Tsaqila Jurnal Pendidikan dan Teknologi [TJPT]
Vol 6 Number 1 July 2026, hal: 15-26
ISSN: 2807-6273

Transformation Of Nutritional Literacy Culture In Deep Learning Of Students With Hearing Impairment Through Demonstration Video Media

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Abstract

Students with hearing impairment in Special Schools (SLB) face limited access to nutritional information media, making them vulnerable to Ultra-Processed Food (UPF) consumption. Research specifically examining nutritional literacy interventions for hearing-impaired students in Indonesian special education remains scarce. This study investigates the effectiveness of BISINDO integrated demonstration video media in improving nutritional literacy and reducing UPF consumption among students with hearing impairment through a Deep Learning approach. In this context, Deep Learning refers to the educational framework by Fullan et al. (2018) emphasizing value internalization and multidimensional competency development and is distinct from the machine-learning concept of the same name. This exploratory study employed Mixed Methods Research with an Explanatory Sequential design (Creswell & Plano Clark, 2018), integrating Action Research and Descriptive Case Study. Six (n=6) hearing-impaired seventh-grade students (age range: 12–14 years; 4 male, 2 female) at SLB Aisyiyah Tulangan, Sidoarjo were purposively selected. Data were collected via a validated Visual Nutritional Literacy Test, a 14-day Daily Food Audit (84 total records), and in-depth parent interviews analyzed against the 8 Graduate Profile Dimensions. The Wilcoxon Signed-Rank Test revealed a statistically significant improvement in nutritional literacy scores (mean: 3.2 to 7.1, scale of 8; $Z = -2.201$, $p = 0.028$; $r = 0.90$, large effect). School meals shifted from 100% UPF at baseline to 83% vegetable-based within two weeks. Qualitative thematic analysis identified emerging agency, critical thinking, communication, and triadic collaboration as indicators of Deep Learning. The novelty of this study lies in the integration of the 8 Graduate Profile Dimensions as a behavioral evaluation framework in special education nutritional literacy research, and in the theoretical modeling of demonstration video as a cognitive bridge for hearing-impaired learners. Given the small, purposive sample and short duration, findings are context-specific and exploratory; they should not be generalized without further study.

Keywords: Demonstration Video, Nutritional Literacy, Deep Learning

1. INTRODUCTION

Unhealthy eating habits among school-age children represent a critical public health and educational concern, particularly in special education settings. Nutritional quality has well-documented consequences for cognitive functioning and academic performance: diets high in ultra-processed food (UPF) are associated with elevated blood glucose variability, reduced sustained attention, and increased fatigue during learning tasks (Burkhalter & Hillman, 2011; Rucklidge & Kaplan, 2014). For students who already require additional cognitive resources to process information through alternative sensory channels as is the case for students with hearing impairment poor nutrition may further reduce the attentional capacity available for learning, compounding existing educational disadvantages. Students with Disabilities in Special Schools (SLB) therefore face a dual challenge: the need for differentiated learning services alongside vulnerability to suboptimal nutritional practices due to limited access to health information media tailored to their special needs (Mikulovic, 2011). A concrete manifestation of this is students' tendency to bring UPF, such as sausages and nuggets, which are high in sodium and preservatives but low in nutritional value (Monteiro et al., 2019).

Among students with hearing impairment specifically, the nutritional literacy challenge is compounded by communication barriers. Deaf students often have reduced access to incidental learning the informal acquisition of health information through overheard conversations or ambient media making them more reliant on structured visual instruction (Marschark & Hauser, 2012) A review by Fellinger et al. (2012) found that deaf adolescents reported lower health literacy and more difficulty understanding health information compared to hearing peers, a disparity directly attributable to limited verbal information access. In the Indonesian special education context, nutritional education programs in SLB rarely incorporate media accessible to hearing-impaired learners, creating a structural gap between health knowledge and dietary behavior. Despite the relevance of this gap, nutritional literacy interventions specifically targeting deaf students in Indonesian SLB have received little empirical attention. The present study addresses this underexplored intersection.

Based on preliminary observations conducted over two weeks at SLB Aisyiyah Tulangan in January 2021, meal records for six seventh-grade hearing-impaired students revealed that all 36 observed meal records (6 students × 6 school days per week × partial weeks) were classified as UPF. Observations were conducted by the class teacher using a structured daily meal checklist; classification was verified by the lead researcher against photographic documentation. While this observation involved a small sample and was not a formal survey, the complete absence of vegetable-based meals warranted intervention. Parental interviews at this baseline stage identified three primary barriers: practicality of UPF preparation, children's habitual rejection of vegetables, and the absence of accessible nutritional education media usable within the home environment.

For students with hearing impairment, limited verbal information access renders conventional nutritional education largely ineffective. Abstract, text-based approaches do not align with the visual-spatial processing strengths of deaf learners (Marschark & Hauser, 2012; Swanwick & Marschark, 2010)). Existing visual nutritional interventions for this population have typically involved static pictorial materials (e.g., food pyramids, picture cards); however, these lack the procedural, sequential, and kinesthetic elements necessary for connecting nutritional knowledge to real food preparation behavior. Demonstration video media incorporating BISINDO sign language, real vegetable handling, and step-by-step cooking demonstrations offers a qualitatively different modality. Unlike static visuals, video provides temporal structure that mirrors the actual sequence of healthy food preparation, making abstract nutritional concepts concrete and actionable (Hitchcock et al., 2016) The mechanism linking such video to behavior change, however, requires explicit theoretical grounding.

The present study embeds demonstration video within two complementary theoretical frameworks. First, (Mayer, 2009) Cognitive Theory of Multimedia Learning (CTML) posits that learning is optimized when information is presented through coordinated visual and verbal channels, reducing extraneous cognitive load and supporting the construction of integrated mental models. For hearing-impaired students, the verbal channel is operationalized as BISINDO sign language and text captioning, making CTML directly applicable. Second, (Fullan et al., 2018) Deep Learning framework conceptualizes genuine learning as the internalization of values and competencies across six global dimensions Character, Citizenship, Collaboration, Communication, Creativity, and Critical Thinking plus Well-being and Self-Connection in the Indonesian Graduate Profile formulation (Kemendikbud, 2022)

Together, these frameworks allow the study to theorize both the cognitive mechanism of video-based learning and its expected behavioral outcomes.

This study aims to: (1) measure the effectiveness of demonstration video in improving nutritional literacy and reducing UPF consumption among hearing-impaired students; (2) analyze the behavioral transformation process through the 8 Graduate Profile Dimensions as evidence of Deep Learning; and (3) describe the role of triadic teacher-student-parent collaboration in sustaining the healthy nutrition program. Findings are expected to contribute a theoretically grounded and practically applicable inclusive nutritional learning media model for Indonesian special education institutions.

2. RESEARCH METHODOLOGY

This study employed Mixed Methods Research with an Explanatory Sequential design (Creswell & Plano Clark, 2018). In this design, the quantitative phase is conducted first to establish the magnitude and direction of change, and the qualitative phase subsequently explains the mechanisms and context of that change. This sequencing is conceptually coherent with the study's dual aim: first measuring whether demonstration video improved nutritional literacy (quantitative), then understanding how and why behavior changed through parent narratives (qualitative). The quantitative component was structured as Action Research, which provides iterative cycles of planning, implementation, observation, and reflection appropriate for classroom-based interventions (Kemmis & McTaggart, 1988) The qualitative component adopted a Descriptive Case Study approach (Yin, 2018) enabling richly contextualized description of individual transformation within the bounded setting of one SLB classroom. These three methodological layers are therefore complementary rather than redundant: Mixed Methods provides the overarching design logic, Action Research structures the intervention cycles, and Case Study governs the qualitative depth of description.

2.1. Research Subjects

Research subjects were six (n=6) hearing-impaired seventh-grade students at SLB Aisyiyah Tulangan, Sidoarjo, East Java, selected using purposive sampling. Participants ranged in age from 12 to 14 years (M = 13.2 years); four were male and two were female. All participants were enrolled in the same seventh-grade special class, had completed primary education at SLB level, and were diagnosed with severe-to-profound hearing impairment (>70 dB HL) verified through school audiological records. None had significant additional disabilities that would require further differentiation of the intervention. All parents provided informed consent and agreed to participate in the parenting component of the program. The sample size of six reflects the total population of eligible students in the target class. While this limits statistical generalizability, purposive whole-class sampling is methodologically appropriate in action research, where the goal is in-depth contextual understanding rather than population inference (Creswell & Plano Clark, 2018; Yin, 2018) All interpretive claims are accordingly bounded to this specific educational context.

2.2. Intervention Procedure

The intervention was delivered over five weeks: one baseline week, two implementation weeks, and two evaluation weeks, following the Action Research cycle. The full schedule is outlined in Table 1.

Table 1
Intervention Schedule Overview

Week	Phase	Key Activities	Duration
1	Baseline	Structured meal observation (daily checklist); pre-test (Visual Nutritional Literacy Test)	5 school days
2	Implementation	Video screening: 3 sessions × 15 min/week (BISINDO-integrated); vegetable planting (water spinach, spinach)	5 school days
3	Implementation	Harvest and food-processing activity; parenting session (1 × 90 min, with take-home video guide via WhatsApp)	5 school days
4–5	Evaluation	Post-intervention meal observation (14 days, 84 records); post-test; in-depth parent interviews	14 calendar days

The demonstration video was developed specifically for this study following visual message design principles adapted for deaf learners: visual dominance, BISINDO sign language integrated throughout, simplified text captioning, and step-by-step procedural demonstration. A BISINDO interpreter was consistently positioned in the lower-right corner of the frame to maintain attentional continuity. Contrasting green color was applied to vegetable objects as a visual stimulus to differentiate healthy food categories from UPF packaging. Each video session lasted 15 minutes and was viewed twice per session to support retention. The parenting session (Week 3) involved a 90-minute structured workshop providing parents with knowledge about nutritional content, guided practice in presenting vegetable-based meals, and a take-home video guide distributed via the class WhatsApp group. Subsequent WhatsApp communication enabled ongoing teacher-parent support through out the evaluation period.

2.3. Research Instruments and Data Collection

To comprehensively evaluate the impact of the visual-based intervention on deaf students' nutritional literacy and dietary habits, this study utilized a convergent parallel mixed-methods design. Through this approach, objective quantitative data were combined with qualitative insights to capture a holistic picture of behavioral shifts across both school and home environments. Data collection was systematically carried out using four primary instruments involving students, teachers, and parents, as detailed below.

Table 2
Research Instrument Matrix

Instrument	Data Source	Validity/Reliability	Analysis
Visual Nutritional Literacy Test	Students (n=6)	Content validity (nutritionist); format validity (special education expert)	Wilcoxon Signed-Rank Test + Effect Size (r)
Daily Food Audit	84 meal records (6 students × 14 days)	Inter-rater agreement = 95% (20% random check by second teacher)	Frequency trend analysis
In-depth Interview	Parents (n=6)	Member checking; dual-coder consensus (30% of transcripts)	Thematic analysis – 6 phases (Braun & Clarke, 2006)
WhatsApp Log & Documentation	Teacher-parent communication	Direct archive	Content analysis (message frequency, category)

The Visual Nutritional Literacy Test comprised eight food picture cards (four healthy:

green vegetables, tempeh, tofu, eggs; four UPF: sausages, nuggets, corned beef, instant noodles) that students classified without verbal assistance by placing cards in “healthy” or “unhealthy” trays. Scoring: one point per correct classification (maximum = 8). Content validity was established through expert review by a registered nutritionist, who confirmed accuracy of food categorizations, and a special education expert, who verified accessibility of the visual format and absence of ambiguous imagery for deaf students. No formal reliability index was computed due to the small sample; this is acknowledged as a limitation. The Daily Food Audit recorded the main protein/side-dish component of each student’s school meal across 14 consecutive post-intervention school days, categorized as UPF, Healthy, or Mixed. The class teacher recorded each entry using a structured daily checklist; a second teacher independently verified a random 20% sub-sample (17 records), yielding an inter-rater agreement of 95%. Qualitative in-depth interviews with parents were audio-recorded with consent, transcribed verbatim, and analyzed using the six-phase thematic analysis procedure (Braun & Clarke, 2019): (1) data familiarization, (2) initial code generation, (3) theme searching, (4) theme review, (5) theme definition and naming, (6) report production. Two researchers independently coded 30% of transcripts; coding discrepancies were resolved through discussion until full consensus was reached, strengthening credibility of the qualitative findings.

3. RESULTS

This section presents the empirical findings regarding the impact of the visual-based intervention on deaf students’ nutritional literacy and dietary habits. The results are structured sequentially to present quantitative advancements before delving into the behavioral shifts and qualitative dimensions. First, data from the pre- and post-intervention tests are evaluated to measure improvements in food classification skills. Second, data from the 14-day post-intervention food audit are analyzed to identify behavioral transitions in school meal composition. Finally, qualitative insights extracted from in-depth parent interviews are mapped against the Graduate Profile Dimensions to provide a holistic understanding of the intervention’s cognitive, communicative, and socio-behavioral outcomes.

3.1. Improvement in Visual Nutritional Literacy (Quantitative)

Pre-test and post-test results showed a consistent increase in nutritional literacy scores for all six participants following the two-week demonstration video intervention.

Table 3
Visual Nutritional Literacy Pre-Post Test Results

Student	Age / Gender	Pre-test (/8)	Post-test (/8)	Improvement
S1	13 yrs / M	3	7	+4
S2	14 yrs / M	4	7	+3
S3	12 yrs / M	2	6	+4
S4	13 yrs / M	3	8	+5
S5	13 yrs / F	4	7	+3
S6	14 yrs / F	3	7	+4
Mean	—	3.2	7.1	+3.9

The Wilcoxon Signed-Rank Test confirmed a statistically significant difference between pre-test and post-test scores ($Z = −2.201$; $p = 0.028 < 0.05$). Effect size was calculated as $r = Z/\sqrt{N} = −2.201/\sqrt{6} = 0.90$, indicating a large effect by Cohen’s (1988) conventions ($r \geq 0.50$ =

large). An average improvement of 3.9 points on an 8-point scale reflects a near-doubling of nutritional food classification accuracy across all participants. The consistently positive direction of change across all six students with improvement ranging from +3 to +5 points further supports the robustness of this pattern within this sample. Causal attribution, however, requires caution given the absence of a control condition.

3.2. Daily Food Audit: Meal Transition Trends

During the pre-intervention baseline period, all 36 observed meal records (6 students × 6 school days) were classified as UPF, with no instances of vegetable or legume-based meals. Table 4 presents the distribution of meal categories across the 84 post-intervention records (6 students × 14 days). Percentages reflect the proportion of records in each category within each time period.

Table 4
Post-Intervention Daily Meal Trends (14 Days, n = 84 records)

Period	n (records)	UPF (%)	Healthy/Vegetable (%)	Mixed (%)
Baseline	36	100	0	0
Week 1 post-intervention	42	33	50	17
Week 2 post-intervention	42	0	83	17

The data show a progressive, unidirectional decline in UPF meal records: from 100% at baseline to 33% in Week 1 and 0% in Week 2. Concurrently, healthy/vegetable-based meals increased from 0% to 83%. Mixed-category meals (e.g., one vegetable component alongside one UPF item) constituted 17% by Week 2, suggesting a transitional pattern in some households rather than an abrupt dietary shift. These findings are corroborated by photographic meal documentation and WhatsApp communication logs between teachers and parents. The trend is notable within this sample; however, given the 14-day observation window and small sample size, it is not possible to determine whether these changes reflect durable habit formation or a time-limited novelty effect. Longitudinal follow-up data would be necessary to address this question.

3.3. Qualitative Findings: In-Depth Parent Interviews Based on the 8 Graduate Profile Dimensions

Following the 14-day evaluation period, in-depth interviews were conducted with all six parents/guardians. Interviews were audio-recorded, transcribed verbatim, and analyzed thematically by two independent coders using the 8 Graduate Profile Dimensions as the coding framework (inter-coder consensus reached across all 30% double-coded transcripts). Findings are presented per dimension; intensity percentages (Table 5) reflect the proportion of the six parent informants whose accounts contained coded indicators for each dimension. All parent names are anonymized using student initials.

3.3.1. Problem Identification (Baseline Context)

All six parents described UPF provision as habitual prior to the intervention, driven by practicality and children’s consistent vegetable refusal. Parent of S1: “Every morning we are in a rush; sausages just need to be fried, and it is done. Vegetables, my child refuses and pushes off the plate.” The parent of S4 identified the absence of accessible communication media as the core barrier: “We do not know how to explain to our child why vegetables are important. We tried, but he did not understand. In the end, we gave up.” These accounts confirm that the UPF dominant pattern originated not from parental indifference but from the structural absence of visually accessible nutritional communication tools in the home.

3.3.2. Character Dimension (Agency/Independence)

Independent food selection initiative was the most consistent finding, reported across all six informants (6/6). Parent of S3: “At the market, my child suddenly grabbed water spinach and put it in the basket. I asked in sign language ‘What for?’ and he signed ‘school meal.’ This had never happened before.” Parent of S6: “Now when I prepare nuggets, my child refuses by pointing to the fridge and signing ‘spinach.’” The shift from passive food receipt to self-initiated healthy food selection is consistent with (Fullan et al., 2018) conception of agency as the primary indicator of genuine Deep Learning.

3.3.3. Critical Thinking Dimension

Critical thinking indicators were reported by five of six parents (5/6). Parent of S2: “I gave him a sausage. He picked it up, looked at it, put it back down, and drew a circle with a cross on paper the video’s symbol for ‘unhealthy.’” Parent of S5 described food categorization at a market stall: “My child saw corned beef and immediately pointed to her stomach with a rejecting expression.” These are parent-reported behavioral observations rather than direct cognitive assessments; they should be interpreted as indicative of developing food evaluation skills rather than as definitive evidence of internal reasoning processes. Direct student assessment instruments would be needed to confirm this dimension.

3.3.4. Communication Dimension

All six parents (6/6) reported increased intensity and specificity in children’s nutritional communication through sign language, drawing, and gesture. Parent of S1: “My child drew a crossed-out sausage and spinach with a star beside it this was the first time he could clearly convey something about food.” Parent of S4 described a shift from basic to persuasive sign use: “Before, signs were only to ask for food or drink. Now she uses extended signs pointing to vegetables, signs ‘grow,’ then holds her arm meaning ‘vegetables make you strong.’” BISINDO-integrated video appears to have expanded students’ expressive repertoire into health communication domains.

3.3.5. Collaboration Dimension

Triadic collaboration was operationalized through two measurable channels: (1) the parenting session, which provided parents with structured, accessible tools to support vegetable-based meals; and (2) the class WhatsApp group, which averaged 8.3 parent messages per week per family during the intervention (meal photos and home planting activity photos). Parent of S2: “The teacher sent a video on growing water spinach. I tried it with my child, and he watered the plants every morning without being asked.” Parent of S5: “Now on Sundays we shop for vegetables together, and my child chooses.” The increase in parent-teacher communication reflects procedural engagement and active home-based behavioral support. Whether this engagement constitutes the deeper co-design of learning that (Fullan et al., 2018) envision requires longitudinal investigation beyond the present study’s scope.

3.3.6. Creativity Dimension

Creative expression of nutritional knowledge was observed in three of six students (3/6), primarily through spontaneous drawing. Examples included S1’s sketchbook depictions of food classifications and S4's hand-drawn "food comparison posters" created at home without prompting. While this dimension was not a primary outcome target of the intervention, its emergence in half the sample suggests that visual media may activate creative processing modes in hearing-impaired learners beyond direct content recall. This is a tentative observation warranting further investigation.

3.3.7. Citizenship Dimension

Citizenship indicators were reported in two of six cases (2/6), representing the lowest observed frequency. Parent of S3: "My child explains using sign language to his cousins which food is healthy even though his cousins are not deaf." The limited frequency of this indicator is expected given the short intervention duration and the interpersonal demands of knowledge sharing across hearing/deaf boundaries. This dimension would require a longer program with explicit community-engagement activities to develop more robustly.

3.3.8. Well-being and Self-Connection Dimensions

Well-being indicators (5/6) included parent reports of overall dietary improvement and increased confidence in social food contexts. Self-Connection (4/6) was evidenced in accounts of students taking autonomous responsibility for food choices: Parent of S6: "Now whenever my child wants to eat, she checks the contents first. Not because I told her to it seems she feels it is her own responsibility." Parent of S3: "My child looks more confident. When family gathers and there is food, he explains in sign language which is healthy." These are holistic behavioral shifts observed by parents and represent the affective dimension of the intervention's impact.

Table 5
Summary of Qualitative Findings per Graduate Profile Dimension

Dimension	Emerging Indicators (Parent-Reported)	Intensity (n=6)	Evidence Level
Character/Agency	Independent initiative in choosing vegetables	6/6 (100%)	Strong
Critical Thinking	Reason-based rejection of UPF	5/6 (83%)	Moderate—parent report only
Communication	Expression of nutritional preferences via sign/drawing	6/6 (100%)	Strong
Collaboration	Active parent-child involvement at home	6/6 (100%)	Strong
Creativity	Drawing representations of food categories	3/6 (50%)	Emergent
Citizenship	Sharing nutritional knowledge with hearing family members	2/6 (33%)	Emergent
Well-being	Overall change in family eating patterns	5/6 (83%)	Moderate
Self-Connection	Awareness of personal responsibility for health	4/6 (67%)	Moderate

Dimensions with strong evidence (Agency, Communication, Collaboration) were directly and consistently supported by multiple parent accounts with concrete behavioral examples. Dimensions rated as moderate relied on parent interpretation of children's behavior rather than direct measurement. Emergent dimensions (Creativity, Citizenship) appeared in fewer than half the sample and reflect promising but preliminary indicators that should not be overstated given the intervention's short duration.

4. DISCUSSION

This section contextualizes the empirical results within the broader theoretical landscape of special education, cognitive learning, and dietary behavior modification. By cross-examining the quantitative surges in nutritional literacy and the qualitative transformations across the Graduate Profile Dimensions, the discussion unpacks the underlying mechanisms that enabled these shifts. The analysis is organized into four thematic areas: first, an evaluation of demonstration videos as a cognitive bridge through the lens of Cognitive Theory of Multimedia Learning (CTML); second, a critical examination of the Deep Learning dimensions achieved, along with their inherent limitations; third, an analysis of the behavioral shift away from Ultra-Processed Foods (UPFs); and finally, an exploration of how the school-teacher-parent triadic collaboration model served as an ecological catalyst for sustainable institutional change.

4.1 Demonstration Videos as a Cognitive Bridge: Findings in Relation to Theory

The large-effect improvement in nutritional literacy scores ($r = 0.90$, $p = 0.028$) is the study's primary quantitative finding. This result is consistent with prior evidence that visual, sign-language-integrated instructional media effectively supports conceptual learning in students with hearing impairment (Schick et al., 2006) and extends this evidence base to the nutritional literacy domain an area where hearing-impaired students face compounded access (Fellinger et al., 2012; Marschark & Hauser, 2012). Compared to static pictorial nutritional materials, which have been shown to improve food identification but rarely to produce behavioral transfer (Contento, 2011) the video-based approach in this study incorporated temporal, procedural, and kinesthetic elements that appear to have supported deeper encoding.

The cognitive mechanism underlying this improvement can be theorized through (Mayer, 2014) CTML. The video's simultaneous presentation of BISINDO sign language (substituting the auditory verbal channel), real vegetable imagery, and text captioning created a multimodal, low-cognitive-load learning environment aligned with CTML's principles of coherence and redundancy. Crucially, the transition from video learning to real-world behavior students physically selecting, handling, and requesting the same vegetables depicted in the video reflects the kind of situated transfer that (Lave & Wenger, 1991) describe as characteristic of authentic, practice-embedded learning. This concreteness distinguished the intervention from conventional nutrition posters or verbal instruction.

The three-stage behavioral transformation model proposed in this study (Visual Observation → Conceptual Understanding → Behavioral Application) is consistent with (Fullan et al., 2018) Deep Learning progression from surface to deep to transfer learning. This theoretical alignment suggests that demonstration video, when designed with accessibility principles for deaf learners, can function as an effective cognitive bridge enabling progression through these stages. This contribution is the study's primary theoretical novelty.

4.2. Deep Learning Dimensions: Evidence, Limitations, and Comparison with Prior Studies

The qualitative findings indicate that the intervention produced behavioral changes consistent with five of the eight Graduate Profile Dimensions at moderate to strong evidence levels. The strongest indicators were Agency (6/6), Communication (6/6), and Collaboration (6/6). The emergence of agency children independently selecting healthy food without parental direction is particularly significant because it reflects value internalization rather than rule compliance, which (Fullan et al., 2018) identify as the defining criterion of Deep Learning. This finding extends prior research on video-based interventions in special education (Hitchcock et al., 2016) by demonstrating that such interventions can produce not only skill acquisition but

Tsaqila Jurnal Pendidikan dan Teknologi [TJPT]
Vol 6 Number 1 July 2026, hal: 15-26
ISSN: 2807-6273

motivational transformation.

However, several important qualifications are warranted. First, the critical thinking and self-connection indicators are based entirely on parent-reported behavioral observations, which are subject to social desirability bias and confirmatory perception. Direct student assessment such as structured food-choice tasks or think-aloud protocols would be necessary to corroborate these dimensions. Second, the collaboration indicator while evidenced by concrete WhatsApp engagement data (8.3 messages/family/week) primarily reflects procedural participation in a structured program rather than the collaborative co-design of learning envisioned by (Fullan et al., 2018) Third, Creativity and Citizenship showed emergent rather than robust evidence (3/6 and 2/6, respectively). These dimensions require longer program duration and explicit pedagogical scaffolding to develop, and should not be claimed as achieved outcomes of the present study. Observers are cautioned against interpreting the 8-Dimension framework as a checklist to be fully satisfied by any single intervention.

4.3. UPF Reduction: Contextualizing the Findings

The shift from 100% UPF meals at baseline to 0% UPF and 83% healthy meals by Week 2 represents a substantial behavioral change within this sample. This finding is consistent with evidence that combining nutritional education with hands-on food experience in this case, vegetable planting and harvest processing produces stronger behavioral outcomes than education alone (Contento, 2011) The food-growing component appears to have created a personal connection to vegetables that enhanced the video-based knowledge transfer. However, the durability of this shift is the critical unanswered question. Research on dietary behavior change in children indicates that short-term improvements frequently attenuate after the removal of structured support (Worsley, 2002) Follow-up assessment at one month, three months, and six months post-intervention would be necessary to determine whether the observed shift represents genuine habit formation. The present findings should be understood as evidence of immediate behavioral response rather than confirmed long-term dietary change.

4.4 Triadic Collaboration: Mechanism and Contributions

The triadic collaboration model contributed to the intervention’s outcomes through two identifiable mechanisms. First, the parenting session reduced the home-based communication barrier by providing parents with concrete, sign-language-accessible tools (video tutorials, WhatsApp guidance), enabling them to reinforce nutritional messaging beyond the classroom. Second, the WhatsApp group created a low-burden accountability structure that maintained behavioral momentum between school sessions through meal documentation and peer-parent visibility. These mechanisms are consistent with (Turnbull et al., 2015) argument that generalization of skills for students with disabilities requires synchronized school-home ecological support. The specific contribution of each mechanism to the observed outcomes, however, cannot be disentangled in the present single-group design.

The school’s subsequent decision to integrate vegetable gardening as a regular Friday curriculum activity under a Local Wisdom theme represents a meaningful institutional response. This is consistent with the ecological model of sustainable special education programming. It should be noted, however, that this institutional decision reflects administrative adoption rather than confirmed cultural transformation; the latter would require longitudinal data on whether the program continued to operate, expanded to other classes, and produced measurable student outcomes beyond the study period.

5. CONCLUSION

This exploratory study investigated the effectiveness of BISINDO-integrated demonstration video media in improving nutritional literacy and reducing UPF consumption among six hearing-impaired seventh-grade students at SLB Aisyiyah Tulangan. The findings suggest three main outcomes: (1) a statistically significant, large-effect improvement in visual nutritional literacy (mean: 3.2 to 7.1 on an 8-point scale; Wilcoxon $Z = -2.201$, $p = 0.028$; $r = 0.90$); (2) a progressive reduction of UPF-based school meals from 100% at baseline to 0% in the second post-intervention week, with vegetable-based meals reaching 83% of records; and (3) qualitative indicators primarily from parent reports consistent with Deep Learning manifestations across five of eight Graduate Profile Dimensions, with Agency, Communication, and Collaboration showing the strongest evidence.

The phrase “this study proves” is intentionally avoided throughout this report. Given the small purposive sample (n=6), short intervention duration (five weeks total), single-group design without a control condition, and reliance on parent-reported qualitative data, the findings are exploratory and context-specific. They indicate the potential of demonstration video as a nutritional literacy intervention for hearing-impaired students in Indonesian SLB settings, but cannot support causal claims or generalizations to broader populations without replication.

The study contributes three areas of novelty: (a) the application of the 8 Graduate Profile Dimensions as a multi-dimensional behavioral evaluation framework for nutritional literacy research in special education an application not previously documented in the Indonesian literature; (b) explicit theoretical modeling of BISINDO-integrated demonstration video as a cognitive bridge via CTML and Deep Learning, providing a replicable design rationale; and (c) preliminary empirical evidence that triadic teacher-student-parent collaboration mediated by accessible video technology can produce observable dietary behavior changes within a special education classroom context.

Future research should address the methodological limitations of the present study by employing larger samples with comparative or control conditions, longer follow-up periods (minimum six months), direct student-level behavioral observation alongside parent-report data, formal instrument reliability analysis, and broader geographical contexts. Practically, SLB institutions are encouraged to develop standardized, accessible nutritional video media banks and to integrate nutritional literacy systematically into Deep Learning curricula as a bridge between academic competence and life skills for students with disabilities.

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