Bioscientist: Jurnal Ilmiah Biologi
https://e-journal.undikma.ac.id/index.php/bioscientist

March 2026 Vol. 14, No. 1
e-ISSN: 2654-4571
pp. 261-268

The Effect of Nutrition Education on Students' Breakfast Habits and Academic Achievement at SMA Negeri 1 Sausu

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Received: January 2026; Revised: February 2026; Accepted: March 2026; Published: March 2026

Abstract: This study aimed to examine the effect of nutrition education on students' breakfast habits and learning outcomes at SMA Negeri 1 Sausu, while also highlighting its role in promoting healthier breakfast behaviors among students. The study employed a quantitative approach using a one-group pretest-posttest design. The participants were 23 tenth-grade students selected through total sampling. Data were collected using questionnaires to assess students' breakfast habits before and after the intervention, as well as documentation of students' learning outcomes. Data were analyzed using descriptive quantitative analysis through mean scores, score improvement, and N-gain values. The results showed that the mean breakfast habit score increased from 40.09 in the pretest to 48.43 in the posttest, with an N-gain of 0.14, which was categorized as low. In addition, the mean learning outcome score increased from 77.30 before the intervention to 80.17 after the intervention, with an N-gain of 0.13, also categorized as low. These findings indicate that nutrition education contributed positively to improvements in students' breakfast habits and learning outcomes, although the level of effectiveness remained low. Therefore, nutrition education has the potential to serve as a promotive and preventive strategy for fostering healthy breakfast behaviors and supporting academic improvement, provided that it is implemented continuously and supported by both the family and the school environment.

Keywords: Nutrition education; breakfast habits; learning outcomes; high school students

How to Cite: Indrianti, N. L., Lilies, Laenggeng, A. H., Dhafir, F., Zainal, S., & Nurdin, M. (2026). The Effect of Nutrition Education on Students' Breakfast Habits and Academic Achievement at SMA Negeri 1 Sausu. *Bioscientist : Jurnal Ilmiah Biologi*, *14*(1), 261–268. https://doi.org/10.33394/bioscientist.v14i1.19914

https://doi.org/10.33394/bioscientist.v14i1.1991

INTRODUCTION

Breakfast is an important dietary habit that supports students' learning readiness, cognitive function, and academic performance. Morning energy intake helps maintain the availability of glucose required by the brain to sustain attention, memory, and information processing during learning activities. Numerous studies have shown that breakfast consumption is associated with improvements in short-term cognitive function, particularly in attention, memory, and executive function, and is also linked to better school-related outcomes, including motivation and academic achievement, in children and adolescents (Adolphus et al., 2016; Hartline-Grafton & Levin, 2022; Martin et al., 2024).

Nevertheless, breakfast habits among school-aged children in Indonesia remain a public health concern that warrants attention. The Ministry of Health of the Republic of Indonesia, referring to data from Riskesdas 2018, reported that approximately 65% of children do not eat breakfast before going to school. This condition is important to note because skipping breakfast may not only reduce learning readiness, but is also associated with poorer dietary quality, increased hunger throughout the day, and a greater risk of overweight and cardiometabolic disorders in children and adolescents (Kementerian Kesehatan RI, 2023; Ricotti et al., 2021).

From a nutritional perspective, breakfast should not merely be viewed as a means of relieving hunger, but rather as an initial contribution to meeting daily nutritional requirements through foods that provide adequate energy, protein, vitamins, minerals, and fluids. A healthy and balanced breakfast helps maintain physical fitness, emotional stability, and students' concentration during school hours. In addition, both breakfast consumption and breakfast quality have been reported to be positively associated with students' motivation and academic achievement (Martin et al., 2024). In contrast, inadequate breakfast intake or the habitual omission of breakfast may cause the body to feel weak, become easily fatigued, and lose focus during classroom learning (Kementerian Kesehatan RI, 2024).

Changes in breakfast behavior can be initiated through improved nutrition knowledge and the development of positive attitudes toward the importance of eating in the morning. In this context, schools represent a strategic setting for fostering healthy eating habits from an early age. Intervention studies among Indonesian adolescents have shown that school-based nutrition education using a multistrategy approach can improve attitudes, self-efficacy, motivation, breakfast frequency, and nutrient intake at breakfast. These findings emphasize that structured and sustained nutrition education has the potential to improve students' eating behaviors, including breakfast habits (Indriasari et al., 2021). In addition, the healthy school approach has increasingly been emphasized in both global and national health policies and guidelines as a means of promoting better eating habits among children and adolescents (WHO, 2026; Kementerian Kesehatan RI, 2024).

Based on observations and interviews conducted by the researchers on 8 September 2025 at SMA Negeri 1 Sausu, it was found that most students still demonstrated poor breakfast behaviors before leaving for school. Observational data indicated that nearly 50% of students had not developed a regular breakfast habit. Some students reported that they did not have time to eat breakfast because they were rushing to school, while others consumed only snacks or instant beverages that did not meet daily nutritional needs. Interviews with teachers further indicated that students who frequently skipped breakfast tended to have difficulty understanding lesson material, were less active in asking questions, and showed lower scores on daily tests and school assignments. In this context, the field findings at SMA Negeri 1 Sausu suggest that breakfast-related problems are associated not only with individual habits, but also with limited understanding of the importance of balanced nutrition and suboptimal nutrition education within the school environment.

These problems indicate that efforts to improve student learning outcomes cannot be separated from attention to eating behaviors, particularly breakfast habits. Poor breakfast habits among students may be influenced by various factors, including time constraints, limited family support, inadequate nutrition knowledge, and the lack of consistent implementation of nutrition education programs in schools. Therefore, sustained nutrition education interventions are needed through counseling, seminars, the promotion of healthy breakfast habits, and the integration of nutrition-related material into learning activities and healthy school programs. By increasing students' awareness of the importance of a nutritionally balanced breakfast, their physical and psychological condition is expected to be better maintained, thereby enabling the learning process to proceed more optimally. Based on this background, this study aims to examine the effect of nutrition education on students' breakfast habits and learning outcomes at SMA Negeri 1 Sausu, while also highlighting its role in promoting healthier breakfast behaviors among students.

METHOD

This study employed a quantitative approach using a one-group pretest-posttest design. This design was used to analyze the effect of nutrition education on students' breakfast habits and learning outcomes by comparing conditions before and after the intervention within the same group. Schematically, the research design was O_1 – X – O_2, where O_1 represents the pretest, X the nutrition education intervention, and O_2 the posttest. The study was conducted at SMA Negeri 1 Sausu in January during the second semester of the 2026/2027 academic year.

The research participants were 10th-grade students at SMA Negeri 1 Sausu who took part in the nutrition education program. The total sample consisted of 23 students. A total sampling technique was applied, in which all students who met the study criteria were included as participants. The inclusion criteria were as follows: (1) active 10th-grade students at SMA Negeri 1 Sausu; (2) willingness to participate in the entire research process; (3) participation in the pretest, nutrition education intervention, and posttest; and (4) availability of complete learning outcome records. Students who did not complete any stage of the study or had incomplete data were excluded from the analysis.

The independent variable in this study was nutrition education, while the dependent variables were students' breakfast habits and learning outcomes. Nutrition education was delivered as an intervention aimed at improving students' understanding of the importance of a healthy breakfast and balanced nutrition. Breakfast habits were measured using questionnaire scores, whereas learning outcomes were assessed through documentation of students' academic scores before and after the intervention.

The research instruments consisted of a questionnaire and documentation. The questionnaire was used to assess students' breakfast habits before and after the intervention, including aspects such as breakfast regularity, types of foods consumed, and basic understanding of the importance of a nutritious breakfast. Documentation was used to obtain secondary data in the form of students' learning outcomes before and after the implementation of the nutrition education intervention. The documents consisted of score recapitulations obtained from the relevant subject teacher.

The research procedure was carried out in several stages. The first stage was the pretest, during which students completed a questionnaire to determine their baseline breakfast habits prior to the intervention. The second stage was the nutrition education intervention, which covered the importance of breakfast, the principles of balanced nutrition, the effects of skipping breakfast on learning concentration, and examples of healthy breakfast menus. The educational session was delivered in a structured manner through lectures, discussion, and question-and-answer activities. The third stage was the posttest, in which the questionnaire was administered again after the intervention to identify changes in students' breakfast habits. The fourth stage involved the collection of academic score documentation, namely the recording of students' learning outcomes before and after the intervention as supporting data to examine changes in academic achievement.

Data were analyzed using a quantitative descriptive approach. Pretest and posttest scores were analyzed using mean values, the magnitude of score improvement, and N-gain to determine the level of improvement in students' breakfast habits and learning outcomes following the intervention. The N-gain was calculated using the following formula:

N-gain = (posttest score – pretest score) / (maximum score – pretest score)

In this study, the maximum score was set at 100. The N-gain results were used to describe the effectiveness of the nutrition education intervention in improving breakfast habits and learning outcomes. The N-gain values were interpreted according to the criteria presented in Table 1.

Table 1. Interpretation of N-gain values

N-gain Value	Interpretation
< 0.30	Low
0.30 ≤ g < 0.70	Moderate
≥ 0.70	High

RESULTS AND DISCUSSION

This study involved 23 tenth-grade students at SMA Negeri 1 Sausu who participated in the research sequence consisting of a pretest, nutrition education intervention, posttest, and documentation of learning outcome scores. Based on the descriptive analysis, the nutrition education intervention was followed by improvements in both breakfast habit scores and students' learning outcomes. To examine changes in students' breakfast habits after the intervention, a comparison was made between the mean pretest and posttest scores. In addition to the score difference, the effectiveness of the change was also analyzed using the N-gain value. The comparison results are presented in Table 2.

Table 2. Comparison of students' breakfast habit scores in the pretest and posttest

Description	Mean Score
Pretest	40.09
Posttest	48.43
Increase	8.35
N-gain	0.14

As shown in Table 2, the mean breakfast habit score increased from 40.09 in the pretest to 48.43 in the posttest, with a gain of 8.35 points. The calculated N-gain value of 0.14 indicates that the improvement falls into the low category. Nevertheless, these findings suggest a positive change after students received nutrition education on the importance of a healthy breakfast and balanced nutrition.

The increase in breakfast habit scores indicates that nutrition education was able to improve students' understanding and awareness of the importance of eating breakfast before participating in classroom learning. This finding is consistent with a systematic review showing that breakfast consumption is preferable to breakfast skipping in supporting cognitive function in children and adolescents, particularly in attention, memory, and mental performance during school hours (Hoyland et al., 2009). This result is also supported by Martin et al. (2024), who reported that breakfast consumption and better breakfast quality were associated with more adaptive learning motivation and higher academic achievement.

However, the low N-gain value indicates that the improvement in breakfast behavior was still not optimal. This may be explained by the fact that eating behavior changes in adolescents are generally influenced not only by knowledge, but also by family factors, food availability at home, morning routines, and support from the school environment. A systematic review by Harris et al. (2021) showed that interventions to

increase breakfast consumption tend to be more successful when they do not focus solely on individual education, but also involve behavioral strategies and environmental changes, including support from teachers, families, and school breakfast arrangements. Similarly, Medeiros et al. (2022) emphasized that school-based nutrition education interventions among adolescents tend to be more effective when they are multicomponent in nature, involve families and teachers, and are supported by school environmental changes that facilitate healthier food choices.

These findings may also be explained in terms of the quality of foods consumed at breakfast. Changes in breakfast behavior should not be assessed solely by whether breakfast is consumed, but also by the nutritional quality of the foods eaten. Cândido et al. (2024) showed that adolescents who skip breakfast tend to have higher consumption of ultra-processed foods and less favorable overweight indicators. Therefore, nutrition education in this study should be understood not only as an effort to increase breakfast frequency, but also as an initial step toward guiding students to make healthier and more nutritious breakfast choices.

In addition to breakfast habits, this study also analyzed changes in students' learning outcomes before and after the nutrition education intervention. The comparison of mean scores and N-gain results are shown in Table 3.

Table 3. Comparison of students' learning outcomes before and after nutrition education

Description	Mean Score
Before intervention	77.30
After intervention	80.17
Increase	2.87
N-gain	0.13

As presented in Table 3, the mean student learning outcome score increased from 77.30 before the intervention to 80.17 after the intervention, representing an improvement of 2.87 points. The N-gain value of 0.13 indicates that the improvement in learning outcomes also falls into the low category. Even so, the increase in the mean score suggests that the nutrition education intervention was followed by better academic achievement.

The improvement in learning outcomes may be explained by the relationship between breakfast, learning readiness, and students' cognitive function. Breakfast provides the energy and glucose needed by the brain in the morning, thereby helping students become more prepared for learning, sustain attention, and process information more effectively. In line with the present findings, Martin et al. (2024) showed that regular consumption of a higher-quality breakfast was associated with stronger motivation and better academic performance. In addition, a large population-based study by Sincovich et al. (2025) found that students who frequently skipped breakfast were at greater risk of low performance on standardized literacy and numeracy tests, with the greatest risk observed in numeracy and reading. These findings strengthen the assumption that breakfast habits constitute one of the relevant factors supporting students' academic performance.

Nevertheless, the improvement in learning outcomes in this study should be interpreted with caution. The one-group pretest-posttest design demonstrates that changes occurred after the intervention, but it does not fully isolate the effects of nutrition education from other influencing factors, such as students' baseline ability,

family support, study habits at home, and classroom learning conditions. Therefore, the findings are more appropriately interpreted as an indication that nutrition education contributed positively to improvements in breakfast habits and learning outcomes, although the magnitude of its effect remains limited. This interpretation is also consistent with the literature showing that the relationship between breakfast and academic achievement tends to be positive, but may vary according to breakfast quality, socioeconomic context, and the way academic achievement is measured (Sincovich et al., 2025).

Overall, the findings indicate that nutrition education produced a positive direction of change in both breakfast habits and students' learning outcomes at SMA Negeri 1 Sausu. However, the low N-gain values suggest that the intervention still needs to be strengthened through more sustained educational efforts, a multicomponent approach, the involvement of parents and teachers, and a more supportive school environment for the promotion of healthy breakfast habits. Thus, school-based nutrition education programs should not be implemented merely as incidental activities, but rather be designed as part of a continuous promotive and preventive effort.

CONCLUSION

The nutrition education provided to tenth-grade students at SMA Negeri 1 Sausu showed a positive contribution to improving both breakfast habits and students' learning outcomes. This was reflected in the increase in the mean breakfast habit score from 40.09 to 48.43, with an N-gain value of 0.14, as well as the increase in the mean learning outcome score from 77.30 to 80.17, with an N-gain value of 0.13. Although both improvements were categorized as low, these findings indicate that nutrition education has the potential to support the development of healthy breakfast habits while also enhancing students' academic achievement. Therefore, nutrition education should be implemented continuously and supported by both families and the school environment to achieve more optimal outcomes.

RECOMMENDATION

Future research should involve a larger sample size, include a control group, and apply a longer intervention period so that the effectiveness of nutrition education on breakfast habits and learning outcomes can be evaluated more robustly. In addition, family factors, socioeconomic conditions, and the school environment should be analyzed as supporting variables. Assessments of breakfast quality and parental involvement should also be incorporated to provide a more comprehensive understanding.

ACKNOWLEDGMENT

The author would like to express sincere gratitude to Ida Sang Hyang Widhi Wasa, the Almighty God, to the academic supervisor, to the author's beloved parent, Ni Ketut Eka, to the author's two siblings, Nikadek Swanita and Komang Radiva, and to the entire family for their continuous support. The author also extends heartfelt thanks to I Wayan Suandinata as the author's partner, as well as to friends and colleagues who consistently provided encouragement, prayers, and assistance throughout the completion of this study. Finally, the author would like to acknowledge and appreciate their own commitment and responsibility in completing this research.

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