

Implementation of Fermented Food and Clean and Healthy Living Behavior (CHLB) Education for Elementary School Students at Public Elementary School 068003 Medan City

Karina Nola Sinamo^{*1}, Ecia Meilonna Koka², Veronica Angelia³,
Nur Ulina W. Sebayang⁴, Hanif Rizqi Nurvandi⁵, Muhammad Rafly Dwi Aqsa⁶,
Zahwa Dwi Rizkiani⁷, Cornelia Butar-butur⁸, Safira Mawaddah⁹,
Sri Rejeki Lumbantoruan¹⁰, Novita Pebrina Lumban Tobing¹¹

^{1,5,6,7,8}Food Technology Study Program, Faculty of Agriculture, Universitas Sumatera Utara, Medan, 20155, Indonesia.

^{2,9,10,11}Nutrition Study Program, Faculty of Public Health, Universitas Sumatera Utara, Medan, 20155, Indonesia.

³Department of Prosthodontics, Faculty of Dentistry, Universitas Sumatera Utara, Medan, 20155, Indonesia

⁴Agrotechnology Study Program, Faculty of Agriculture, Universitas Sumatera Utara Medan, 20155, Indonesia.

*Corresponding Author: karinanolasinamo@usu.ac.id

ARTICLE INFO

Article history:

Received : 19th May 2026

Revised : 1st June 2026

Accepted : 19th June 2026

Available online

<https://talenta.usu.ac.id/jst/index>

E-ISSN: 2621-4830

P-ISSN: 2621-2560

How to cite:

K. N. Sinamo, E. C. Koka, V. Angelia, N. U. W. Sebayang, H. R. Nurvandi, M. R. D. Aqsa, Z. D. Rizkiani, C. Butar-butur, S. Mawaddah, S. R. Lumbantoruan, and N. P. Lumban Tobing, "Implementation of Fermented Food and Clean and Healthy Living Behavior (CHLB) Education for Elementary School Students at Public Elementary School 068003 Medan City," *Journal of Saintech Transfer*, vol. 9, no. 1, pp. 57-65, 2026.

ABSTRACT

Improving public health, including among early childhood populations, is an essential component of national development that aims to enhance awareness, willingness, and capacity to adopt healthy lifestyles, thereby achieving optimal health and well-being. One practical approach to achieving this goal is through educational interventions in elementary schools. This community service activity at Medan 068003 Public Elementary School implemented an educational program introducing fermented foods and Clean and Healthy Living Behavior (CHLB) to strengthen student's knowledge, awareness, and daily health practices. The program used educational methods such as animated video presentations, pre- and post-tests, and interactive discussions. Materials covered the benefits and preparation of fermented foods, as well as the importance of CHLB implementation within the school environment. Students practiced proper handwashing and toothbrushing techniques. Additionally, "little doctors" were trained wound cleaning, managing nosebleeds, and measuring body temperature and blood pressure. The community service team also donated School Health Unit (SHU) equipment, including a bed, weighing and height scales, a thermometer, first aid kits, and a sphygmomanometer. The outcomes showed an increase in students' knowledge of fermented foods from 63.57% to 85.14% and CHLB from 63.95% to 89.07%, demonstrating the effectiveness of this educational intervention.

Keyword: Clean and Healthy Living Behavior, Educational Program, Fermented Food

ABSTRAK

Peningkatan kesehatan masyarakat, termasuk anak usia dini, merupakan bagian dari pembangunan nasional yang bertujuan menumbuhkan kesadaran, kemauan, dan kemampuan untuk hidup sehat guna mencapai kesejahteraan serta derajat kesehatan yang optimal. Salah satu bentuk implementasinya adalah melalui kegiatan edukasi di sekolah dasar. Edukasi pengenalan pangan fermentasi dan Perilaku Hidup Bersih dan Sehat (PHBS) di sekolah bertujuan meningkatkan pengetahuan, kesadaran, dan kebiasaan siswa dalam menerapkan gaya hidup sehat guna menciptakan lingkungan belajar yang bersih dan sehat. Kegiatan pengabdian kepada masyarakat di SD Negeri 068003 Medan dilaksanakan dengan metode edukatif melalui pemutaran video animasi, pelaksanaan pre-test dan post-test, serta diskusi interaktif. Materi yang disampaikan meliputi manfaat dan cara pembuatan pangan fermentasi serta pentingnya penerapan PHBS di sekolah. Siswa juga melaksanakan praktik mencuci tangan dan menyikat gigi yang benar. Selain itu,



This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International.

<https://doi.org/10.32734/jst.v9i1.25559>

dibentuk dokter kecil melalui pelatihan membersihkan luka, menangani mimisan, serta mengukur suhu tubuh dan tekanan darah. Tim pengabdian juga memberikan bantuan perlengkapan UKS berupa tempat tidur, timbangan berat dan tinggi badan, termometer, kotak P3K, dan tensimeter. Hasil kegiatan adalah peningkatan pengetahuan tentang pangan fermentasi dari 63,57% menjadi 85,14% dan PHBS dari 63,95% menjadi 89,07%, menunjukkan efektivitas kegiatan edukasi dalam menanamkan perilaku hidup sehat sejak dini.

Keyword: Perilaku Hidup Bersih dan Sehat, pPogram Edukasi, Pangan Fermentasi

1. Introduction

Improving children's health is an important component of national development aimed at creating a healthy and productive generation. Schools are strategic settings for promoting healthy lifestyles because children spend a substantial proportion of their daily time in the school environment, where eating habits and health-related behaviors are established. Consequently, school-based health promotion programs play an essential role in improving students' health literacy and long-term well-being [1].

One of the major health concerns in elementary schools is the widespread consumption of unhealthy school snacks. School snacks should not only be readily available but also safe, nutritious, and supportive of children's growth and development. However, many children continue to consume snacks high in sugar, salt, and fat while having limited knowledge of healthier alternatives. The World Health Organization emphasizes the importance of creating healthy school food environments by improving access to nutritious foods and reducing children's exposure to unhealthy snacks and beverages [2].

Fermentation technology offers a practical approach to improving the quality and management of school snacks by producing foods that are naturally preserved, microbiologically safe, nutritionally enhanced, and acceptable to children. Fermented foods such as yogurt, fermented milk, fermented cereals, and fermented soybean products contain beneficial microorganisms and bioactive compounds that contribute to gut health, improved nutrient bioavailability, and immune function. Therefore, introducing fermentation technology to elementary school students can increase their understanding of healthy snack choices while encouraging the selection of safer and more nutritious foods in the school environment [3,4].

The community service partners, namely students of Public Elementary School 068003 Medan, were selected because unhealthy snack consumption remains common among students. A preliminary survey involving 50 students showed that 82% frequently consumed unhealthy school snacks, while 76% did not routinely wash their hands with soap before eating and after using the toilet. These findings indicate that unhealthy snack consumption is accompanied by inadequate hygiene practices, increasing the risk of foodborne diseases and other health problems. Therefore, interventions should address both healthy snack selection and personal hygiene simultaneously.

In addition to promoting healthier food choices, implementing Clean and Healthy Living Behaviors (CHLB) in schools is essential for preventing communicable diseases and establishing lifelong healthy habits. CHLB includes handwashing with soap, consuming nutritious foods, maintaining environmental sanitation, and practicing personal hygiene. Integrating CHLB education with healthy snack education enables students to understand not only what foods should be consumed but also how hygienic behaviors contribute to food safety and disease prevention [5,6].

Based on these conditions, this community service activity aimed to introduce fermentation technology as an approach to managing healthier school snacks by educating students on fermented foods as safe, nutritious, and naturally preserved snack alternatives, while simultaneously strengthening Clean and Healthy Living Behaviors (CHLB). The program also included the provision of school health unit (SHU) equipment and the establishment of Little Doctors to support the sustainability of school health promotion. Through this integrated approach, students are expected to improve their knowledge and practices regarding healthy snack selection, food safety, and personal hygiene, thereby contributing to healthier school food environments. Furthermore, this activity supports Sustainable Development Goal (SDG) 3 (Good Health and Well-being) by promoting healthy lifestyles and preventing foodborne diseases, and SDG 12 (Responsible Consumption and Production) by encouraging responsible consumption through the selection of nutritious and sustainable fermented foods.

2. Methods

This community service program was conducted at Public Elementary School 068003 Medan, located on Jalan Kayu Manis 1, Mangga Village, Medan Tuntungan District, Medan, Indonesia. The program involved 50 fifth- and sixth-grade students in the fermented food education activities and 43 students in the Clean and Healthy Living Behaviors (CHLB) training. The community service activities were implemented using the following methods: 1) The community service team conducted a preliminary survey at the partner school to assess students' hand hygiene practices and school snack consumption as the basis for designing the educational intervention. The survey identified that many students did not routinely wash their hands with soap before eating and after using the toilet and frequently consumed unhealthy snacks in the school environment; 2) The community service team provided education on fermented foods as healthy snacking through educational videos, product tasting, and discussions on the nutritional benefits and production of tempeh, bread, yogurt, and nata de coco. CHLB education covered hand hygiene, personal hygiene, first aid, and basic health examinations. Students' knowledge was assessed using pre-test and post-test questionnaires, and the effectiveness of both interventions was evaluated using paired t-tests ($p < 0.05$); 3) The community service team established a team of six little doctors and provided practical training in basic first-aid skills, including wound cleaning, management of nosebleeds (epistaxis), measurement of body temperature using a thermometer, and measurement of blood pressure using a sphygmomanometer. To support the sustainability of the school health program, the students were also provided with little doctor uniforms, enabling them to continue their roles in promoting health and delivering basic first-aid services within the school after the completion of the community service program; 4) The community service team provided School Health Unit (SHU) equipment, including height and weight measuring devices, SHU beds, sphygmomanometers, thermometers, and first-aid kits, to support school health services. The donated anthropometric equipment was subsequently used to measure the height and weight of 50 students for growth assessment.

3. Results and Discussion

Elementary school students in Medan still frequently purchase snacks outside the school cafeteria and tend to have limited knowledge about choosing safe and nutritious foods. Poor hygiene and sanitation practices among snack vendors in Medan have been associated with an increased incidence of diarrheal disease among elementary school students, highlighting the need to improve the safety of school snacks [7]. The community service team conducted a preliminary survey involving 50 students at Public Elementary School 068003 Medan to assess the current condition of school snack consumption. The survey revealed that 82% of students frequently consumed unhealthy school snacks, indicating a high reliance on foods with limited nutritional value and potential food safety risks. In addition, 76% of students did not regularly wash their hands with soap before eating and after using the toilet, increasing the risk of foodborne illness associated with unsafe snack consumption. These findings demonstrated the need for interventions targeting both the selection of healthy school snacks and personal hygiene practices. Therefore, the community service team implemented an educational program on fermented foods as healthy snack alternatives, integrated with Clean and Healthy Living Behavior (CHLB) education. This community service activity began with a speech from the Principal, Mrs. Sri Ningsihan, S.Pd.I (Figure 1).



Figure 1. Opening remarks from the Principal of Public Elementary School 068003 Medan

The technological concept applied in this program is the implementation of food fermentation technology to introduce and promote safe, nutritious, and naturally preserved school snacks through familiar fermented foods such as bread, yogurt, nata de coco, and tempeh. These products represent practical examples of fermentation processes involving beneficial microorganisms, including yeast, lactic acid bacteria, and acetic acid bacteria, which produce organic acids and other bioactive metabolites that lower food pH, inhibit spoilage

and pathogenic microorganisms, improve nutrient bioavailability, and extend shelf life without extensive use of synthetic preservatives [8]. By using commonly consumed fermented foods as educational media, students can more easily understand the role of beneficial microorganisms in improving food quality and safety. This technological intervention is integrated with Clean and Healthy Living Behavior (CHLB) education to enhance students' knowledge, foster healthy eating habits, and encourage informed food choices. Consequently, the program combines food fermentation technology with health education to address both the availability of healthier school snacks and the behavioral factors influencing children's dietary practices.

The implementation of fermentation technology in school snack management is increasingly important because schools are recognized as strategic settings for improving children's dietary quality and creating healthier food environments. Fermentation technology enhances the nutritional value, safety, shelf life, and sensory quality of foods, making fermented products suitable as healthier alternatives to commonly consumed school snacks. Before the educational activity, students completed a pre-test questionnaire to assess their baseline knowledge of fermented foods and their role as healthy school snack alternatives.

The educational activity was conducted through the screening of a video entitled "Let's Get to Know Fermented Foods" (Figure 2), which was specifically designed for elementary school students. This educational video has been copyrighted under No. 000996315 by the Director General of Intellectual Property, with the Scientific Writing and Intellectual Property Rights Innovation Institute, Universitas Sumatera Utara, as the copyright holder. The video was developed by the community service team and introduces various fermented food products, including tempeh, bread, yogurt, and nata de coco, together with explanations of their nutritional benefits and production processes. The use of video-based education in this community service is consistent with previous studies showing that audiovisual media effectively improve children's nutrition knowledge and support healthier food choices. The improvement in students' knowledge observed in this study is also consistent with the findings of Bello et al. (2024), who reported that nutrition education significantly enhanced children's knowledge and promoted healthier food choices in primary schools. Likewise, Pyo et al. (2024) emphasized that increasing children's understanding of fermented foods encourages the consumption of probiotic-rich foods that support gut health and immune function. These findings indicate that integrating fermentation technology into school nutrition education is an effective strategy for improving students' knowledge while promoting healthier and safer school snack choices through the selection of nutritious, naturally preserved fermented foods [4,9].



Figure 2. Implementation of the educational activity "Let's Get to Know Fermented Foods" for students through the screening of video media as an interactive learning tool

After the video screening, the community service team conducted an interactive question-and-answer session to encourage students' active participation, improve their understanding of the material, and promote critical thinking through two-way communication. To reinforce the educational content, students were also given samples of fermented food products, allowing them to directly observe, taste, and recognize fermented foods as healthy school snack alternatives (Figure 3). This hands-on activity helped students better understand the characteristics, nutritional value, and health benefits of fermented foods while increasing their acceptance of these products. The use of interactive discussions combined with food demonstrations is consistent with previous studies showing that participatory nutrition education improves children's comprehension, acceptance of healthy foods, and willingness to adopt healthier eating behaviors. Furthermore, recent evidence indicates

that fermented foods contribute to gut microbiota modulation, gastrointestinal health, and overall well-being through probiotics and other bioactive compounds [10]. These findings support the integration of fermentation technology into school nutrition education as a practical strategy for promoting healthier school snack choices. Consequently, introducing fermented foods as safe, nutritious, and minimally processed snack alternatives aligns with current public health initiatives to improve the quality of school food environments and children's dietary habits.



Figure 3. Fermented foods distributed to students at Public Elementary School 068003 Medan as a supporting medium for educational activities

The community service team conducted a post-test to measure the students' level of understanding of the education on fermented foods. Students' knowledge of fermented foods was assessed using seven knowledge-based questions covering the definition, examples, benefits, and preparation of fermented foods. Table 1 presents the comparison of students' knowledge scores before and after the fermented food education program. The mean pre-test knowledge score was 4.45 ± 1.47 , which increased significantly to 5.96 ± 1.63 following the educational intervention. When converted to percentages based on the maximum score of seven, the average knowledge score increased from $63.57 \pm 21.00\%$ to $85.14\% \pm 23.29\%$, representing an improvement of 21.57 percentage points (Figure 4). Paired t-test analysis confirmed that this increase was statistically significant ($t = 8.48$, $p < 0.001$), with a mean difference of 1.51 points (95% CI: 1.15–1.87), indicating that the fermented food education program effectively improved students' knowledge.

Table 1. Comparison of Students' Knowledge Scores Before and After Fermented Food Education (n = 50)

Outcome	Pre test (Mean $\pm$ SD)	Post test (Mean $\pm$ SD)	Mean Differences (95%CI)	t	p-value
Knowledge score (0-7)	4.45 ± 1.47	5.96 ± 1.63	1.51 (1.15–1.87)	8.48	<0.001

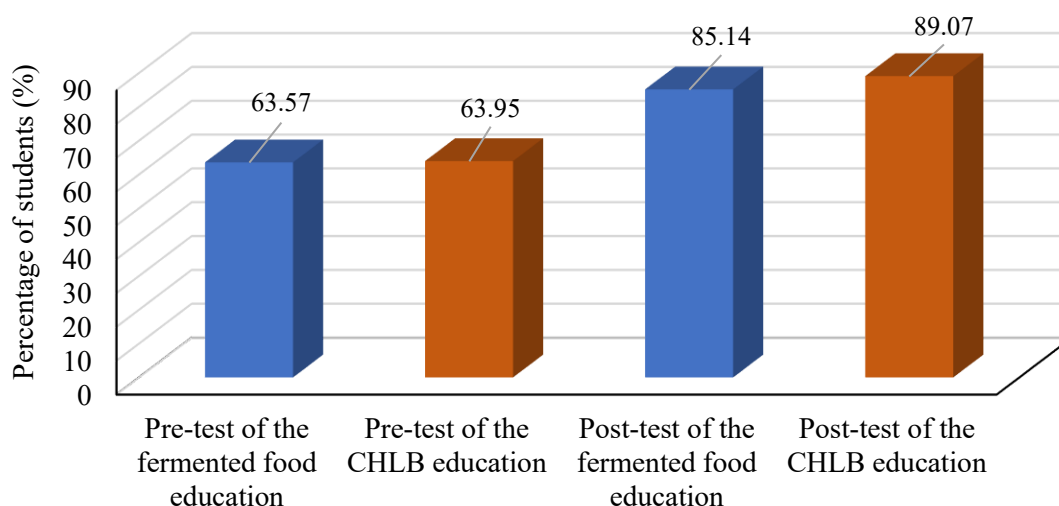


Figure 4. Changes in students' knowledge scores before and after the fermented food and Clean and Healthy Living Behavior (CHLB) education programs

The activity continued with education on clean and healthy living behaviors for 43 students. This activity was also carried out by showing animated videos so that students could understand better. In addition, students were also invited to practice how to brush their teeth and wash their hands properly (Figure 5). Handwashing methods (not just frequency) are important for school children as part of their hygiene habits [11]. The community service team first demonstrated the methods in front of the students, who then followed suit. To support the continuation of these practices at home, each student was given a toothbrush and toothpaste.



Figure 5. Practice of clean and healthy living behaviors (brushing teeth and washing hands properly)

In this educational activity on clean and healthy living behavior, Table 2 presents the comparison of students' knowledge scores before and after the educational intervention. The mean pre-test score was 6.40 ± 1.33 , which increased to 8.91 ± 0.97 in the post-test. In percentage terms, the mean knowledge score improved from $63.95 \pm 13.30\%$ before the intervention to $89.07 \pm 9.71\%$ after the intervention, representing an overall increase of 25.12 percentage points (Figure 4). Paired t-test analysis revealed a statistically significant improvement in students' knowledge following the intervention ($t = 10.53$, $p < 0.001$). The mean knowledge score increased by 2.51 points (95% CI: 2.03–2.99), indicating that the educational program effectively enhanced students' knowledge.

Table 2. Comparison of Students' Knowledge Scores Before and After the Educational Intervention (n = 43)

Outcome	Mean $\pm$ SD	Minimum	Maximum	Difference (95% CI)	t	p-value
Pre-test	6.40 ± 1.33	3	9	2.51 (2.03–2.99)	10.53	<0.001
Post-test	8.91 ± 0.97	6	10			

In this community service activity, the community service team formed a team of 6 little doctors and provided them with junior doctor uniforms and hats (Figure 6). It is hoped that these little doctors can become

"student leaders" who have the task of being agents of change in health education for their friends at school. The little doctors were given training by the community service team first demonstrated the training procedures, and the little doctors then practiced these procedures under the guidance of the community service team. The roles of the little doctors at school are as follows:

1. Helping to maintain student health, personal hygiene, and the school environment.
2. Being role models for clean and healthy living (CHLB). They set an example for their friends in practicing healthy habits, such as washing hands, brushing teeth, and maintaining food hygiene.
3. Spreading health information, assisting teachers in conveying health messages and education to other students.
4. Providing simple first aid, such as helping friends who have minor injuries or dizziness before receiving further treatment.
5. Supporting SHU (School Health Unit) activities, such as participating in health programs at school, including regular check-ups, cleanliness competitions, or healthy living campaigns.



Figure 6. Formation of six little doctors at Public Elementary School 068003 Medan

As a form of health facility support at Public Elementary School 068003 Medan, the community service team provided height and weight measuring equipment, SHU beds, thermometers, sphygmomanometers, and first-aid kits to the school. The equipment was officially handed over through an asset transfer report signed by representatives of the community service team and the school. To ensure the effective use of these facilities, the community service team also provided practical training for the school's little doctors. As shown in Figure 7, the little doctors were trained in basic first-aid skills, including wound cleaning, management of nosebleeds (epistaxis), and the measurement of body temperature and blood pressure, following standard first-aid guidelines issued by the Indonesian Ministry of Health [12].

The steps for wound cleaning training are as follows: 1) Participants are taught to wash their hands with soap or hand sanitizer before performing the procedure; 2) Clean the wound area with running water or antiseptic solution; 3) Use sterile gauze from the center of the wound outward; 4) Dry the wound with sterile gauze; 5) Cover with a bandage or plaster if necessary; and 6) Dispose of used gauze or adhesive tape in a medical waste bin or closed container.

Steps for treating a nosebleed including 1) Stay calm and position the patient in an upright sitting position with the head slightly tilted forward to prevent blood from flowing into the throat; 2) Do not tilt your head back to prevent blood from entering your airway or being swallowed, which can cause nausea or vomiting; 3) Press your nose correctly using your thumb and index finger to press the soft part of your nose (nostrils) for ± 10 minutes without releasing the pressure; 4) Apply pressure by placing a clean cloth or ice wrapped in a small towel on the bridge of the nose to help constrict the blood vessels and stop the bleeding; 5) Ask the patient to breathe through their mouth to help reduce pressure in the nasal cavity during the pinching process; 6) After the bleeding stops, avoid blowing the nose for several hours, do not pick or rub the inside of the nose, and rest the patient in a sitting or semi-reclining position; and 6) Seek immediate medical attention if the nosebleed does not stop after 15–20 minutes or if there is excessive bleeding.



Figure 7. Training and mentoring activities for elementary school health cadres (“little doctors”)

The donated anthropometric equipment was subsequently used to measure students' height and weight to assess their growth status. The results of these measurements are presented in Table 2. As shown in Table 2, the mean body weight of male and female students was 30.24 ± 9.26 kg and 35.50 ± 9.41 kg, respectively, while the mean height was 137.00 ± 5.37 cm for males and 140.26 ± 6.91 cm for females. Based on the World Health Organization (WHO) Growth Reference for School-aged Children and Adolescents (5–19 years), these measurements were within the normal growth range for children of comparable age when interpreted using height-for-age (HAZ) and body mass index-for-age (BAZ) z-scores [13]. Although female students had slightly higher mean height and weight than male students, the differences are consistent with normal variations in growth according to age and sex.

These findings are consistent with previous studies reporting that healthy school environments and improved nutrition knowledge contribute to maintaining normal growth among school-aged children. Bello et al. (2024) reported that nutrition education enhanced children's knowledge and encouraged healthier food choices in primary schools, while the WHO (2025) emphasizes that healthy school food environments, combined with regular growth monitoring, are essential for supporting optimal growth and preventing malnutrition. The availability of anthropometric measuring equipment through this community service program enables schools to conduct routine growth monitoring while supporting nutrition education and healthier school snack choices, thereby strengthening the implementation of the School Health Unit (SHU).

Table 3. Mean Height and Weight of Fifth-Grade Elementary School Students
(Mean Age: 10.14 ± 0.35 Years)

	Male n=27	Female n=23
Weight (kg)	30.24 ± 9.26	35.50 ± 9.41
Height (cm)	137.00 ± 5.37	140.26 ± 6.91

4. Conclusion

The community service program implemented an educational intervention on fermented foods and Clean and Healthy Living Behaviors (CHLB) for students at Public Elementary School 068003 Medan. Statistical evaluation demonstrated a significant improvement in students' knowledge following the intervention. Among the 50 participants, the mean knowledge score regarding fermented foods increased significantly from $63.57 \pm 21.00\%$ before the intervention to $85.14 \pm 23.29\%$ after the intervention (paired t-test, $t = 8.48$, $p < 0.001$), representing an increase of 21.57 percentage points. Likewise, among the 43 students who participated in the CHLB training, the mean knowledge score increased from $63.95 \pm 13.30\%$ to $89.07 \pm 9.71\%$, with a statistically significant improvement (paired t-test, $t = 10.53$, $p < 0.001$), representing an increase of 25.12 percentage points. These findings indicate that the combination of educational videos, live demonstrations, and interactive question-and-answer sessions effectively improved students' knowledge of fermented foods and healthy living practices. Integrating fermentation technology education with CHLB training may serve as an effective school-based strategy to improve health literacy, encourage healthier school snack choices, and promote healthy lifestyle behaviors among elementary school students.

5. Acknowledgments

The author would like to thank the Community Service Institute of the Universitas Sumatera Utara, where this article is one of the outputs of the implementation of the 2025 USU Non-PNPB Funded Community Service Program in accordance with the Letter of Agreement on the Implementation of Community Service on the Theme of Health Service Number: 205/UN5.4.11.K/Kontrak/PM.01.02/2025.

References

- [1] World Health Organization, "How school systems can improve health and well-being: Topic briefs: Nutrition," Geneva: World Health Organization, 2023. [Online]. Available: <https://iris.who.int/server/api/core/bitstreams/81349e2f-1c0f-46ef-b194-96605bc2eeda/content>. [Accessed: Jul. 24, 2026].
- [2] World Health Organization, "Policies and interventions to create healthy school food environments: WHO guideline," Geneva: World Health Organization, 2025. [Online]. Available: <https://iris.who.int/server/api/core/bitstreams/6989e26c-c181-4ec8-bb99-104415a2e142/content>. [Accessed: Jul. 24, 2026].
- [3] J. Kolniak-Ostek, "Fermented means beneficial—fermented foods as support for the metabolism of children and adolescents," *Pediatric Endocrinology, Diabetes and Metabolism*, vol. 31, no. 2, pp. 41–43, 2025.
- [4] F. Bello, E. Koukou, S. Bodjrenou, C. Termote, P. Azokpota, and W. A. Hounkpatin, "Food and nutrition knowledge, attitudes and practices among children in public primary schools with canteens in southern Benin," *BMC Nutrition*, vol. 10, no. 40, pp. 1–8, 2024.
- [5] United Nations Children's Fund, "Nutrition Environment Assessment Toolkit for Schools (NEAT-S) in Indonesia: Identifying barriers to healthy school nutrition environments to strengthen policies and programmes," Jakarta: UNICEF Indonesia, 2024. [Online]. Available: <https://www.unicef.org/indonesia/media/24206/file/nutrition-environment-assessment-toolkit-for-schools-Indonesia.pdf>. [Accessed: Jul. 24, 2026].
- [6] World Health Organization and United Nations Children's Fund, "Progress on drinking water, sanitation and hygiene in schools 2015–2023: Special focus on menstrual health," Geneva: World Health Organization, 2024. [Online]. Available: <https://www.who.int/publications/i/item/9789240097490>. [Accessed: Jul. 24, 2026].
- [7] J. B. Girsang, D. Syaputri, R. Tanjung, and Y. S. Siagian, "Perilaku hygiene sanitasi pedagang makanan jajanan dan perilaku jajan siswa dengan kejadian diare di sekolah dasar," *Jurnal Ilmiah PANNMED*, vol. 18, no. 1, pp. 125–130, 2023.
- [8] R. H. Hernández Figueroa, A. López-Malo, and E. Mani-López, "Antimicrobial activity and applications of fermentates from lactic acid bacteria: A review," *Sustainable Food Technology*, vol. 2, no. 2, pp. 292–306, 2024.
- [9] Y. Pyo, K. H. Kwon, and Y. J. Jung, "Review: Probiotic functions in fermented foods: Anti-viral, immunomodulatory, and anti-cancer benefits," *Foods*, vol. 13, no. 2386, pp. 1–18, 2024.
- [10] S. Todorovic, A. Akpinar, R. Assunção, et al., "Health benefits and risks of fermented foods—the PIMENTO initiative," *Frontiers in Nutrition*, vol. 11, no. 1458536, pp. 1–14, 2024.
- [11] C. Shi, M. O'Donoghue, L. Yang, H. Tsang, J. Chen, J. Zou, J. Qin, Y-W. Mak, D. Pittet, Y. J. Xie, T. Lai, C. Li, and J. Cao, "Factors associated with hand washing effectiveness: An institution-based observational study," *Antimicrobial Resistance & Infection Control*, vol. 12, no. 85, pp. 1–11, 2023.
- [12] Kementerian Kesehatan Republik Indonesia, "Pertolongan pertama saat kamu terluka. Ayo Sehat," 2024. [Online]. Available: <https://ayosehat.kemkes.go.id/>. [Accessed: tanggal akses belum tercantum — mohon dilengkapi].
- [13] World Health Organization, "Growth reference data for 5–19 years," Geneva: World Health Organization, 2007. [Online]. Available: <https://www.who.int/tools/growth-reference-data-for-5to19-years>. [Accessed: Jul. 24, 2026].