

Free Nutritious Meal Program Implementation and Mathematics Learning Endurance Among Grade VII Junior High School Students in Jakarta

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ABSTRACT: The Free Nutritious Meal Program has become a strategic education policy in Indonesia because it addresses a basic condition for learning: students need adequate energy and nutritional support to remain attentive, motivated, and physically ready in class. This study examined the implications of the program for mathematics learning endurance among Grade VII junior high school students in Jakarta. Learning endurance was defined as students' ability to sustain learning focus, learning concentration, learning motivation, and physical stamina during mathematics lessons. A quantitative descriptive-correlational survey design was used. The respondents consisted of 20 teachers and 118 Grade VII students. Data were collected using a closed-ended questionnaire with a five-point Likert scale and four indicators: learning focus, learning concentration, learning motivation, and physical endurance. The data were analyzed through descriptive statistics, Pearson item-total correlation, inter-indicator correlation, and significance testing at the 0.05 level. The teacher data produced a mean score of 3.56, equivalent to 71.25 percent of the ideal score, and fell within the very good implication category. The student data produced a mean score of 3.22, equivalent to 64.32 percent of the ideal score, and fell within the good implication category. All indicators in both datasets showed positive and significant relationships with the total instrument score, with $p < 0.001$. The findings suggest that the Free Nutritious Meal Program is positively associated with students' mathematics learning endurance. The strongest perceived benefit appeared in physical endurance, while learning focus received the lowest score. These results indicate that school nutrition policy should be integrated with instructional strategies, classroom management, and appropriate meal distribution timing to produce stronger learning benefits.

KEYWORDS: Free Nutritious Meal Program, learning endurance, mathematics education, school nutrition, junior high school, education policy

1. INTRODUCTION

Students' readiness to learn depends on more than curriculum design, teacher quality, or classroom methods. Physical condition, energy availability, and nutritional adequacy shape how long students can remain attentive, engaged, and cognitively active during lessons. In mathematics classrooms, this issue becomes more salient because students need sustained attention to follow explanations, process symbols, solve problems, and check the accuracy of their reasoning. A student who begins a lesson hungry or physically weak may still attend class, but may struggle to maintain effort until the end of the learning session.

School-age nutrition remains an important educational concern because it relates to attention, stamina, and academic performance. Arifin et al. stated that nutritional problems among schoolchildren can negatively affect physical growth and academic performance. The same study reported that some children still attend school while hungry and that only a small proportion of children regularly consume nutritionally balanced breakfast (Arifin et al. 2025. p. 790). This condition shows that school-based nutrition interventions can serve as a practical entry point for improving the quality of learning processes.

The Free Nutritious Meal Program can be understood as an education policy that seeks to support students' basic learning conditions. The program is not limited to food provision. It also relates to learning readiness, concentration, motivation, and sustained engagement in classroom activities. Putri et al. argued that the Free Nutritious Meal Program aims to improve students' nutritional status as a way to support learning readiness and instructional quality (Putri et al. 2026. p. 165). Setiawan et al. also emphasized that education requires adequate nutritional access because food intake affects the learning process (Setiawan et al. 2025. p. 341).

Previous studies have linked school meal programs with learning-related outcomes. Arifin et al. found that the Free Nutritious Meal Program significantly improved students' concentration in the intervention group (Arifin et al. 2025. pp. 790, 795). Nida and

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Sari reported that school meal programs contributed positively to students' cognitive achievement, including mathematics scores (Nida and Sari. 2023. p. 69). Other evidence also indicates that nutritious meal programs may relate to learning motivation, active participation, and school attendance (Marzhela Putri et al. 2025. p. 11335).

Despite this growing evidence, most prior research has focused on concentration, learning interest, motivation, attendance, or general academic achievement. Few studies have examined how the Free Nutritious Meal Program relates to mathematics learning endurance among junior high school students. This gap matters because mathematics learning requires continuous mental effort. Students need to sustain focus, concentration, motivation, and physical readiness across a lesson, not only at its beginning.

Learning endurance is conceptually close to cognitive endurance. Brown et al. defined cognitive endurance as the ability to maintain effortful mental activity over a period of time (Brown et al. 2022. p. 1). In mathematics education, this concept can be operationalized as students' ability to stay focused, concentrate on explanations and tasks, remain motivated, and avoid fatigue during mathematics learning. For Grade VII students, this issue is especially relevant because they are transitioning from elementary to junior high school. They face more structured schedules, more abstract content, and higher academic expectations. This study addresses that gap by examining the implications of Free Nutritious Meal Program implementation for mathematics learning endurance among Grade VII junior high school students in Jakarta. The study asks: how does the implementation of the Free Nutritious Meal Program relate to mathematics learning endurance among Grade VII students? The analysis does not claim pure causality. Instead, it provides empirical evidence based on teacher and student perceptions across four indicators: learning focus, learning concentration, learning motivation, and physical endurance.

2. THEORETICAL FRAMEWORK

2.1 The Free Nutritious Meal Program as an Educational Intervention

The Free Nutritious Meal Program is a school nutrition intervention that connects health support with learning readiness. In educational settings, meal provision should not be treated as a separate welfare activity. It can operate as part of a learning support system because adequate food intake provides energy for the body and supports brain functions needed for attention, memory, and persistence.

Arifin et al. explained that adequate nutrient intake, including iron, iodine, and essential fatty acids, plays an important role in brain function, especially in areas related to attention and working memory (Arifin et al. 2025. p. 796). Nutritional inadequacy can reduce attention span, increase fatigue, and limit students' performance in school activities. Therefore, a school meal policy may influence learning indirectly through students' physical and cognitive readiness.

Implementation quality is central to this policy. Tambunan et al. noted that school meal implementation involves distribution timing, recipient data, classroom teacher support, and food provision by the supplier (Tambunan et al. 2025. p. 25). This means that the success of the program depends not only on whether food is available, but also on regularity, punctuality, hygiene, portion adequacy, menu quality, and students' acceptance of the food.

2.2 Mathematics Learning Endurance

Mathematics learning endurance refers to students' capacity to maintain learning conditions during continuous mathematics activities. In this study, the construct includes four indicators: learning focus, learning concentration, learning motivation, and physical endurance. These indicators are relevant because mathematics requires students to understand concepts, follow procedures, process symbolic information, solve problems, and review answers with care.

Learning endurance differs from momentary concentration. Concentration describes the ability to direct attention at a particular moment. Learning endurance emphasizes the continuity of attention and effort across time. A student with strong learning endurance does not only appear prepared at the beginning of a lesson. The student can continue to engage with explanations, examples, exercises, and corrections until the lesson ends.

Brown et al. argued that cognitive endurance is related to the capacity to maintain mental performance during tasks that require sustained thinking (Brown et al. 2022. p. 1). This concept fits mathematics learning because mathematics often requires repeated cognitive effort. Students need to keep reasoning, calculating, comparing, and correcting. Physical readiness and mental persistence therefore become important conditions for meaningful mathematics learning.

2.3 Nutrition, Learning Readiness, and Mathematics Learning

The relationship between nutrition and learning can be explained through physiological and pedagogical pathways. Physiologically, nutritious meals provide energy for the body and the brain. Students who receive adequate food intake are more likely to enter

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the classroom with better physical readiness. Pedagogically, better physical readiness may help students listen to explanations, maintain attention, and complete learning tasks.

Nida and Sari found that school meal programs had a positive effect on students' cognitive achievement, including mathematics performance (Nida and Sari. 2023. p. 69). Adolphus et al. also showed that breakfast is associated with behavior and academic performance among children and adolescents (Adolphus et al. 2013. p. 425). These findings support the assumption that food intake can contribute to learning conditions that are required in mathematics classrooms.

Based on this theoretical and empirical basis, the operational hypothesis of this study is: H1, the implementation of the Free Nutritious Meal Program has a positive and significant implication for mathematics learning endurance among Grade VII junior high school students in Jakarta.

3. RESEARCH METHODS

3.1 Research Design

This study used a quantitative descriptive-correlational survey design. The design was selected because the study aimed to analyze empirical tendencies in the relationship between Free Nutritious Meal Program implementation and mathematics learning endurance. The data were collected using a five-point Likert scale questionnaire.

The study was positioned within an education policy evaluation perspective. The Free Nutritious Meal Program was treated as a policy that supports students' learning readiness. Purnama explained that educational policy research aims to provide information that can help understand, evaluate, or improve education policy (Purnama. 2010. p. 8).

3.2 Participants and Setting

The study involved two groups of respondents. The first group consisted of 20 teachers. The second group consisted of 118 Grade VII junior high school students in Jakarta. Each respondent answered four items representing the indicators of mathematics learning endurance.

The teacher dataset contained 80 item responses, calculated from 20 respondents and four items. The student dataset contained 472 item responses, calculated from 118 respondents and four items. The use of two respondent groups allowed the study to compare classroom observation from teachers with direct learning experience from students.

3.3 Instrument

The research instrument was a closed-ended questionnaire using a five-point Likert scale. Score 1 indicated no implication. Score 2 indicated low or insufficient implication. Score 3 indicated good implication. Score 4 indicated very good implication. Score 5 indicated excellent implication. All items were positive. Higher scores indicated stronger perceived implications of the Free Nutritious Meal Program for mathematics learning endurance.

The instrument included four indicators: learning focus, learning concentration, learning motivation, and physical endurance. Table 1 presents the instrument blueprint.

Table 1. Instrument blueprint

No.	Indicator	Measurement focus
1	Learning focus	The program helps students stay focused during mathematics lessons.
2	Learning concentration	The program helps students concentrate when understanding explanations and solving mathematics problems.
3	Learning motivation	The program helps increase students' motivation in mathematics learning.
4	Physical endurance	The program helps students avoid hunger, fatigue, or loss of energy during mathematics lessons.

3.4 Data Analysis

The data were analyzed using descriptive and inferential statistics. Descriptive statistics were used to calculate total score, mean score, ideal percentage, and category. Inferential statistics were used to calculate Pearson item-total correlations, inter-indicator correlations, and correlation significance tests.

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The significance decision used the 0.05 alpha level. A p-value below 0.05 indicated a statistically significant relationship. Since the study relied on survey-based perception data, the findings were interpreted as empirical support for positive program implications, not as proof of pure causality.

4. RESEARCH RESULTS

4.1 General Findings

The general findings show that teachers and students gave positive evaluations of the Free Nutritious Meal Program in relation to mathematics learning endurance. The summary is presented in Table 2.

Table 2. Respondent profile and general results

Group	N	Items	Total responses	Mean	Ideal percentage	Category
Teachers	20	4	80	3.56	71.25%	Very good implication
Students	118	4	472	3.22	64.32%	Good implication

The teacher data produced a mean score of 3.56 and were categorized as very good implication. The student data produced a mean score of 3.22 and were categorized as good implication. This difference suggests that teachers and students viewed the program from different positions. Teachers assessed observable classroom behavior, while students reported their own learning experiences.

4.2 Teacher Data

The teacher data show that all indicators fell within the very good implication category. The highest indicators were learning motivation and physical endurance, both with a mean score of 3.65. This result indicates that teachers perceived the strongest program implications in students' learning enthusiasm and physical readiness.

Table 3. Teacher data by indicator

Indicator	N	Total score	Mean	Ideal percentage	Category
Learning focus	20	69	3.45	69.00%	Very good implication
Learning concentration	20	70	3.50	70.00%	Very good implication
Learning motivation	20	73	3.65	73.00%	Very good implication
Physical endurance	20	73	3.65	73.00%	Very good implication
Overall	80	285	3.56	71.25%	Very good implication

Table 4. Item-total correlation in teacher data

Indicator	Item-total r	t-value	p-value	Decision
Learning focus	0.9478	12.6136	< 0.001	Significant
Learning concentration	0.9551	13.6698	< 0.001	Significant
Learning motivation	0.9721	17.5955	< 0.001	Significant
Physical endurance	0.9280	10.5696	< 0.001	Significant

All item-total correlations in the teacher data exceeded the r-table value of 0.4438. All indicators also had p-values below 0.001. Therefore, the four indicators showed strong and significant relationships with the total instrument score.

4.3 Student Data

The student data show that all indicators fell within the good implication category. The highest indicator was physical endurance, with a mean score of 3.30. This means that students most strongly felt the program benefits in physical readiness, reduced hunger, and stronger capacity to continue participating in mathematics lessons.

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Table 5. Student data by indicator

Indicator	N	Total score	Mean	Ideal percentage	Category
Learning focus	118	373	3.16	63.22%	Good implication
Learning concentration	118	378	3.20	64.07%	Good implication
Learning motivation	118	378	3.20	64.07%	Good implication
Physical endurance	118	389	3.30	65.93%	Good implication
Overall	472	1518	3.22	64.32%	Good implication

Table 6. Item-total correlation in student data

Indicator	Item-total r	t-value	p-value	Decision
Learning focus	0.8980	21.9763	< 0.001	Significant
Learning concentration	0.9227	25.7703	< 0.001	Significant
Learning motivation	0.9112	23.8260	< 0.001	Significant
Physical endurance	0.9081	23.3619	< 0.001	Significant

All item-total correlations in the student data exceeded the r-table value of 0.1809. All indicators also had p-values below 0.001. Therefore, all indicators in the student data were statistically significant and strongly related to the total instrument score.

4.4 Inter-Indicator Correlation

The inter-indicator correlation analysis shows that mathematics learning endurance is a connected construct. In the teacher data, correlations ranged from 0.8073 to 0.9082. The strongest relationship was between learning motivation and physical endurance, with $r = 0.9082$. In the student data, correlations ranged from 0.7266 to 0.8177. The strongest relationship was between learning concentration and learning motivation, with $r = 0.8177$.

Table 7. Summary of inter-indicator correlations

Data source	Range of Pearson r	Strongest correlation	r-value	Interpretation
Teachers	0.8073 to 0.9082	Learning motivation and physical endurance	0.9082	Very strong
Students	0.7266 to 0.8177	Learning concentration and learning motivation	0.8177	Very strong

4.5 Hypothesis Testing

The hypothesis testing results show operational support for H1. The decision was based on the mean score tendency, item-total correlations, and significance results for all indicators in both teacher and student datasets.

Table 8. Summary of hypothesis testing

Data source	Mean	Ideal percentage	Category	Significance result	Decision
Teachers	3.56	71.25%	Very good implication	All indicators $p < 0.001$	H1 supported
Students	3.22	64.32%	Good implication	All indicators $p < 0.001$	H1 supported

These results indicate that the Free Nutritious Meal Program has positive and significant implications for mathematics learning endurance among Grade VII junior high school students in Jakarta based on teacher and student data. The findings show that the Free Nutritious Meal Program is positively related to students' mathematics learning endurance. This pattern appeared consistently in the teacher and student datasets. Teachers placed the program in the very good implication category, while

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students placed it in the good implication category. The difference is reasonable because teachers assessed observable classroom behavior, whereas students assessed their own direct experience.

The findings support the argument that nutritional support is linked to learning readiness. Arifin et al. explained that adequate nutrient intake contributes to brain functions related to attention and working memory (Arifin et al. 2025. p. 796). In mathematics learning, attention and working memory are essential because students must understand concepts, follow procedures, remember steps, and process symbols accurately. In the teacher data, learning motivation and physical endurance had the highest mean scores. This result aligns with Setiawan et al., who found that the Free Nutritious Meal Program in pesantren settings was associated with increased enthusiasm and concentration among students (Setiawan et al. 2025. p. 341). It also supports Marzhela Putri et al., who reported that teachers perceived improvements in students' learning motivation after the implementation of nutritious meal programs (Marzhela Putri et al. 2025. p. 11335).

In the student data, physical endurance had the highest score. This indicates that students directly felt the program benefits through improved bodily readiness. They perceived themselves as less hungry, less tired, and more able to continue participating in mathematics learning. This finding is important because mathematics requires both physical and mental persistence. Students need to listen, calculate, solve, revise, and remain attentive across the lesson.

The inter-indicator correlations also show that mathematics learning endurance is not a single isolated response. Learning focus, concentration, motivation, and physical endurance are connected. In the teacher data, learning motivation and physical endurance showed a very strong relationship. In the student data, concentration and motivation showed the strongest relationship. These patterns indicate that better physical readiness may be linked with stronger psychological and cognitive readiness.

However, learning focus had the lowest mean score in both teacher and student data. This finding suggests that nutritious meal provision does not automatically produce optimal classroom focus. Learning focus may still depend on teaching strategy, classroom climate, sleep quality, psychological condition, study habits, technology distraction, and the timing of meal distribution. Therefore, the program should not stand alone. It should be integrated with pedagogical support.

From a policy perspective, the Free Nutritious Meal Program should be treated as part of the learning ecosystem. Evaluation should not only count the number of meals distributed. It should also examine punctuality, hygiene, nutritional composition, portion adequacy, students' acceptance, and the relationship between distribution time and lesson schedules. Tambunan et al. emphasized that school meal programs require distribution management, data accuracy, and school support to work effectively (Tambunan et al. 2025. pp. 25-26). This study contributes to the literature on school nutrition policy by positioning mathematics learning endurance as the main analytical focus. Prior studies have often examined concentration, motivation, learning interest, or general cognitive achievement. This study adds a more specific perspective by linking school nutrition policy with students' capacity to sustain learning conditions in mathematics. The use of teacher and student data also provides a broader view of program implications.

5. CONCLUSION

This study used aggregated teacher and student data. School and respondent identities were not disclosed to protect confidentiality. Data collection should be conducted after obtaining permission from the school and consent from respondents according to educational research procedures.

This article contributes to school nutrition policy research by using mathematics learning endurance as the central construct. The contribution lies in the use of four indicators, learning focus, learning concentration, learning motivation, and physical endurance, viewed from teacher and student perspectives.

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