability to receive and understand basic nutrition information, while also beginning to exercise some degree of independence in food selection, both at school and at home. This study is therefore expected to provide a relevant account of the role of nutrition understanding in shaping the eating habits of school-age children.

II. METHODS

This community service activity was designed as a descriptive qualitative study with a participatory observation approach, aimed at examining the process and effectiveness of nutrition education delivered through visual-based flashcard media to elementary school students (Rosenstock, 1974). The study objective was to evaluate the extent to which a single-session visual intervention could foster basic nutritional literacy among students in the target group, specifically in terms of their ability to distinguish healthy from unhealthy food choices and articulate awareness of the long-term health consequences of dietary habits. The primary research variable in this study is the effectiveness of flashcard-based nutrition education as an intervention

method, while the secondary variable encompasses the behavioral and cognitive responses of students as observable indicators of knowledge reception and engagement during the session.

The research target consisted of elementary school students at SDI Mohammad Hatta, Malang, East Java, selected purposively as the study population on the grounds that children aged 6 to 12 years represent a developmentally critical window for the formation of long-term dietary behaviors. This age group is particularly receptive to structured behavioral interventions, as eating habits established during childhood have been shown to significantly influence metabolic health outcomes in adulthood. The sample for this study comprised students who were present and actively participated in the socialization session held on May 13, 2026. A purposive sampling technique was applied, meaning participants were not selected randomly but based on their availability and direct involvement in the educational activity. The facilitation team consisted of seven sixth-semester students of the International Relations Study Program, Faculty of Social and Political Sciences, Universitas Brawijaya, who designed and delivered the session as part of the Global Health course project.

Data collection was conducted through two complementary techniques. The first was structured participatory observation, carried out by two members of the facilitation team who were not assigned as primary presenters during the session. These observers documented student responses, spontaneous questions raised during discussions, and the degree of active participation exhibited throughout each segment of the session. Observation was guided by three predetermined qualitative indicators, namely the level of student engagement during the flashcard demonstration, the depth and relevance of questions posed by students, and the students' demonstrated ability to independently categorize food items into healthy and unhealthy groups by the end of the session. The second data collection technique was reflective discussion, conducted among all seven facilitators immediately following the session (Paivio, 1991). This post-activity debrief served to triangulate individual observations and produce a consolidated qualitative account of the session's outcomes and limitations.

The research model applied in this study draws on the Health Belief Model as its theoretical foundation, which posits that behavioral change is preceded by an individual's perceived susceptibility to a health threat and perceived benefits of taking preventive action. The flashcard-based intervention was structured to activate both dimensions by presenting relatable food comparisons, specifically *gado-gado* as a locally familiar example of nutritious eating and instant noodles as a widely consumed product whose excessive intake poses documented health risks including hypertension, digestive disorders, and increased blood sugar levels. This locally contextualized approach was deliberate, as educational effectiveness in child populations is significantly enhanced when instructional content reflects the cultural and experiential reality of the learner.

Data analysis was carried out using descriptive qualitative techniques. Observational field notes and reflective discussion records were organized thematically and analyzed to identify recurring patterns in student responses that indicated comprehension, curiosity, or misconception regarding the nutritional content of the foods presented. The analysis did not employ statistical instruments given the qualitative and exploratory nature of the study. Rather, findings were interpreted in relation to the session's predefined learning objectives and discussed in light of existing theoretical frameworks on health communication and visual learning in early childhood education. The research hypothesis, stated implicitly, is that the use of contextually relevant visual media in a single structured session is sufficient to produce a measurable shift in students' basic awareness of healthy eating practices, even in the absence of a formal pre-test and post-test instrument.

III. RESULT AND DISCUSSION

The implementation of the healthy nutrition socialization activity conducted by students of International Relations at Universitas Brawijaya in SDI Mohammad Hatta reflects a structured and participatory educational intervention aimed at improving children's awareness of balanced nutrition. The program was designed to introduce fundamental concepts of healthy eating habits through interactive and age-appropriate learning methods. The activity began with an opening session that established rapport with

the students, followed by the delivery of core materials related to balanced nutrition, including the importance of consuming vegetables, fruits, protein, and maintaining hydration. The use of flashcards as the primary educational medium played a significant role in simplifying complex nutritional concepts into visually engaging and easily understandable information for elementary school students.

From an implementation perspective, the activity demonstrated effective planning and execution. The facilitators successfully adapted their communication style to match the cognitive level of the students, ensuring that the material was neither too complex nor overly simplistic. The incorporation of interactive elements such as question and answer sessions, games, and direct student participation contributed to a more dynamic learning environment. This approach aligns with experiential learning principles, where active engagement enhances knowledge retention. Furthermore, the structured flow of the session from introduction, material delivery, interactive engagement, to closing indicates that the program followed a clear pedagogical framework, which is essential in educational outreach activities.

The results observed during the activity indicate a positive reception from the students. The majority of participants showed enthusiasm and curiosity, particularly during the flashcard sessions where visual stimuli attracted their attention. Students were actively involved in identifying different types of food and categorizing them into healthy and unhealthy groups. This active participation suggests that the learning media used were effective in stimulating both cognitive and emotional engagement. Additionally, students demonstrated an increasing ability to recall and articulate key messages related to balanced nutrition as the session progressed, indicating short-term knowledge acquisition.



Figure 1. Flashcard session

In terms of student response, the level of enthusiasm was notably high throughout the session. Many students eagerly volunteered to answer questions and participate in games, reflecting a strong interest in the topic. This enthusiasm can be attributed to the interactive teaching methods employed, which differ from conventional lecture-based approaches commonly experienced in classrooms. The informal and engaging atmosphere created by the facilitators also contributed to reducing communication barriers, allowing students



Fig. 2. Question and Answer session

to feel more comfortable expressing their ideas and asking questions. Such an environment is crucial in educational interventions targeting young learners, as it fosters openness and active learning.

Students' enthusiasm was further reflected in their ability to recall the material presented. When facilitators posed follow-up questions at the end of the session, most students were able to respond accurately, indicating that the key messages had been well understood. Additionally, their expressions of

curiosity and enjoyment throughout the activity highlighted the suitability of the educational approach for their age group. This positive response can be attributed to the communicative and engaging approach adopted by the university students, who successfully created a learning environment that was both enjoyable and effective. Consequently, the socialization activity not only improved students' knowledge of nutrition but also provided a memorable learning experience. The high level of enthusiasm demonstrated by the students serves as evidence that health education can be effectively delivered when packaged through creative and interactive methods.

The healthy nutrition socialization activity demonstrates that interactive, visually supported, and participatory approaches are highly effective in delivering educational content to elementary school students. The positive response and high level of engagement observed during the session highlight the importance of using innovative teaching methods in community-based educational programs. At the same time, future implementations should consider continuity and reinforcement strategies to ensure that the knowledge gained translates into sustained behavioral change.

The positive responses demonstrated by the students also highlighted the importance of contextualizing health education materials to suit the learners' daily experiences. In this regard, the selection of local food examples played a significant role in enhancing students' understanding of the concepts being introduced. The flash cards used during the activity featured foods that were familiar to the students, including rice, tempeh, tofu, vegetables, fruits, milk, and commonly consumed snacks. Because these foods were part of the students' everyday environment, they were able to easily relate the information presented to their own dietary habits and experiences.

The effectiveness of the flashcard-based intervention was demonstrated by students' capacity to identify between healthy and unhealthy foods, as well as verbalize the nutritional attributes and health consequences connected with each food item. Throughout the activity, students were able to correctly classify the items provided on the flashcards and explain their nutritional worth. For example, when shown images of fruits, vegetables, fish, milk, and traditional Indonesian dishes, many students were able to identify key nutrients such as vitamins, minerals, protein, calcium, and fiber while also explaining their benefits for growth, immunity, and general health. In contrast, students were able to identify highly processed snacks, sugary beverages, and quick foods as less nutritious options and correlate them with potential negative health outcomes when taken in excess. These results indicate that the intervention improved not only memorization but also meaningful knowledge of dietary concepts.

From a theoretical point of view, Paivio's Dual Coding Theory, which proposes that information presented through both verbal and visual channels is processed and retained more effectively than information delivered solely through text or verbal explanation, can help explain the efficacy of flashcards. The use of visuals help primary school students build tangible comprehension and lessen cognitive load, especially when introducing abstract ideas like health and nutrition. Students were able to create cognitive connections between food visuals, nutritional components, and health outcomes thanks to the flashcards utilized throughout the session, which converted nutritional information into visually accessible content. During the learning exercise, this procedure improved recall and encouraged active engagement.

A further indicator of effectiveness was the students' capacity to elaborate on the functions of nutrients found in various diets. Several children displayed a grasp that vegetables supply vitamins and fiber needed for digestion, meat and eggs provide protein required for body growth, and milk's calcium content promotes bone development. This capacity to link individual nutrients to physiological activities indicates that pupils had advanced beyond basic food recognition to a more thorough understanding of nutrition literacy. According to current health literacy frameworks, nutritional literacy includes not only knowledge acquisition but also the ability to comprehend, evaluate, and use nutrition-related information in daily decision-making. As a result, the students' replies indicate that the flashcard intervention effectively enhanced foundational nutritional knowledge among participants.

The use of local food examples contributed to the development of contextual understanding, which is considered an important component of effective learning. Rather than introducing unfamiliar food items that students might rarely encounter, the facilitators incorporated foods that reflected the local dietary culture.

This approach allowed students to connect theoretical knowledge about healthy nutrition with practical situations they face in their daily lives. As a result, students were not only able to identify healthy and unhealthy foods correctly but also gained a clearer understanding of how nutritional choices can be applied within their own households and communities.

Furthermore, the incorporation of local food examples reinforced the message that healthy eating does not necessarily require expensive or imported products. Many students often associate healthy food with items that may be perceived as costly or inaccessible. By presenting nutritious local foods such as vegetables, fruits, fish, tempeh, and tofu, the activity emphasized that balanced nutrition can be achieved through affordable and readily available food sources. This message is particularly relevant in promoting sustainable healthy eating behaviors among children, as it encourages realistic dietary practices that can be maintained over time.

From a broader health promotion perspective, the use of culturally and socially relevant examples aligns with principles of community-based health education. Health messages are generally more effective when they are adapted to the social and cultural contexts of the target population. Therefore, the utilization of local food examples in this activity not only enhanced students' comprehension but also increased the relevance and practicality of the nutritional information being delivered. The findings suggest that contextualized educational materials can serve as an effective tool for improving health literacy among elementary school students.

Despite the positive outcomes observed during the activity, several limitations should be acknowledged. First, the duration of the socialization program was relatively short, limiting the opportunity to explore nutritional concepts in greater depth. While students were introduced to the basic distinction between healthy and unhealthy foods, there was insufficient time to discuss more complex topics such as nutritional requirements, balanced diet planning, and the long-term health consequences of poor eating habits.

Second, the assessment of learning outcomes was conducted primarily through direct observation, interactive discussions, and question-and-answer sessions during the activity. Although these methods provided immediate insights into students' comprehension, they did not allow for the measurement of long-term knowledge retention or behavioral change. Consequently, it remains unclear whether the information acquired during the session will translate into sustained improvements in dietary practices. Future programs may benefit from incorporating follow-up evaluations to assess the longer-term impact of the intervention.

Another limitation relates to the diversity of students' learning abilities and levels of participation. While many students actively engaged with the activities and demonstrated strong understanding of the material, others were less participatory and may have required additional guidance or individualized attention. Given the group-based format and limited time available, it was challenging for facilitators to ensure that every participant achieved the same level of comprehension.

Finally, although flash cards proved to be an effective educational tool for attracting attention and facilitating engagement, they have inherent limitations in conveying more detailed nutritional information. Visual aids are particularly useful for introducing concepts and encouraging participation; however, they may be less effective in explaining complex nutritional processes or fostering deeper critical understanding. Therefore, future health education initiatives could consider combining flash cards with complementary learning methods such as demonstrations, videos, practical activities, or follow-up workshops to strengthen learning outcomes.

Overall, while the activity successfully increased students' awareness and understanding of healthy eating habits, these limitations indicate opportunities for further improvement. Addressing these challenges in future implementations may enhance both the educational effectiveness and the long-term impact of similar nutrition promotion programs.

IV. CONCLUSION

This study demonstrates that flashcard-based nutrition education can serve as an effective and engaging approach to improving nutritional literacy among elementary school students. The implementation

of visual and interactive learning methods successfully increased student's understanding of the differences between healthy and unhealthy foods, encouraged active participation, and strengthened their ability to relate nutritional concepts to their daily eating habits. The use of familiar local food examples further contributed to student's contextual understanding by making health messages more relevant and easier to apply in everyday life.

In addition to improving student's awareness of healthy eating, this activity highlights the contribution of university students in supporting community-based health promotion through service-learning initiatives. By translating theoretical knowledge into practical educational interventions, university students can play an important role in strengthening health literacy at the community level, particularly among children in the critical stage of habit formation.

However, several limitations remain, including the short duration of the intervention, limited opportunities to assess long-term behavioral change, and differences in student's levels of participation and comprehension. Therefore, future programs are recommended to incorporate follow-up evaluations, longer intervention periods, and complementary learning media such as demonstrations, videos, or practical activities to strengthen educational outcomes.

Overall, this study suggests that integrating contextualized visual learning with service-learning approaches holds strong potential for developing sustainable global health education models in elementary schools. Such initiatives may contribute not only to improving children's nutritional knowledge but also to fostering healthier dietary behaviors that support long-term well-being.

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