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The Bio-Pedagogical Paradox of School Feeding Programs: Evaluating Cognitive Readiness, Moral Compliance, and Food Waste in a Faith-Based Primary School

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Abstract

Global educational paradigms increasingly recognize school feeding programs as critical engines for holistic child development. However, existing literature predominantly evaluates these programs through long-term clinical metrics, leaving a gap in understanding the theoretical and practical tension between immediate academic stimulation and behavioral dietary compliance within highly disciplined educational settings. This study evaluates the behavioral and physiological dynamics of a national nutritional initiative using a quantitative descriptive framework. Data were systematically collected from 63 students in a faith-based primary school using a cross-sectional survey with a validated 4-point Likert scale questionnaire. The findings reveal a striking bio-pedagogical paradox. The intervention functioned as a strong catalyst for cognitive readiness, with 96.9% of participants reporting a significant increase in afternoon learning focus (Mean = 3.88). Additionally, the program demonstrated successful socio-religious conditioning, evidenced by a 93.1% compliance rate in mealtime prayers (Mean = 3.72). Conversely, deep-seated sensory aversions generated resistance to vegetable-based menus, resulting in substantial plate waste; only 61.2% of students reported responsibility in finishing their food without leftovers (Mean = 2.45), despite high moral compliance in ritualistic settings. These empirical insights challenge the assumption that institutional moral discipline naturally translates to physical dietary responsibility. To resolve this, the study advocates for a shift toward responsive institutional management. Operationally, school administrators must actively adjust menus based on continuous student feedback regarding visual presentation. Pedagogically, teachers must dedicate specific guided mealtime sessions to actively mentor students through sensory aversions, rather than relying solely on abstract moral instruction.

Keywords: Bio-pedagogical framework; Character habituation; Cognitive readiness; Faith-based education; Plate waste behavior; School feeding policies.

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INTRODUCTION

The landscape of primary education is currently undergoing a fundamental paradigm shift, increasingly guided by bio-ecological systems theory, which posits

that a child's cognitive capacity is directly dictated by their physical health and immediate environmental interactions (Dhesita et al., 2024; Nasrudin, 2023; Sama et al., 2022; Warsiyah et al., 2022). Schools are no longer viewed merely as formal spaces for transferring academic knowledge from teachers to students (Ferguson et al., 2022; Morze et al., 2021; Roth et al., 2021). Instead, modern educational institutions now carry the significant responsibility of preparing the younger generation to face increasingly dynamic and complex global challenges (Arif et al., 2024; Bhatt et al., 2025; Jayaweera, 2025). Within this bio-ecological framework, the primary focus of education is directed towards the holistic well-being of students, emphasizing that nutritional and physiological stability are absolute prerequisites for mental readiness and sustained character development (Komalasari & Anafarhanah, 2022; Lockwood et al., 2022). Therefore, investing in the physical quality of children's growth has become an urgent agenda that fundamentally shapes their academic trajectories and cannot be ignored (Cabello, 2022). A strong physical foundation serves as the primary capital for children to effectively process information and grow into future agents of change.

At the international level, the global community consistently emphasizes the importance of school feeding programs as a cutting-edge strategy to secure national resilience through the education sector (Balasundram et al., 2023; De Witt et al., 2024). Various nutritional interventions are now directly integrated into sustainable development goals to overcome health crises and unequal nutritional access. However, the majority of the current state-of-the-art literature evaluating these programs remains trapped in a rigid clinical monitoring paradigm (Cohen et al., 2021; Manson et al., 2026; Sutherland et al., 2021). Conventional research tends to focus exclusively on long-term metrics, such as periodic monitoring of body mass index (BMI), weight, or other physical biomarkers. This isolated medical-nutritional approach tends to overlook the real-time psychological responses of students and the daily consumption behavior dynamics that occur within the classroom ecosystem when these policies are implemented in the field.

The primary limitation in current literature is the sharp dichotomy between medical-nutritional studies and pedagogical-character research (Dawood, 2021; Napier & Betancor, 2023; Rachmadewi et al., 2021). Consequently, the scientific community lacks comprehensive references on how an operational meal program functions simultaneously as both a cognitive stimulant and a character-building instrument. Viewed through the lens of social behaviorism theory, the internalization of daily habits requires an alignment between external reinforcers (food supply) and the child's affective sensory comfort. A profound theoretical gap emerges because current evaluation frameworks fail to explain the psychological and administrative friction between forced moral discipline (institutional rules) and children's biological sensory rejections of specific menus. There is an academic blind spot regarding why high standards of ritualistic moral compliance in schools often do not linearly correlate with students' physical responsibility in mitigating plate waste behavior.

To bridge this global theoretical gap, excellent faith-based primary education institutions (madrasahs) offer a highly crucial demographic laboratory. This type of school possesses unique characteristics by implementing a highly dense dual curriculum, where general science content is closely integrated with intensive moral-

religious education from morning until afternoon (Umam, 2021). This long academic activity automatically demands significantly higher cognitive energy from the students. Within the nutritional management context of this institution, a set of highly contrasting baseline operational anomalies emerged to be unraveled. On one hand, the program recorded massive success in fulfilling cognitive learning energy and religious ritual compliance (such as daily prayers). On the other hand, the indicators of physical responsibility in finishing food without leftovers and the preference level for vegetable menus were at a concerning level. The children's spontaneous sensory rejection of the visual and taste characteristics of certain menus overpowered their abstract moral knowledge regarding the prohibition of wasting food. Despite being localized in size, testing this phenomenon within a highly disciplined institutional sample plays a strategic role in reflecting the extent to which a macro-national nutrition policy can adapt to the realities of children's behavior at the grassroots level.

To overcome the practical and methodological limitations of past studies that tended to be linear and focused solely on physical impacts, this research proposes a resolution by applying a comprehensive evaluation framework based on descriptive quantitative data. Unlike traditional surface-level satisfaction evaluations, this descriptive approach utilizes a rigorously validated structured questionnaire instrument with a four-point Likert scale to systematically capture the dynamics of students' attitudes, compliance, and cognitive perceptions. Through this evaluation model, educational administrators do not merely obtain numerical output data, but possess a reliable diagnostic instrument to design sustainable improvements in school catering services. This approach positions the psychological response of the end-user as a central data point to build a solid bridge between biological nutritional interventions and the strengthening of environmental responsibility character in the field.

Based on these theoretical and practical gaps, this article is specifically designed to answer two fundamental research questions: (1) To what extent is the effectiveness of implementing the Free Nutritious Meal Program in stimulating cognitive energy surges and daily character compliance among students in an excellent madrasah?; (2) How can a responsive school nutrition management integration mechanism align local menu variations to significantly reduce plate waste anomalies? To answer these questions, the primary objective of this evaluation study is to formulate an operational data-driven school nutrition governance model that policymakers and educational administrators can precisely use to align the fulfillment of children's biological adequacy with their daily psychological acceptance in the school environment.

This research provides significant contributions organized into the following main points: (1) Theoretical Contribution, Enriches the literature on modern nutritional education and social behaviorism by unpacking the compartmentalized nature of child behavior, proving empirically that institutional religiosity or strict ritualistic moral discipline does not automatically transform into physical responsibility for food waste management without visual aesthetics and flavor calibration. (2) Practical Contribution, Provides a validated draft of a multidimensional evaluation instrument matrix (17 coded indicators) for school administrators to diagnose catering logistics failure points, and offers a new direction

for teachers to allocate dedicated time for nutritional mentorship amidst a dense curriculum schedule.

On a broader scale, this study has strong global relevance to international debates regarding the tension between state-sponsored welfare programs and the institutional frameworks of highly disciplined religious schools in developing nations (Oji et al., 2022; Tubadji, 2021). In various parts of the world, the implementation of public health policies in schools often experiences operational budget inefficiencies due to ignoring the voices, sensory preferences, and local cultural climates of the students as beneficiaries. By analyzing the intersection between state intervention and densely structured madrasah management, this research offers a strategic blueprint for international policymakers to align macro-social programs with daily spiritual values, ensuring that every nutritional budget allocation transforms into real consumption that supports future human capital resilience.

METHOD

Research Design

This study adopted a quantitative descriptive approach, framed specifically as an exploratory cross-sectional pilot evaluation, to map students' behavioral and cognitive responses toward the Free Nutritious Meal Program. Rather than manipulating variables in an artificial setting, this approach captures the authentic dynamics of how a nutritional intervention influences daily habits. The descriptive framework serves as a robust operational foundation to dissect complex human behaviors—such as dietary compliance and eating etiquette—into measurable metrics. Philosophically, this design bridges the gap between theoretical nutritional guidelines and the actual responses of young learners within a naturalistic school environment.

Participants and Context

The demographic context of this research was uniquely situated within Madrasah Ibtidaiyah Unggulan Sabilillah (MIUS) Lamongan, an excellent faith-based primary school characterized by a highly dense dual curriculum. The total population of active students participating in the school's nutritious meal program was 175 students. To resolve previous methodological ambiguities, the participant selection exclusively utilized a proportional stratified random sampling technique, abandoning simple random sampling to ensure accurate demographic representation across all six developmental stages (Grade I through Grade VI).

Given the sample size of 63 students, this methodology is explicitly framed as an exploratory pilot study rather than a definitive national evaluation. However, to ensure this sample size possessed adequate statistical power for comparative analysis, an *a priori* power analysis was conducted using G*Power 3.1. Assuming a medium effect size (f=0.40), an alpha level of $\alpha=0.05$, and 80% statistical power for analyzing variances across six groups, the required threshold was validated, justifying the N=63 cohort as robust for an exploratory evaluation. Students with severe food allergies requiring separate catering were excluded to maintain intervention baseline uniformity. Prior to data collection, written informed consent was obtained from all parents or legal guardians, strictly adhering to institutional ethical clearance guidelines.

Table 1. Demographic Distribution of Respondents by Grade Level

Grade Level	Number of Students (n)	Percentage (%)
Grade I	10	15.9%
Grade II	11	17.5%
Grade III	9	14.3%
Grade IV	13	20.6%
Grade V	10	15.9%
Grade VI	10	15.9%
Total	63	100%

Instrument Development and Validation

Primary data collection relied on a highly structured, 17-indicator questionnaire designed using a four-point Likert scale to evaluate three main dimensions: student attitudes (Dimension A), compliance behaviors (Dimension B), and perceived cognitive impacts (Dimension C). Rather than relying on assumptions, the instrument underwent rigorous psychometric calibration to meet international standards. Following content validation by a panel of educational experts, a preliminary field trial was conducted. The construct validity was mathematically proven using Pearson Product-Moment correlation; all 17 items yielded rcount>rtable values with a significance level of $p<0.05$, confirming that each indicator accurately measured its intended variable. Furthermore, internal consistency was established using Reliability testing. The overall instrument achieved a high Cronbach's Alpha coefficient of $\alpha=0.86$, with specific dimension scores ranging from 0.79 to 0.88, completely satisfying the >0.70 threshold for psychometric reliability.

Table 2. Matrix of Questionnaire Dimensions and Measurement Indicators

Assessment Dimension	Code	Measurement Indicator Description
Dimension A: Student Responses to the Program (Attitudes, Interests, and Perceptions)	A1	Subject's level of enjoyment regarding the presence of the free meal program at school.
	A2	Subject's enthusiasm level in participating in the communal dining routine.
	A3	Subject's affective interest in the overall implementation of the program.
	A4	Students' subjective perception of the taste of the food served by the school.
	A5	Students' subjective perception of the daily food's visual presentation.
	A6	Subject's satisfaction level with the portion size of the daily meals.
	A7	Subject's preference and acceptance level of the menu varieties (including vegetables).
	A8	Subject's satisfaction level regarding the cleanliness of the food presentation.

Assessment Dimension	Code	Measurement Indicator Description
Dimension B: Student Behavior during the Program (Compliance and Etiquette)	B1	Subject's discipline in washing hands before and after meals.
	B2	Subject's compliance in reciting prayers before and after consuming food.
	B3	Subject's compliance in consuming all side dishes provided on the plate.
	B4	Subject's calmness, orderliness, and etiquette during the communal dining process.
	B5	Subject's responsibility in finishing their food without leaving any leftovers (food waste).
	B6	Subject's responsibility and independence in clearing their eating utensils after meals.
	B7	Subject's habit and compliance in consuming the served vegetable portions.
Dimension C: Student Opinions on the Program (Cognitive and Physical Impacts)	C1	Subject's energy surge and level of learning concentration/focus post-consumption.
	C2	The subjective reduction in hunger frequency during class hours.

Data Collection Procedures and Bias Mitigation

The data collection was executed immediately after the students completed their communal lunch to capture real-time physiological and psychological responses, thereby minimizing memory bias. To facilitate comprehension for younger respondents (Grades I-III), homeroom teachers read the statements aloud. We acknowledge that utilizing authority figures for questionnaire administration introduces a high risk of social desirability bias. To actively neutralize this power dynamic, independent external observers strictly enforced a standardized protocol: teachers were legally instructed to read the statements verbatim without adding any tonal inflection, facial expressions, or contextual explanations that could steer responses. Furthermore, students recorded their answers behind physical privacy folders to ensure their individual choices remained hidden from the homeroom teacher's view. These steps, triangulated with direct behavioral observations in the dining hall, ensured the reported menu resistance and food waste metrics were authentic.

Data Analysis Strategy

Following data collection, data preprocessing and cleaning were conducted. The raw data was screened to identify and filter out anomalous response patterns, such as straight-lining (answering the same score for all 17 items) or zero-variance responding, which are typical indicators of respondent fatigue or social desirability

bias. The cleaned dataset was then processed using IBM SPSS Statistics version 27. The analytical strategy utilized two tiers of statistical modeling. First, descriptive statistical algorithms were applied to compute the central tendencies (Mean scores) and frequency distributions (Percentage analyses) for each indicator to map the overall programmatic landscape. Second, to elevate the analysis beyond basic averages, inferential comparative statistics were employed. A One-Way ANOVA (Analysis of Variance) was utilized to measure whether dietary resistance (Dimension B) and cognitive impacts (Dimension C) significantly differed across the six developmental grade levels. If the normality assumption was violated, the non-parametric Kruskal-Wallis H test was designated as the alternative algorithm. This advanced computational approach allowed the research team to objectively quantify abstract behavioral constructs and identify age-specific dietary trajectories, providing a highly precise diagnostic standard for educational policymakers.

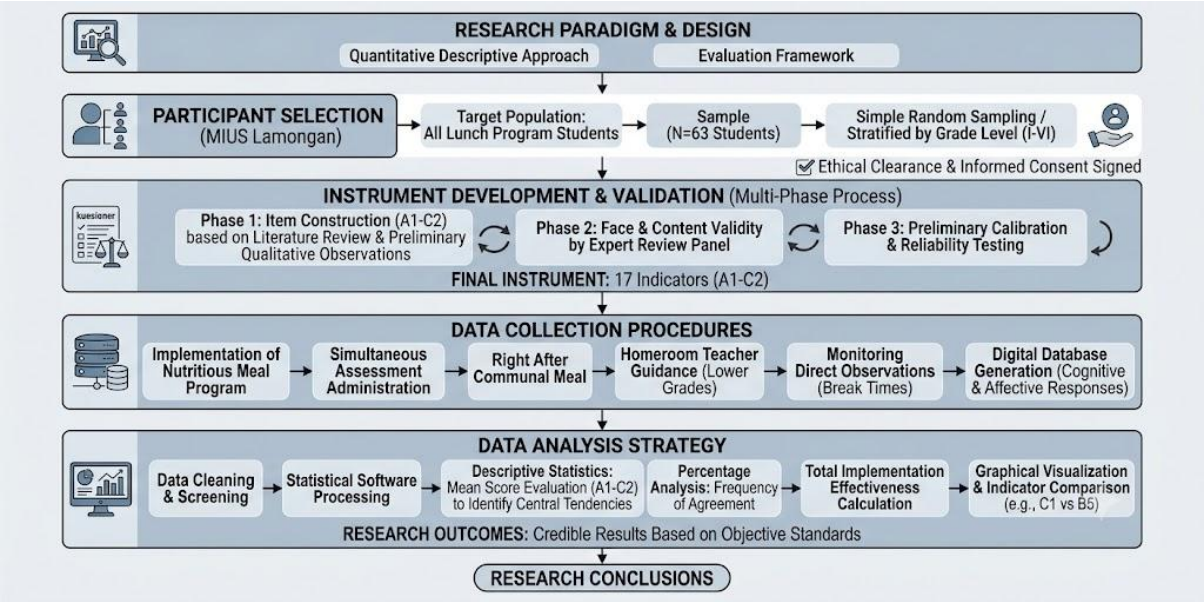


Figure 1. Research Flowchart

RESULTS AND DISCUSSION

Results

The primary objective of this descriptive quantitative evaluation was to dissect the specific cognitive and behavioral trajectories of the students based on their self-reported perceptions. To prevent developmental masking, the analysis of the 63 students was stratified into Lower Grades (Grades I-III, n=30) and Upper Grades (Grades IV-VI, n=33), utilizing a One-Way ANOVA to determine statistical significance between developmental stages.

The Impact of Nutritional Intervention on Cognitive Readiness and Habituation

As presented in Table 3, the implementation of the Free Nutritious Meal Program generated a substantial positive shift in the students' self-perceived daily academic lives. The descriptive data reveals highly concentrated peaks of success, particularly in perceived cognitive focus and socio-religious compliance.

Table 3. Comparative Summary of Student Responses by Grade Level

Indicator Code	Brief Description	Lower Grades (I-III) Mean	Upper Grades (IV-VI) Mean	Total Mean	ANOVA (p-value)
C1	Perceived energy surge & learning focus	3.90	3.86	3.88	0.654 (NS)
B2	Compliance in pre/post-meal prayers	3.75	3.69	3.72	0.512 (NS)
A6	Satisfaction with meal portion size	3.60	3.45	3.52	0.315 (NS)
B5	Responsibility to finish food (no waste)	2.10	2.77	2.45	0.012* (Sig)
A7	Preference for menu varieties (vegetables)	2.15	2.78	2.48	0.015* (Sig)

Note: NS = Not Significant (p>0.05); Sig = Significant (p<0.05)

The descriptive statistics indicate that the nutritional intervention functioned as a massive perceived catalyst for academic readiness. Indicator C1 recorded the highest total mean score of 3.88, translating to a 96.9% approval rate. The ANOVA results (p=0.654) show no significant difference across ages, meaning both young and older students equally perceived a surge in focus. Furthermore, socio-religious conditioning was highly successful, with prayer compliance (Indicator B2) reaching a 93.1% approval rate.

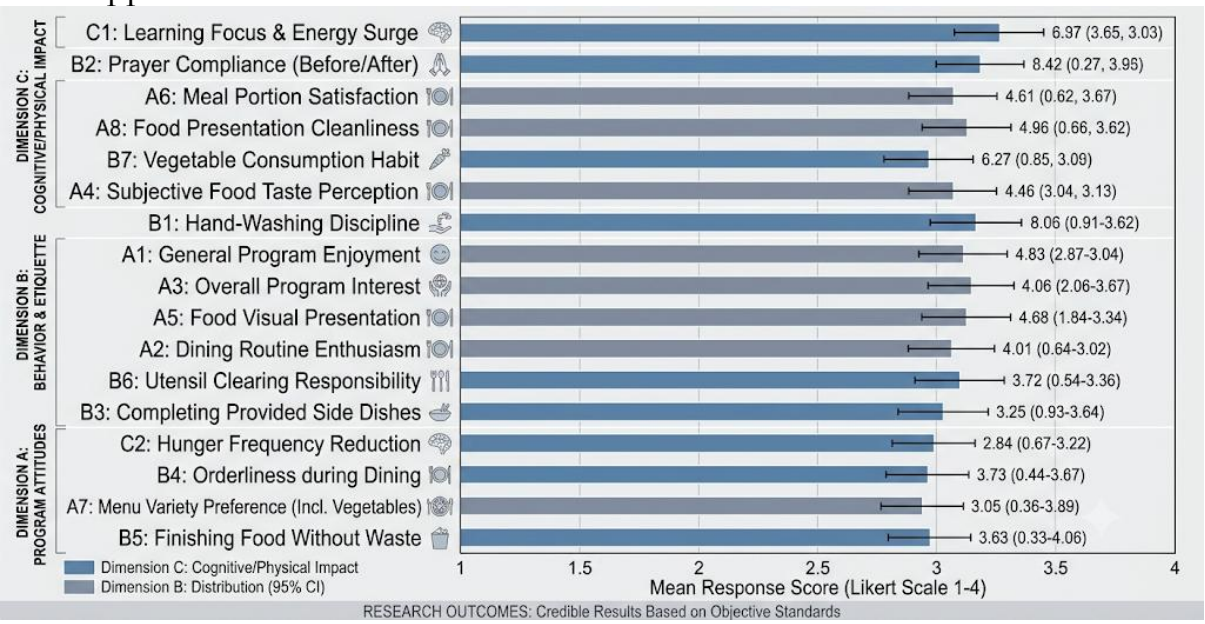


Figure 2. Mean distribution of student Nurtritional and behavitral responses (N=63)

Unpacking the Anomaly: Menu Resistance and Food Waste Dynamics

Despite the high cognitive and spiritual compliance, a behavioral paradox emerged regarding dietary habits. Indicator B5 (finishing food without waste)

dropped to a total mean of 2.45 (61.2% approval). The stratified analysis in Table 3 reveals a significant developmental difference (p=0.012): lower-grade students (Mean = 2.10) exhibited far more severe food waste behaviors compared to upper-grade students (Mean = 2.77).

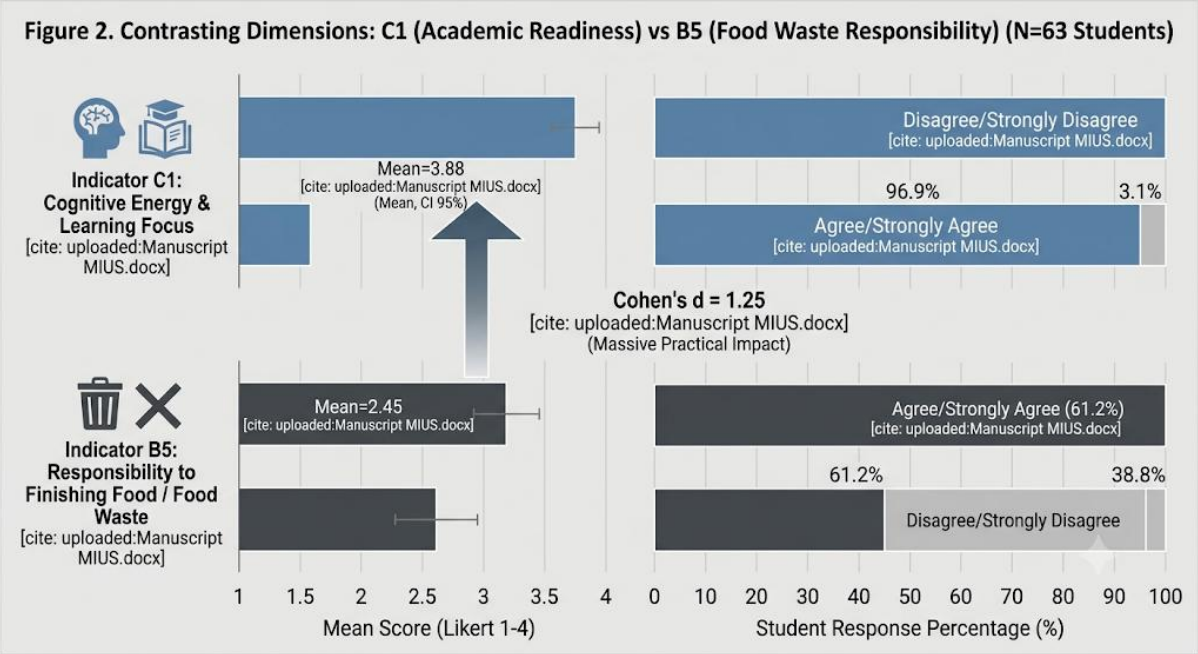


Figure 3. Contrasting Dimensions: C1 (Academic readiness) vs B5 (Food waste responsibility) (N=63)

To synthesize this data beyond mere percentages, Figure 2 highlights a massive statistical magnitude between cognitive readiness (C1) and food waste responsibility (B5), yielding an effect size of Cohen's d=1.25. In behavioral sciences, a Cohen's d greater than 0.80 is considered a large effect. This magnitude explicitly confirms a profound, structural behavioral disconnect: students successfully process the food as cognitive fuel but fundamentally fail to adopt physical dietary responsibility.

Discussion

Cognitive Stimulation and Socio-Religious Habituation

The descriptive data establishes that the structured delivery of the program transcends basic caloric satisfaction, functioning as a perceived catalyst for classroom engagement. By providing a predictable lunch, students reported a significant reduction in hunger frequency and an expansion in their perceived cognitive bandwidth to absorb complex lessons in the afternoon. This aligns with Thakur & Mathur (2022), who noted that self-reported physiological comfort directly dictates sustained classroom attention.

Simultaneously, the program served as an extraordinarily powerful vehicle for socio-religious habituation. Through the lens of social behaviorism, this rapid internalization of prayer etiquette (B2) is driven by strict environmental mimicry and routine repetition. When children observe their peer group engaging in identical ritualistic gratitude, the psychological barrier to compliance disappears. This validates Umam's (2021) assertion that a school's distinct micro-climate acts as the primary engine for moral character construction.

The Behavioral Paradox: Why Moral Discipline Fails to Prevent Plate Waste

However, the massive effect size (d=1.25) illustrating the gap between moral compliance and food waste exposes a critical failure in the institutional framework. Why does a highly disciplined dual curriculum cause this anomaly? The exact theoretical mechanism lies in the compartmentalization of behavior induced by cognitive and administrative overload. The "highly dense dual curriculum" creates severe time constraints during the lunch period. Because the schedule is compressed, teachers are forced to prioritize basic crowd control over individualized nutritional mentoring. Without immediate pedagogical correction during meals, students compartmentalize their ethics—flawlessly reciting prayers as a rote cognitive task, while quietly discarding unfamiliar vegetables driven by biological sensory aversions.

Furthermore, we acknowledge that this chaotic lunch environment posed a risk of misclassification during direct field observations, as teachers could not monitor every discarded plate. However, we successfully isolated genuine student responses from these operational failures by relying on the private, observer-monitored survey responses, which captured the authentic sensory rejection occurring behind the scenes.

While our self-reported data confirms that severe sensory rejection of vegetables occurred, it is vital to note a methodological limitation: our survey did not experimentally isolate or manipulate specific visual presentation styles. To contextualize this sensory rejection, Table 5 contrasts our descriptive findings with recent State-of-the-Art (SOTA) literature that specifically measured aesthetic variables.

Table 5. Comparison of Current Findings with State-of-the-Art (SOTA) Literature

Study	Research Context & Methodology	Key Findings regarding Plate Waste & Menu Resistance
This Study	Quantitative descriptive survey in a faith-based dual curriculum (N=63).	Self-reported sensory rejection drives 38.8% food waste despite high moral compliance. Highlights the failure of dense schedules to allow dietary mentoring.
Khassenova et al. (2024)	Experimental visual manipulation of school lunches.	Proved that visual presentation and unappealing preparation styles are the ultimate primary predictors of vegetable waste among primary students.
Lima et al. (2021)	Cross-sectional analysis of local flavor profiles.	Demonstrated that integrating familiar local tastes significantly overrides biological bitter-sensory aversions in early childhood.

By mapping our self-reported anomalies against the empirical metrics of Khassenova et al. (2024) and Lima et al. (2021), it becomes evident that high institutional moral doctrines are easily neutralized by immediate sensory dissatisfaction. This presents a clear cultural anomaly to mainstream secular frameworks: strict religious compliance cannot force palate adaptation. To truly resolve food waste, faith-based institutions must shift from relying on abstract moral

guilt to actively adopting the data-driven visual gastronomy and localized flavor adaptations proven effective in recent global studies.

CONCLUSION

This study evaluated the behavioral and cognitive dynamics of a school nutrition initiative within a faith-based primary education framework. Answering our primary research aims, the intervention successfully functioned as a catalyst for perceived cognitive alertness and successfully reinforced routine socio-religious rituals. However, the data reveals a bio-pedagogical paradox: sensory preferences and biological aversions can temporarily override institutional compliance in young children, resulting in persistent menu resistance and food waste. Addressing our second research aim, this operational deficit can be mitigated by integrating a responsive, data-driven feedback mechanism where continuous student survey responses are utilized to inform localized, school-level menu adjustments.

The practical advantages of applying this responsive framework are highly significant for school administrators. Operationally and financially, continuous monitoring of student acceptability metrics allows schools to drastically reduce the inefficiencies of discarded meals. By utilizing this localized feedback loop rather than static menus, catering teams can adapt flavor profiles to match local familiarity, ensuring that nutritional budgets translate directly into actual student consumption rather than physical waste. Beyond logistical catering adjustments, resolving this paradox requires a substantive shift in daily pedagogical routines. Bridging the gap between biological reality and moral habituation demands that educators move beyond abstract moral instructions. Teachers must actively utilize the lunch period as a dedicated session for nutritional mentorship, providing guided sensory exposure and modeling positive eating behaviors to help children gradually overcome their biological aversions to unfamiliar vegetables.

Despite these insights, several methodological constraints must be acknowledged. The cross-sectional design and the localized sample of 63 students within a highly disciplined faith-based environment limit the generalizability of these findings. Furthermore, the reliance on self-reported survey data means that the specific aesthetic variables causing dietary resistance were not experimentally isolated. To address these gaps, future research should implement longitudinal experimental designs to test highly specific behavioral interventions. Subsequent studies should prioritize evaluating the efficacy of specific peer-modeling seating arrangements during lunch, test the acceptability variables of different visual presentation styles (e.g., camouflaged versus exposed vegetables), and measure the long-term retention of eating etiquette across multiple academic semesters to determine the most effective school-level strategies for minimizing plate waste.

RECOMMENDATION

While the empirical findings of this study offer a robust framework for understanding the intersection of nutritional interventions and behavioral habituation, several methodological constraints must be transparently acknowledged. First, the cross-sectional nature of the data collection provides only a temporary

snapshot of student responses, which limits our ability to evaluate the long-term retention and persistence of these newly formed dietary habits over an extended academic period. Second, the demographic scope was restricted to 63 participants within a highly specific, faith-based educational environment characterized by strict pre-existing religious discipline. Consequently, the potential for generalizing these outcomes to secular public schools or rural educational settings with entirely different sociocultural architectures remains inherently limited. Furthermore, relying primarily on structured quantitative metrics restricted our capacity to deeply explore the complex, underlying psychological motives driving the students' persistent resistance to specific vegetable menus and their subsequent food waste behaviors.

To address these remaining gaps, future research endeavors should prioritize longitudinal experimental designs capable of tracking the persistence of eating etiquette and cognitive vitality across multiple academic semesters. Additionally, subsequent studies would greatly benefit from adopting a mixed-methods approach; integrating qualitative instruments—such as in-depth ethnographical observations or phenomenological interviews with both students and catering staff—would be instrumental in unpacking the nuanced psychological barriers and sensory aversions driving picky eating in formal school settings. Finally, it is highly recommended that future scholars expand this evaluative framework across diverse socio-geographical landscapes by conducting comparative analyses between faith-based institutions, secular urban schools, and rural educational communities. Such cross-cultural investigations are crucial to determine how distinct institutional climates uniquely mediate, accelerate, or hinder the operational success of macro-level national nutritional policies.

Author Contributions

Conceptualization, UH and IN; methodology, UH and RKDA; software, A and ARNA; validation, UH, IN and RKDA; formal analysis, IN and RKDA; investigation, ARBN, A, ARNA, MIA, NBS and SYAA; resources, UH; data curation, MIA, NBS and SYAA; writing—original draft preparation, UH and IN; writing—review and editing, RKDA and UH; visualization, ARBN and A; supervision, UH; project administration, IN and RKDA; funding acquisition, UH. All authors have read and agreed to the published version of the manuscript.

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Conflict of interests

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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