

The Effect of Free Nutritious Meal Program (MBG) Quality on the Learning Readiness of Elementary and Junior High School Students in Bandung City

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Abstract : The Free Nutritious Meal Program (Makan Bergizi Gratis, MBG) is a large-scale national priority program, making the quality of its implementation an important aspect to evaluate. This study analyzes the effect of four MBG quality dimensions: food quality, nutritional adequacy, menu variety, and meal distribution quality on the learning readiness of elementary (SD) and junior high (SMP) school students in Bandung City. A convergent parallel mixed method design was employed. Quantitative data were collected from 203 students (89 elementary and 114 junior high) using a four-point Likert questionnaire and analyzed with multiple linear regression, conducted separately per school and then pooled; qualitative data were obtained from interviews with 11 students and 8 teachers. Results show that the four dimensions simultaneously affect learning readiness ($R^2 = 0.508$; $F = 51.02$; $p < 0.001$). Partially, food quality ($\beta = 0.399$) and nutritional adequacy ($\beta = 0.285$) are significant and consistent across both levels. Menu variety is significant only at the junior high level, whereas meal distribution quality is significant only at the elementary level, so both become non-significant in the pooled model. These findings reveal level-specific effect patterns and offer implications for improving MBG service quality differently for elementary and junior high schools.

Keywords: Free Nutritious Meal; Program Quality; Learning Readiness; Food Quality; Mixed Method

Abstrak: Program Makan Bergizi Gratis (MBG) merupakan program prioritas nasional berskala besar, sehingga kualitas implementasinya menjadi aspek penting untuk dievaluasi. Penelitian ini menganalisis pengaruh empat dimensi kualitas MBG, yaitu kualitas makanan, kecukupan gizi, variasi menu, dan kualitas distribusi makanan terhadap kesiapan belajar siswa sekolah dasar (SD) dan sekolah menengah pertama (SMP) di Kota Bandung. Penelitian menggunakan desain *mixed method* paralel konvergen. Data kuantitatif diperoleh dari 203 siswa (89 siswa SD dan 114 siswa SMP) melalui kuesioner skala Likert empat poin dan dianalisis menggunakan regresi linear berganda. Data kualitatif diperoleh melalui wawancara terhadap 11 siswa dan 8 guru. Hasil penelitian menunjukkan bahwa keempat dimensi kualitas MBG secara simultan berpengaruh terhadap kesiapan belajar ($R^2 = 0,508$; $F = 51,02$; $p < 0,001$). Secara parsial, kualitas makanan ($\beta =$

0,399) dan kecukupan gizi ($\beta = 0,285$) berpengaruh signifikan dan konsisten pada kedua jenjang pendidikan. Variasi menu hanya signifikan pada tingkat SMP, sedangkan kualitas distribusi makanan hanya signifikan pada tingkat SD. Temuan ini menunjukkan adanya pola pengaruh yang berbeda berdasarkan jenjang pendidikan serta memberikan implikasi bagi peningkatan kualitas layanan MBG secara spesifik pada tingkat SD dan SMP.

Kata kunci : Makan Bergizi Gratis; Kualitas Program; Kesiapan Belajar; Kualitas Makanan; Metode Campuran.

INTRODUCTION

School feeding programs are among the strategic interventions widely used across countries to improve the nutritional status, health, attendance, and learning outcomes of school-age children. Through a systematic review and meta-analysis, Wang et al. (2021) found that school feeding programs in low- and middle-income countries contribute to improvements in body weight, height, and student attendance. A similar finding was reported by Cohen et al. (2021), who stated that universal school meal policies are associated with increased student participation, diet quality, food security, and a number of educational indicators. A recent review by Spill et al. (2024) likewise confirmed that the universal provision of free school meals is related to improvements in various student outcomes.

The link between nutritional intake and learning readiness can be explained through physiological and cognitive mechanisms. In a systematic review, Adolphus et al. (2016) found that morning food consumption is positively associated with the cognitive performance of children and adolescents, particularly in the domains of attention and executive function. Lundqvist et al. (2019) also concluded that there is a positive effect of food consumption on cognitive performance, academic achievement, and student well-being. Thus, the availability of adequate, good-quality food at school has the potential to support students' physical condition and concentration, which are prerequisites of learning readiness.

Children who receive adequate and nutritious food tend to have better energy, are more able to concentrate, and are more ready to follow the learning process. Through a systematic review, Wall et al. (2022) found a positive correlation between school feeding programs and educational outcomes such as attendance, enrollment, and learning achievement. Accordingly, school feeding programs can be understood not only as a nutritional intervention but also as part of a strategy to improve the quality of learning.

In Indonesia, the Free Nutritious Meal Program (Makan Bergizi Gratis, MBG) has become one of the national priority programs aimed at improving the quality of human resources through nutritional fulfillment for school children and other target groups. The National Nutrition Agency (Badan Gizi Nasional) reported that by early 2026 the MBG program had reached approximately 59.86 million beneficiaries through 21,102 Nutrition Fulfillment Service Units (Satuan Pelayanan Pemenuhan Gizi, SPFG), with a projection of reaching up to 82.9 million beneficiaries in 2026. Early studies in Indonesia have begun to indicate benefits of the program for student learning. Fatmawati (2025) found that MBG was more effective in improving concentration than discipline among elementary students, while Rahmah et al. (2025) and Merlinda and Yusuf (2025) highlighted the contribution of MBG to students' nutritional status and learning motivation.

The large scale of MBG implementation makes the quality of program delivery an important aspect that needs to be examined. The quality of a school meal program relates not only to the availability of food, but also encompasses food quality, nutritional and portion adequacy, menu variety, and distribution quality. Lee (2019) showed that students' satisfaction with school food service and their attitudes toward school meals are related to school meal consumption. Furthermore, Guo et al. (2024) found that perceptions of service quality at school are related to students' learning satisfaction. Therefore, students' perceptions of MBG quality are important to examine because students are the direct beneficiaries of the program.

Bandung City is relevant as a research location because it is one of the areas that implemented MBG from the early stage, covering both the elementary (SD) and junior high (SMP) levels. Comparing elementary and junior high students can enrich the understanding of how MBG quality is perceived by students at different developmental stages of learning, given that the two levels have differing degrees of independence, nutritional understanding, and learning readiness.

Although research on school feeding programs has been conducted extensively at the international level, studies on MBG in Indonesia are still relatively new and largely focus on policy, implementation, or general impact. Research that specifically tests the effect of MBG quality dimensions on students' learning readiness, particularly by comparing the elementary and junior high levels through a mixed method approach is still limited. This condition indicates a research gap that is important to address.

The novelty of this study lies in testing MBG quality through four dimensions: food quality, nutritional adequacy, menu variety, and meal distribution quality on the learning readiness of elementary and junior high students, and in the convergent parallel mixed method approach that combines quantitative and qualitative data. This study aims to analyze the effect of MBG quality on students' learning readiness and is expected to make an academic contribution to the study of school nutrition and learning readiness, while providing practical input for schools, program implementers, and policymakers.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

School Feeding Program and the Free Nutritious Meal Program

A school feeding program is a program of providing meals for students at school to support nutritional fulfillment, health, school participation, and children's learning outcomes (Wang et al., 2021). This program is widely applied across countries, particularly in low- and middle-income countries, because school-age children need adequate nutritional intake to support physical growth and cognitive ability. School meal programs function not only as a food intervention but are also closely related to student attendance, concentration, and engagement in learning (Cohen et al., 2021; Wall et al., 2022).

In Indonesia, MBG can be understood as a nationwide school feeding program targeting the basic to secondary levels of education. In this study, MBG is viewed not merely as a food-provision program but as a program that possesses quality dimensions: food quality, nutritional and portion adequacy, menu variety, and distribution quality that can be assessed directly by students as beneficiaries. This multidimensional approach is important because the success of the program is determined not only by the presence or absence of food, but also by how the food is received, consumed, and experienced by students (Lee, 2019).

Learning Readiness

Learning readiness is a condition of students that reflects physical, mental, and emotional readiness to follow the learning process. Learning readiness is reflected in students' ability to focus, their enthusiasm to follow lessons, active participation in class, not easily becoming drowsy, and readiness to receive learning material. In the context of school meal programs, learning readiness is a relevant outcome because food intake and students' experience of the program can affect students' condition during learning (Adolphus et al., 2016; Lundqvist et al., 2019). This study uses learning readiness as the dependent variable because it is closer to students' daily experience after receiving MBG and is more realistically measured through students' perceptions than academic achievement, which is influenced by many other factors such as prior ability, teaching methods, and family support.

Food Quality and Learning Readiness

Food quality refers to students' perceptions of the quality of MBG food, including taste, cleanliness, appearance, and freshness. Lee (2019) found that students' experience of the quality of school food and food service affects the extent to which students accept and consume the food provided. Food that tastes good, is clean, fresh, and attractive is more likely to be consumed optimally. Good food consumption in turn supports the availability of energy and cognitive function needed for concentration (Adolphus et al., 2016), thereby increasing students' readiness to learn. Based on this discussion:

Nutritional Adequacy and Learning Readiness

Nutritional adequacy refers to students' perceptions of whether MBG food portions are sufficient to keep them full, energized, and focused in class. Adequate nutritional intake is an important factor for cognitive development and learning readiness (Wang et al., 2021; Lundqvist et al., 2019). Proper portions play a big role and can reduce hunger during learning activities so that students are more focused, less drained, and more ready to receive materials in class. Therefore, students' impression of the adequacy of MBG food constitute an important dimension in assessing program quality. Based on this discussion:

Menu Variety and Learning Readiness

Menu variety refers to students' perceptions of the diversity of the MBG menu. Menu variety is important because monotonous school food can reduce students' interest in consuming the food, whereas a varied menu can increase students' acceptance of the program (Lee, 2019). In the context of MBG, menu variety becomes part of the student experience because students assess food not only based on portion and nutritional content but also based on the diversity of side dishes, vegetables, and menu appearance. When the menu is perceived as varied and not boring, students tend to be more interested in consuming the food, which supports energy fulfillment during school hours and contributes to learning readiness. Based on this discussion:

Meal Distribution Quality and Learning Readiness

In this study, meal distribution quality is determined by students' perceptions of the MBG food distribution process. This includes timeliness, orderliness, ease of receiving food, and the condition of the food upon receipt. Distribution quality is a crucial factor to be taken into account in school meal programs like MBG because the quality could deteriorate and have less optimal outcome if distribution is late, disorderly, or disruptive to learning activities (Cohen et al., 2021). The perception of service quality at school also correlates with students' learning satisfaction (Guo et al., 2024). Thus, orderly and timely distribution helps students be able to receive and consume food at a steady pace and be more prepared to learn.

Simultaneous Effect of MBG Quality

The four dimensions of MBG quality are expected to jointly shape students' experience of the program. If the food provided is of good quality, sufficient in portion, varied, and distributed in an orderly manner, students tend to have a more positive experience of MBG. This positive experience can support students' physical and psychological condition in following the learning process. Based on this discussion:

Research Model

Based on the theoretical discussion and hypothesis development above, a research model is developed to describe the relationships among variables. There are four model positions of the MBG quality dimensions: food quality (X_1), nutritional adequacy (X_2), menu variety (X_3), and meal distribution quality (X_4) as independent variables that affects learning readiness (Y) as the dependent variable, both partially ($H1-H4$) and simultaneously ($H5$). The research model is presented in Figure 1.

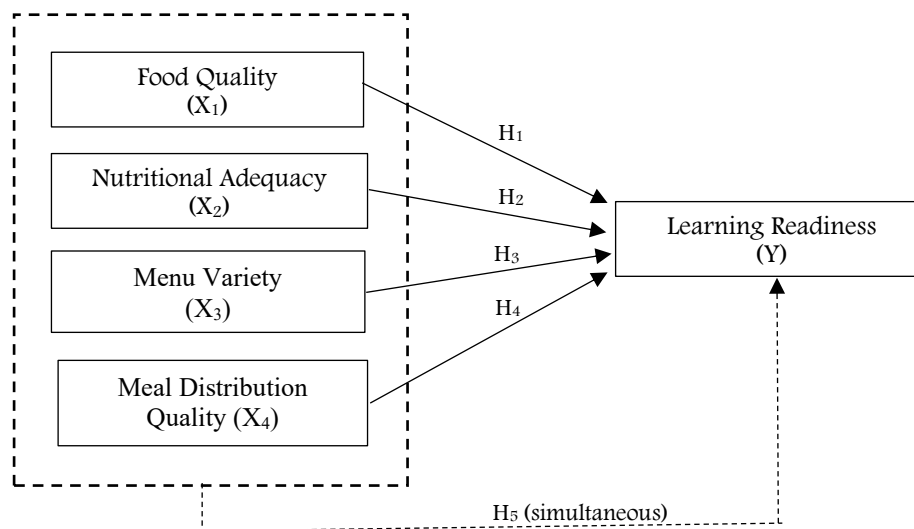


Figure 1. Research Model
Source: developed by the author (2026).

RESEARCH METHOD

Approach and Research Location

This study uses a mixed method approach with a convergent parallel design (Creswell & Plano Clark, 2018), in which quantitative and qualitative data are collected simultaneously, analyzed separately, and then integrated at the discussion stage. This study uses a quantitative data to test the effect of MBG quality on learning readiness through statistical analysis, while the qualitative data help to explore more deeply the actual experiences of students and teachers with the MBG implementation.

The study was conducted at two schools located in Bandung City, West Java Province, namely SD Slamet Riyadi (elementary level) and SMP Santa Maria (junior high level). Both schools were selected purposively (purposive sampling) with several considerations: (1) both are recipients of the Free Nutritious Meal Program that was already running at the time the study was carried out; (2) both represent the two education levels that are the focus of the study, namely elementary and junior high, thereby enabling a comparison of effect patterns between levels; and (3) research access and permission were available from the schools. The selection of two schools within the same city also aims to maintain the equivalence of the MBG delivery context (provider, regional policy, and area characteristics), so that observed differences can be attributed more to differences in education level rather than to differences in location.

Population and Sample

The study population comprises all MBG-recipient students at the two schools, specifically SD Slamet Riyadi and SMP Santa Maria in Bandung City. The minimum sample size was calculated using the Slovin formula with a 5% margin of error, and quantitative sampling was calculated using proportionate stratified random sampling, due to the population consisting of two different level groups. The quantitative data successfully collected amounted to 203 respondents, comprising 89 elementary students of SD Slamet Riyadi (grades 4–5) and 114 junior high students of SMP Santa Maria (grades 7–9). This sample size meets the adequacy requirement for multiple regression analysis with four predictors, both for each school subsample and for the pooled sample. Qualitative informants were selected through purposive sampling based on direct involvement in MBG implementation, comprising 11 students (5 elementary and 6 junior high) and 8 teachers (5 elementary and 3 junior high). Interviews were conducted in a semi-structured manner to explore their experiences and perceptions of the program.

Instrument and Data Collection Technique

Quantitative data were collected using a questionnaire with a four-point Likert scale (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree). The use of a four-point scale is

intended to avoid the tendency toward neutral answers and to clarify respondents' perceptions. To ensure accessibility for elementary and junior high school students, the questionnaire was arranged in simple language. The final instrument consists of 19 statement items measuring five research variables, with the operational definitions and statement items presented in Table 1. Qualitative data were obtained through semi-structured interviews with students and teachers regarding their experience of MBG (food quality, portion adequacy, menu variety, distribution quality) and its impact on learning readiness, recorded in the form of transcripts for further analysis.

Table 1. Operational Definitions, Indicators, and References of the Variables

Variable	Operational Definition	Indicators (Statement Items)	References
<i>Food Quality (X1)</i>	Students' perception of the quality of MBG food, including taste, cleanliness, appearance, and freshness.	X1.1 MBG food tastes good; X1.2 MBG food looks clean; X1.3 the appearance of MBG food is appealing; X1.4 MBG food looks fresh.	Lee (2019); Li & Lee (2023)
<i>Nutritional Adequacy (X2)</i>	Students' perception of portion sufficiency and the benefit of MBG food in helping learning readiness	X2.1 The MBG portion is sufficient for me; X2.2 MBG food makes me feel full; X2.3 after eating MBG I feel more energized.	Wang et al. (2021); Adolphus et al. (2016)
<i>Menu Variety (X3)</i>	Students' perception of the diversity of the MBG menu.	X3.1 The MBG menu is sufficiently varied; X3.2 I am not bored with the MBG menu; X3.3 the variety of side dishes and vegetables is sufficiently diverse.	Lee (2019); Li & Lee (2023)
<i>Meal Distribution Quality (X4)</i>	Students' perception of the MBG food distribution process.	X4.1 MBG food is distributed on time; X4.2 MBG distribution is orderly; X4.3 I receive MBG food easily; X4.4 MBG food is received in good condition.	Li & Lee (2023); Cohen et al. (2021)
<i>Learning Readiness (Y)</i>	Students' readiness to follow lessons after receiving MBG.	Y1 After eating MBG I am more focused; Y2 more enthusiastic about lessons; Y3 more active in class; Y4 not easily drowsy in class; Y5 more ready to follow lessons.	Adolphus et al. (2016); Lundqvist et al. (2019); Wall et al. (2022)

Source: developed from various references (2026).

Data Analysis Technique

Quantitative data were analyzed with the aid of statistical software. In line with the research design, regression analysis was first conducted separately for each school and then pooled to obtain an overall picture while identifying differences in patterns between levels. The analysis stages comprised the following five steps. First, descriptive analysis to describe respondent characteristics and the distribution of answers. Second, a validity test was evaluated using corrected item-total correlation, where items were considered valid if their coefficient exceeded the *r*-table critical value at 5% significance level. Third, scale reliability was assessed using Cronbach's alpha, applying a standard threshold with a minimum of 0.70. Fourth, classical assumption tests-specifically for normality, multicollinearity, and heteroscedasticity, were conducted to ensure the data met the requirements for regression analysis. Lastly, multiple linear regression analysis was performed using t-test (partial), F-test (simultaneous), and coefficient of determination (R^2). The regression model used is:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + e$$

where Y = learning readiness; X_1 = food quality; X_2 = nutritional adequacy; X_3 = menu variety; X_4 = meal distribution quality; a = constant; b = regression coefficient; and e = error. When the heteroscedasticity test indicated an assumption violation, the robustness of the results was checked using robust standard errors (HC3) to ensure that the conclusions did not change. Qualitative data were analyzed using thematic content analysis through the stages of transcription, data reduction, grouping of themes according to the five research constructs, and interpretation. The qualitative analysis results were used to strengthen and explain the quantitative findings at the discussion stage.

RESULTS AND DISCUSSION

Respondent Characteristics

The quantitative respondents numbered 203 students spread across two schools, comprising 89 elementary and 114 junior high students. The composition by gender was relatively balanced at both schools, as presented in Table 2. All respondents were active MBG recipients at the time the study was conducted.

Table 2. Characteristics of Quantitative Respondents

Characteristic	Category	Elementary (n=89)	Junior High (n=114)
Gender	Male	45	58
	Female	44	56
Grade	Elementary grades 4–5	89	–
	Junior high grades 7–9	–	114
Total		89	114

Source: primary data processed (2026).

Validity and Reliability Tests

The validity test used corrected item-total correlation. In the pooled sample ($n = 203$; r -table ≈ 0.138), all 19 items had correlation values above the r -table with a range of 0.44–0.75, so all items were declared valid. The reliability test produced Cronbach's Alpha values meeting the 0.70 threshold for all constructs, with the highest value for learning readiness (0.835) and the lowest for nutritional adequacy (0.713), as presented in Table 3. Examined per school, reliability at the junior high level was very good ($\alpha = 0.79$ – 0.91), whereas at the elementary level some constructs fell in the range of 0.55–0.69. The lower values at the elementary level are understandable given that respondents are younger so that answers tend to be less consistent, and the number of items per construct is relatively short. This condition is noted as a research limitation, while the main analysis uses constructs that have been shown to be reliable in the pooled sample.

Table 3. Validity and Reliability Test Results (Pooled Sample, $n=203$)

Variable	No. of Items	r-item Range	Cronbach's α
Food Quality (X_1)	4	0.506–0.629	0.754
Nutritional Adequacy (X_2)	3	0.440–0.609	0.713
Menu Variety (X_3)	3	0.555–0.647	0.756
Meal Distribution Quality (X_4)	4	0.496–0.657	0.785
Learning Readiness (Y)	5	0.546–0.746	0.835

Source: primary data processed (2026)

Descriptive Statistics

The score of each construct was calculated as the item average on a 1–4 scale. Overall, meal distribution quality obtained the highest score ($M = 3.26$), indicating that the distribution process

was rated relatively well by students. Conversely, learning readiness and menu variety obtained relatively lower scores ($M = 2.79$ and 2.81). A comparison across levels shows that elementary students' scores tended to be higher than those of junior high students on almost all constructs, including learning readiness (2.95 versus 2.67), as presented in Table 4.

Table 4. Descriptive Statistics of Constructs (scale 1–4)

Construct	Mean (Total)	Std. Dev.	Mean (Elem.)	Mean (Jun. High)
Food Quality (X1)	2.91	0.54	2.99	2.85
Nutritional Adequacy (X2)	2.97	0.66	3.12	2.84
Menu Variety (X3)	2.81	0.70	2.96	2.70
Meal Distribution Quality (X4)	3.26	0.56	3.24	3.27
Learning Readiness (Y)	2.79	0.62	2.95	2.67

Source: primary data processed (2026)

Regression Analysis per School

Accordance with the research design, the analysis was first performed on each school separately. Both response produced a considerably simultaneous effect with comparable explanatory power (Elementary: $R^2 = 0.514$; $F = 22.17$; $p < 0.001$; Junior High: $R^2 = 0.503$; $F = 27.54$; $p < 0.001$), but their partial effect patterns differed, as presented in Table 5.

Table 5. Multiple Regression Results per School

Variable	Elem. β	Elem. Sig.	Jun. High β	Jun. High Sig.
Food Quality (X1)	0.453	0.000**	0.377	0.000**
Nutritional Adequacy (X2)	0.271	0.005**	0.249	0.003**
Menu Variety (X3)	-0.034	0.724	0.239	0.015*
Meal Distribution Quality (X4)	0.188	0.038*	-0.054	0.502
R^2 / F	0.514 / 22.17		0.503 / 27.54	

Source: primary data processed (2026)

At the elementary level, the significant dimensions were food quality, nutritional adequacy, and meal distribution quality, while menu variety had no effect. Conversely, at the junior high level the significant dimensions were food quality, nutritional adequacy, and menu variety, while meal distribution quality had no significant effect. In other words, food quality and nutritional sufficiency consistently serve as controls of learning readiness at both levels, while meal distribution quality is elementary-specific, whereas menu variety is specifically junior-high-specific

Pooled Regression Analysis and Classical Assumption Tests

In the pooled model ($n = 203$), the four dimensions simultaneously had a significant effect on learning readiness ($R^2 = 0.508$; Adjusted $R^2 = 0.498$; $F = 51.02$; $p < 0.001$), so H_5 is accepted. Partially, only food quality ($\beta = 0.399$) and nutritional adequacy ($\beta = 0.285$) were significant, while menu variety and meal distribution quality were not significant (Table 6). This occurs because the latter two dimensions operate at different levels, so their effects offset each other when the two levels are pooled.

Table 6. Multiple Regression Results – Pooled Model ($n=203$)

Variable	B	β	t	Sig.
(Constant)	0.176	–	0.831	0.407
Food Quality (X1)	0.463	0.399	5.729	0.000**

Variable	B	β	t	Sig.
Nutritional Adequacy (X2)	0.267	0.285	4.625	0.000**
Menu Variety (X3)	0.117	0.132	1.928	0.055
Meal Distribution Quality (X4)	0.044	0.040	0.698	0.486

Source: primary data processed (2026)

Classical assumption tests on the pooled model showed no multicollinearity (all VIF values < 2). The normality test via Kolmogorov-Smirnov showed normally distributed residuals ($p = 0.245$), supported by the large sample size ($n > 30$). The Breusch-Pagan test indicated a symptom of heteroscedasticity ($p = 0.007$); therefore, the robustness of the results was checked with robust standard errors (HC3). With this correction, the conclusions did not change: food quality and nutritional adequacy remained significant ($p < 0.001$), while menu variety and meal distribution quality remained non-significant. Thus, the pooled-model results are robust.

Cross-Level Comparison and Hypothesis Decisions

Table 7 presents the summary of cross-level comparison of effects as well as the hypothesis decisions. To summarize, H1, H2, H5 are accepted, while H3 and H4 are rejected. Even so, the per-school analysis still shows that H3 and H4 are partially supported with H3 (menu variety) persists at the junior high level and H4 (meal distribution quality) persists at the elementary level.

Table 7. Hypothesis Decisions and Cross-Level Patterns

H	Statement	Decision (Pooled)	Cross-Level Pattern
H1	Food quality → learning readiness	Accepted	Significant at Elem. & Jun. High
H2	Nutritional adequacy → learning readiness	Accepted	Significant at Elem. & Jun. High
H3	Menu variety → learning readiness	Rejected	Significant only at Junior High
H4	Meal distribution quality → learning readiness	Rejected	Significant only at Elementary
H5	X1–X4 simultaneously → learning readiness	Accepted	Significant at Elem. & Jun. High

Source: primary data processed (2026).

Qualitative Findings and Triangulation

Interviews with 11 students and 8 teachers reinforced and explained the quantitative pattern. A summary of themes per construct at each level is presented in Table 8. In general, the emerging themes are consistent with the direction and significance of the regression coefficients at each level.

Table 8. Interview Theme Matrix by Construct and Level

Construct	Themes at Elementary	Themes at Junior High
Food Quality	Taste rated as good and appetizing; food is clean.	Taste sometimes rated as bland; concerns about cleanliness arose on certain occasions.
Nutritional Adequacy	Portion rated as sufficient and filling; body feels fresher.	Portion rated as insufficient given students' high activity; composition seen as too carbohydrate-heavy.
Menu Variety	Menu rated as varied; boredom rarely mentioned.	Menu changes weekly but boredom with recurring menus still arises.

Construct	Themes at Elementary	Themes at Junior High
Meal Distribution	Distribution orderly and on time; prominent in students' and teachers' narratives.	Distribution rated as smooth and not a main issue.
Learning Readiness	Report being more enthusiastic and more focused after eating.	Some report the effect as ordinary.

Source: interviews processed (2026)

The validity is strengthened by the evident consistency between the qualitative and quantitative findings. The high focus to taste and cleanliness is strongly inline with the high food quality. Both the elementary and junior level has a similar theme or nutritional adequacy, indicating the significance of nutritional adequacy. Meanwhile, the emphasis by junior high students on menu boredom is consistent with the junior-high-specific significance of menu variety, and the emphasis by elementary students and teachers on orderliness and timeliness of distribution is consistent with the elementary-specific significance of meal distribution quality.

Discussion

This section discusses the research findings sequentially to answer the problems raised in the introduction, namely (1) whether and how MBG quality affects students' learning readiness; (2) how the effect pattern differs between the elementary and junior high levels; and (3) what theoretical and practical contributions are produced for the development of the MBG program in Indonesia.

The effect of MBG quality on learning readiness. The results answer the main question: MBG quality simultaneously has a significant effect on students' learning readiness, with an explanatory power of 50.8%. This finding substantiates that MBG cannot be viewed as merely a food-distribution program, but rather as a service whose quality also determines the program's benefit for learning, from a student's perspective. Based on the gathered results in this study, it is clear that food quality and nutritional adequacy are the two strongest and most consistent dimensions. This result also complements the literature which places food quality and adequacy as the main determinants of whether a school meal program is beneficial or not (Wang et al., 2021; Cohen et al., 2021; Lee, 2019; Li & Lee, 2023). In theory, a good-quality, filling food should be able to ameliorate one's energy and cognitive function which is necessary for concentration, which is exemplified by reviews on the relationship between food consumption and the cognitive performance of children and adolescents (Adolphus et al., 2016; Lundqvist et al., 2019). Therefore, this study is able to provide empirical evidence on an Indonesian context that by far remains limited, while also being inline with early MBG studies which associate the program with a proliferated learning concentration (Fatmawati, 2025; Rahmah et al., 2025).

Differences in effect patterns across levels. The main contribution of this study—as well as the answer to the research gap identified in the introduction lies in the finding that the effect pattern of MBG quality differs by level. It is shown that menu variety only significantly effects junior high level students while meal distribution quality significantly affects the elementary level students. Developmental characteristics could explain the difference between the two groups. Junior high students tend to have more established taste preferences and have more sensitivity to menu boredom as they are older. Thus, menu variety becomes a decisive acceptance factor, which is a consistent finding with that of Lee's (2019) and Li & Lee's (2023) which states that school food acceptance is also influenced by students' attitudes and satisfaction towards the food they consume. By contrast, elementary students who have lower levels of independence are rather more affected by the orderliness and timeliness of distribution. Thus, distribution quality becomes a stronger factor that influences their experience and learning readiness. This finding is inline with Guo et al's 2024 study that perceptions of service quality at school are related to students' learning satisfaction. This variations in pattern also exemplifies the contextual nature of how effective the MBG quality dimensions are as it also depends on the developmental stage of the beneficiaries.

Methodological implication: the risk of single generalization. The per-level findings carry an important methodological implication for evaluating a nationwide program. In the pooled model,

the effect of menu variety (positive at junior high) and meal distribution quality (positive at elementary) offset each other, so both appear non-significant. This means that an analysis that merely pools all levels risks masking factors that are actually meaningful for particular groups and producing misleading conclusions. For a program as large as MBG covering diverse levels, level-segmented evaluation becomes crucial so that policy recommendations are well targeted. This affirms the value of a research design that analyzes each school separately before pooling them.

The added value of the mixed method approach. The use of a convergent parallel mixed method design addresses the limitation of prior studies that were generally purely quantitative or purely qualitative. The qualitative data do not only complement but also explain the mechanisms behind the numbers. Specifically, junior high students' complaints about menu boredom puts forward menu variety as a crucial factor while the emphasis on orderliness and timeliness of distribution by both elementary students and teachers positions meal distribution quality as an important factor. The convergence seen between the quantitative and qualitative findings strengthens the validity of the conclusion in this study and thus provides a more cohesive understanding rather than a single approach.

Theoretical implications. Theoretically, this study extends the school feeding program literature—most of which has developed in other countries—into the Indonesian MBG context by positioning program quality as a multidimensional construct assessed directly by students. This study also enriches the understanding of learning readiness as an outcome that is closer to students' daily experience than academic achievement, and shows that the relationship between food service quality dimensions and learning readiness is implicitly moderated by education level. Thus, the tested four-dimension framework of MBG quality can serve as a basis for developing subsequent school nutrition research models in Indonesia.

Practical and policy implications. In line with the research objective, these results provide input for three stakeholders. For schools, it is important to maintain the quality of taste and cleanliness of food as well as portion adequacy as fundamental priorities at all levels, because these two dimensions consistently have an effect. For program implementers (Nutrition Fulfillment Service Units and the National Nutrition Agency), quality-improvement strategies should be differentiated by level: strengthening distribution governance timeliness and orderliness has a greater impact at the elementary level, while menu diversification and portion adjustment have a greater impact at the junior high level. For policymakers, these findings suggest that MBG quality monitoring and evaluation should not be uniform across levels but should consider beneficiary characteristics, so that budgets and quality-improvement interventions can be allocated more efficiently and precisely.

CONCLUSION

This study concludes that the quality of the Free Nutritious Meal Program simultaneously has a significant effect on the learning readiness of elementary and junior high students in Bandung City, with an explanatory power of 50.8%. It is substantiated that both food quality and nutritional adequacy are the strongest and most consistent dimensions for both junior high and elementary levels. The other two dimensions, namely, menu variety and meal distribution quality only have level-specific patterns due to the difference in student's characteristics at different stages of development. Particularly, only those at the junior high level placed menu variety as having a significant effect while only elementary students placed meal distribution quality as having a significant effect. Because these two dimensions operate at different levels, both appear non-significant in the pooled model, urging the need of future separate analysis per level in order to reveal patterns that are relevant for policy-making.

The findings gathered in this study also suggests that MBG quality-improvement strategies should not be uniform for different levels. As mentioned, these strategies should not be curated for each level's needs and expectations based on their unique and respective characteristics. This includes strengthening distribution governance at the elementary level while creating menu diversification and portion adjustment for junior high level students. What should be uniform and prioritized for both levels is the food quality and nutritional adequacy. The limitations of this study includes the limited generalizability as it only covers two different schools, the homogeneity in the

duration of MBG participation in the elementary sample as well as the moderate reliability of some constructs in the elementary subsample. Therefore, future research and studies on the MBG program should study a greater number of schools and levels, refine the instrument for elementary-age respondents as well as consider mediating variable such as actual consumption and student satisfaction.

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