Balanced Nutrition Education Strategy Through Local Culinary for Early Childhood

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Abstract: Early childhood is known as the golden age, a critical period for physical growth and brain development. During this stage, the intake of nutritious food significantly influences a child's physical development and the maturation of the brain's nervous system, which serves as the center of cognitive function. Conversely, a deficiency in essential nutrients can negatively affect brain development and reduce a child's learning potential. Early Childhood Education (ECE) serves as a strategic avenue for instilling an understanding of the importance of balanced nutrition from an early age through engaging approaches that align with children's developmental characteristics. This study explores various theories and strategies for nutrition education that can be applied within the context of ECE in Central Java. A systematic review method was employed to examine and synthesize relevant studies related to nutrition education for early childhood. The data sources used in this study include nationally accredited journals, and reputable international journals. The literature review reveals that learning-through-play approaches, the integration of nutrition themes into the curriculum, and the active involvement of both parents and teachers are effective strategies for enhancing children's understanding of healthy eating. The findings of this review are expected to serve as a foundation for developing a balanced nutrition education model that optimally supports brain development and intelligence in early childhood, particularly in the Central Java region.

1 INTRODUCTION

Early childhood is recognized as a crucial phase in human development, as it is during this period that physical, cognitive, social, and emotional growth occurs and progresses rapidly. This stage is often referred to as the "golden age." To support optimal growth and development during this period, an adequate and balanced nutritional intake including both macronutrients and micronutrients is essential. Good and balanced nutrition plays a vital role in tissue formation, brain development, immune system function, learning readiness, and long-term behavioral outcomes (Black et al., 2017). Nutritional deficiencies in early childhood can disrupt cognitive development and increase the risk of long-term learning impairments (Prado and Dewey, 2014).

Unfortunately, real-world data show that many Indonesian children still suffer from nutritional deficiencies, including stunting, anemia, and malnutrition. According to the 2022 Indonesian Nutritional Status Survey (SSGI), there was a decrease in the stunting rate from 24.4% in 2021 to 21.6% in 2022. This downward trend is expected to continue so that the National Medium-Term Development Plan (RPJMN) target of 14% can be achieved by 2024.

These facts demonstrate that nutritional problems in early childhood remain a critical issue requiring serious attention and intervention. Research suggests that the problem is not solely due to food scarcity, but also to a lack of parental knowledge regarding balanced nutrition. This is supported by the findings of Jamalatun Nisa & Wahab, (2024); Silitonga et al., (2023); Sulistyowati, (2021) who emphasized that parental feeding behavior

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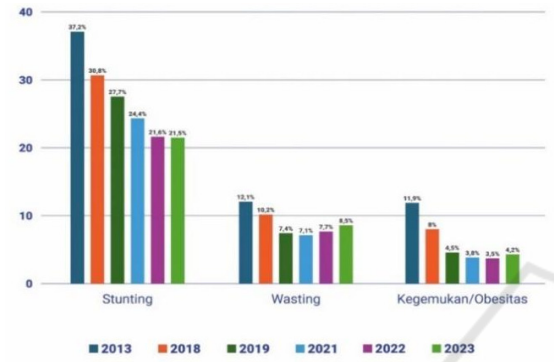
significantly influences a child's nutritional status. Parents with low nutritional knowledge are four times more likely to have malnourished children than those with adequate knowledge (de Buhr and Tannen, 2020). Furthermore, parents who actively involve their children in meal planning and preparation tend to have children with better nutritional outcomes (Scaglioni et al., 2018). This suggests that a combination of positive feeding behavior and adequate knowledge is crucial for supporting optimal child nutrition (Sukmawati et al., 2023).



Source : https://www.unicef.org/indonesia/id/gizi (UNICEF, 2024)

Figure 1: Child Malnutrition Trends in Indonesia.

This situation is further worsened by the increasing consumption of fast food (Sumitro, 2025). Fast food is typically low in nutrients but high in sugar, salt, and saturated fat (Health Research and Development Agency, 2019; Yulyanti et al., 2019). Ironically, despite Indonesia's rich culinary heritage, the potential of nutritious local foods remains underutilized in meeting children's dietary needs. Traditional foods are often regarded merely as snacks rather than primary sources of nutrition. In fact, many of these foods contain essential nutrients such as complex carbohydrates, fiber, vitamins, protein, and healthy fats critical for overall health and development (Nurhasanah et al., 2023; Santoso et al., 2023).

Global studies have shown that the use of local foods not only contributes to food security and environmental sustainability but can also enhance nutritional security when regularly incorporated into family meals (Lambers et al., 2021; Giyose et al., 2020). Strengthening nutrition education rooted in local culture is essential to increase public awareness about the nutritional potential of traditional foods, which are often overlooked. Prioritizing local foods is also aligned with the principles of food sovereignty and represents a more sustainable approach to nutrition interventions within the broader framework of human resource development.

However, traditional foods are often regarded as complementary items or snacks, rather than primary sources of nutrition. Therefore, nutrition education based on local foods needs to be strengthened and introduced early, so that communities and future generations understand that these traditional foods passed down through generations can play a crucial role in building a healthy and intelligent generation from an early age. Several studies have shown that nutrition education rooted in local culture is more effective in changing community dietary behavior due to its cultural familiarity and social acceptance (Bickenbach, 2011; Carpenter et al., 2017). When utilized properly, these traditional foods can serve as an effective alternative source of local nutrition to help address childhood malnutrition.

This study aims to explore various theories and strategies for nutrition education that can be applied within the context of Early Childhood Education (PAUD) in Semarang.

2 METHOD

This research is a qualitative descriptive study employing a library research approach. Library research refers to a data collection method that involves reviewing books, literature, notes, and various reports relevant to the problem being investigated (Jalali and Wohlin, 2012). The data sources used in this study include nationally accredited journals, and reputable international journals. These journals addressed the following topics: (1) culinary food ; (2) children's eating patterns; and (3) the nutritional content of traditional foods.

The literature was analyzed using a descriptive analytical method. The analysis process began with literature collection, which involved searching two databases Google Scholar and E-journal for research articles and review papers published between 2018 and 2024. The literature search focused on the following themes: (1) the urgency of balanced nutrition in early childhood; (2) strategies for balanced nutrition education in early childhood; and (3) the potential of traditional culinary arts as a source of balanced nutrition.

Keywords used in the literature search included: traditional food, child nutrition, early childhood diet, and traditional culinary. Journal articles were selected based on the relevance of their titles and abstracts. When the title or abstract was unclear, the full manuscript was reviewed for suitability. After the literature was collected, the data were synthesized to

deepen the understanding of the research problem and to draw comparisons with relevant case studies. The analysis was carried out in alignment with the specific objectives of the study.

3 RESULT AND DISCUSSION

Food is a basic necessity for every human being. The food consumed must fulfill the requirements of balanced nutrition, as achieving such balance is a crucial component of human growth and development, aimed at supporting a healthy life. This is also emphasized by Hasrul et al., (2020); Nurchayati & Pusari, (2015) who state that consuming healthy food is essential for optimal human growth and development especially during early childhood.

Children in early childhood require proper nutritional intake to support their physical and cognitive development into adolescence (Teixeira et al., 2022). Children who receive adequate nutrition tend to be healthier, more productive, and demonstrate improved learning abilities. Conversely, a deficiency in essential nutrients such as iron, iodine, and vitamin A can lead to short-term declines in cognitive performance and concentration (Black et al., 2017, 2013; Gannika, 2023).

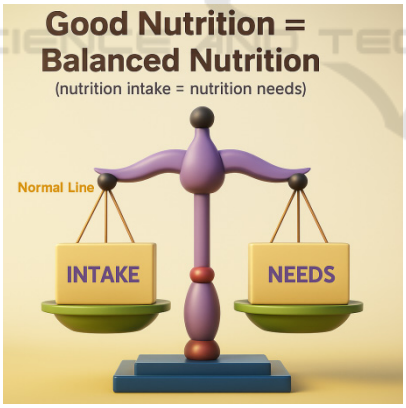


Figure 2: Balanced Food Intake and Nutritional Needs.

Good nutrition is achieved when nutrient intake matches the body's physiological needs. As illustrated in Figure 1, a balanced scale between "intake" and "needs" reflects the ideal condition in which the quantity and quality of food and nutrients are neither excessive nor deficient. This nutritional equilibrium is essential for supporting early childhood growth, immune function, and cognitive development. This concept is referred to as balanced nutrition, where the intake of each nutrient such as carbohydrates, proteins, fats, vitamins, and minerals is fulfilled according to the body's requirements (UNICEF, 2021; World Health Organization (WHO), 2020).

(a) (b)

Figure 3: Relationship Between Food Intake and Balanced Nutritional Needs.

The two figures above illustrate an imbalance between nutritional intake and bodily needs. Figure 2.a depicts a tilted scale, with the weight leaning towards the "Intake" side indicating that food consumption exceeds nutritional requirements. This condition reflects overnutrition, which can lead to various health problems such as obesity, early-onset hypertension, and metabolic disorders, particularly when children consume excessive amounts of foods high in sugar, saturated fat, or calories without sufficient physical activity (Lobstein et al., 2015; Popkin et al., 2020). Figure 2.b, on the other hand, represents a condition of undernutrition, in which nutritional intake falls short of the body's needs. The scale appears heavier on the "Needs" side, signaling that the body demands more nutrients than it receives. This type of malnutrition can result in stunting, wasting, anemia, and reduced immunity conditions that are especially concerning during early childhood, a critical period of growth and development(Black et al., 2017, 2013; Mamun et al., 2023).

1) The Urgency of Balanced Nutrition in Early Childhood

Every child undergoes rapid physical, intellectual, emotional, and mental development. This process requires adequate and balanced nutritional intake. Early childhood is a pivotal period for supporting physical growth, immune system function, and brain development. Therefore, ensuring balanced nutrition during this stage is essential. Balanced nutrition goes beyond simply consuming three meals per day. It involves achieving a proper balance between macronutrients (carbohydrates, proteins, and healthy fats) and micronutrients (vitamins and minerals), all of which must be consumed in appropriate quantities based on the body's needs.

Providing children with a balanced diet positively influences brain development, physical growth, immune function, and long-term learning capacity. Conversely, nutritional deficiencies during this stage can result in long-term consequences, such as stunting, anemia, and cognitive impairment conditions that may hinder a child's ability to reach their full potential in the future (Black et al., 2017; Hoddinott et al., 2013; Prado and Dewey, 2014). Thus, ensuring balanced nutrition in early life is not only a health initiative, but also an investment in sustainable human capital development. This aligns with Maslow's Hierarchy of Needs (Maslow, 1943), which posits that physiological needs form the foundational layer of human motivation. Without meeting these basic needs, individuals especially children cannot progress to higher levels of development, including self-actualization. As such, the role of families, early childhood education institutions, and government policies is crucial in fostering an environment that supports access to healthy food and early nutrition education.

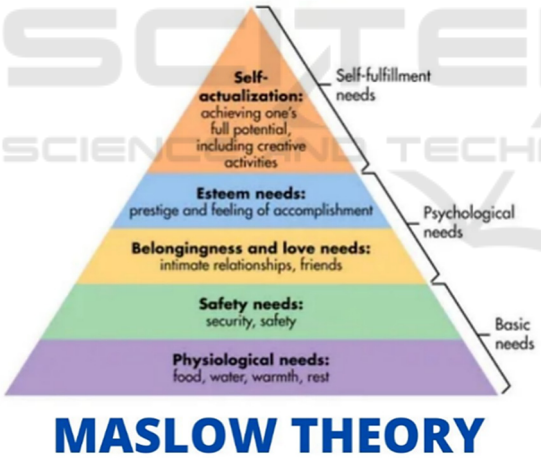


Figure 4: Maslow Theory.

2) Balanced Nutrition Education Strategies for Early Childhood

Balanced nutrition education can be implemented through various approaches, including integration into the Early Childhood Education (PAUD) curriculum. One effective approach is the use of educational media based on local culinary traditions. This method not only enhances children's nutritional knowledge but also reinforces local cultural values. In addition, strengthening family nutrition literacy should be an essential component of the educational strategy, as parents serve as primary decision-makers regarding their children's food consumption at home. According to Faber & Laurie, (2011) nutrition education that involves parents particularly mothers can significantly improve children's dietary diversity and micronutrient intake. Chatterjee & Nirgude, (2024); Suciyanti et al., (2025) also emphasize that nutrition education combining school-, family-, and community-based strategies has a greater impact on improving children's overall eating behavior.

The following are strategies for balanced nutrition education in early childhood:

a. Thematic Learning (Theme: "Healthy Food" integrating local culinary traditions)
   Through this thematic learning activity, children are expected to recognize 3–4 food groups (carbohydrates, protein, fruits/vegetables, and healthy snacks) using examples from Semarang's local cuisine. Children should also be able to give at least one reason for choosing fruits or vegetables every day (e.g., color, taste, or health benefits). The theme is integrated across activities language, art, sensory play, and practical demonstrations so that nutritional concepts are learned through repeated, meaningful experiences.
b. Role Play: Market and Pretend Cooking Activities
   Role play enables children to learn about traditional foods, basic portion concepts, social skills, and the function of each food group. In the "Semarang Market" activity, children assume roles such as seller, buyer, or cook, using replicas or pictures of local foods. They practice simple transactions (counting from 1–5), selecting balanced portions, and engage in short discussions about why they chose certain vegetables or foods. Evidence suggests that role play and food-related play can enhance children's understanding of nutrition (B and G.K., 2024; Willemsen et al., 2023).
c. Storytelling: AI-Based Short Interactive Animated Videos
   Use AI-generated short animation videos designed specifically for young children. These videos combine engaging visual and audio storytelling and when paired with adaptive AI prompts can be lightly personalized (for example, by including a

child's name, local characters, or typical dishes Local Culinary). Pedagogically designed digital media, used alongside hands-on activities, can strengthen both parents' and children's understanding and engagement with nutrition concepts. Studies from BMC Nutrition (2024) and BMC Health Services Research (2024) indicate that well-designed digital learning videos can increase parent and child knowledge and participation.

Thus, nutrition education that is contextual, engaging, and culturally rooted is vital to developing a generation that is healthy, intelligent, and resilient to global health challenges.

3) Local Culinary Potential as a Source of Balanced Nutrition

Indonesia's rich traditional culinary heritage offers a diverse and valuable resource for supporting balanced nutrition in early childhood. Local dishes such as tofu and tempeh, pecel sayur (vegetable salad), corn rice, lodeh (vegetables in coconut milk), sambal anchovies with peanuts, and boiled mung beans are examples of traditional foods that are rich in plant-based proteins, fiber, vitamins, and essential minerals. Moreover, local culinary products benefit from the availability of raw ingredients, affordability, and strong cultural acceptance within communities. According to (Sibhatu et al., 2015), the diversity of local food consumption is strongly associated with both micro- and macronutrient intake, which contributes significantly to improving children's overall nutritional status. (Johns et al., (2013) further support this view, stating that culinary practices based on local ingredients can promote food security and enhance the sustainability of food systems, particularly in developing countries. In addition, the use of local culinary practices helps preserve traditional eating habits and cultural identity.

In early childhood education settings, teachers and parents can utilize mealtime as an educational opportunity to introduce children to local ingredients, explain their origins, discuss their nutritional benefits, and demonstrate healthy preparation methods. This is consistent with findings by (Gartaula et al., 2020; Principato et al., 2025) who found that children exposed to traditional foods from an early age are more likely to accept healthy food options later in life. Therefore, it is important for child nutrition and education programs to revitalize the use of local culinary resources as a source of balanced nutrition that is contextual, sustainable, and readily accessible. The city of Semarang offers a variety of traditional foods that are not only flavorful but also rich in nutrients. Dishes such as lumpia, wingko babat, mochi, and garang asem incorporate natural ingredients like bamboo shoots, coconut, eggs, and chicken providing essential proteins, fiber, vitamins, and minerals beneficial for children's growth. Utilizing local culinary traditions can serve as a sustainable strategy to meet children's nutritional needs while fostering an appreciation and love for local food culture. Several examples of local foods used in nutrition education include:

Table 1: Several examples of local foods used in nutrition education include.

Food	Nutritional Content	Educational Value
Tahu Gimbal	Plant-based protein, carbo-hydrates, fiber	Introducing sources of protein and fiber
Pecel	Leafy vegetables, carbohydrates, vitamins A & C	Emphasizing the importance of vegetables and colorful meals
Bubur Tumpang	Legumes, coconut milk, plant-based protein	Source of energy and protein
Mochi Semarang	Complex carbohydrates, peanuts (plant-based protein), natural sugar	Educating about healthy snacking and sugar moderation
Pempek Palembang	Fish-based protein, carbohydrates, low fat	Understanding protein from aquatic sources and traditional preservation methods
Gudeg	Young jackfruit (fiber, vitamin C), coconut milk, plant-based protein	Learning about balanced meals with plant-based protein and fiber

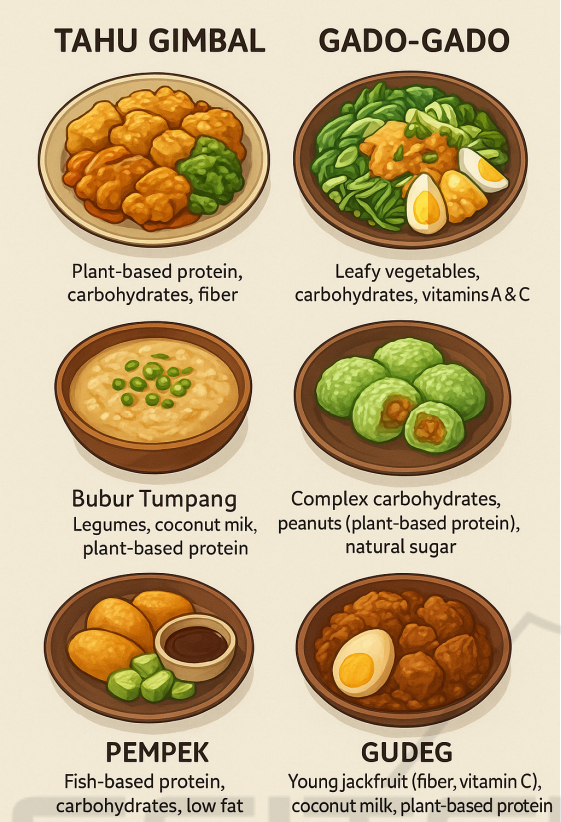


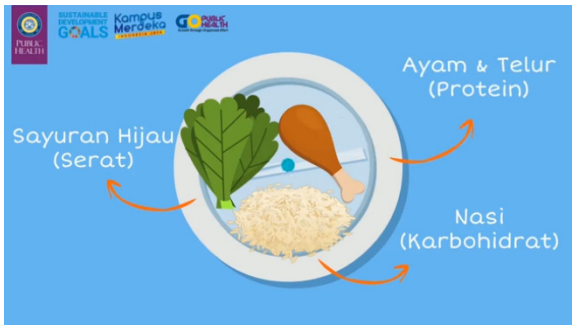
Figure 5: Local Culinary Foods.

The image above shows several types of traditional Indonesian culinary dishes, namely Tahu Gimbal, Gado-Gado, Bubur Tumpang, Mochi, Pempek, and Gudeg. Each traditional food is accompanied by information on its nutritional content, such as plant-based protein, complex carbohydrates, fiber, vitamins, healthy fats, and natural sugars.

Through the presentation of this image, it is expected that children will be able to understand the nutritional value of everyday foods. Using a visual approach, learners can easily recognize local food sources, understand their nutritional content, and relate them to a balanced diet.

The selection of these six dishes reflects the diversity of food sources in Indonesia, ranging from plant-based proteins (tofu, legumes, tempeh), animal proteins (fish in pempek, eggs in gudeg), complex carbohydrates (rice, sago, glutinous rice), to vegetables and fruits rich in vitamins. This introduction is expected to raise awareness of the importance of food diversity and minimize the consumption of ultra-processed foods..

Learning about balanced meals with plant based protein and fiber



Source : https://www.youtube.com/watch?v=fwgtWPDX6cY

Figure 6: Learning Video Image.

4) The Potential of Local Culinary Delights as a Source of Balanced Nutrition

In today's digital era, information technology-based media serve as powerful tools for delivering educational messages including those related to early childhood nutrition. One effective medium is digital content such as interactive videos. These videos can be used to introduce the concept of balanced nutrition based on local foods to both children and their parents.

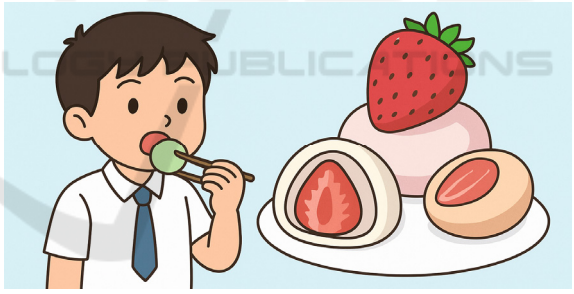


Figure 7: Traditional culinary food mochi.

According to Hikmatullah, (2023); Raut et al., (2024) digital media specifically designed for child nutrition education has been shown to improve nutritional literacy and promote healthy eating behaviors, particularly when developed contextually and grounded in local culture. Digital media enables the presentation of educational content in an engaging, interactive, and age-appropriate manner. For example, a short animated video about mochi can help children understand not only the ingredients and preparation process, but also its nutritional value and the cultural significance behind the dish.

4 CONCLUSIONS

Balanced nutrition during early childhood lays a critical foundation for physical growth, cognitive development, and long-term health. During this golden age, children require adequate nutritional intake in both quality and quantity, including sufficient macronutrients and micronutrients. Malnutrition at this stage may result in serious consequences such as stunting, anemia, and cognitive impairments. Therefore, an effective nutrition education strategy is essential. Such education should not remain theoretical but should be fully integrated into the early childhood education curriculum. It should also involve active participation from families and utilize local foods as both learning tools and daily consumption options.

Parental involvement particularly by mothers has been shown to enhance dietary diversity and improve the overall quality of children's diets. This is further supported by the implementation of contextual learning approaches, such as the use of local culinary delights as educational media. These local foods not only offer nutritional value comparable to modern food products but also carry cultural meaning and are more accessible within communities.

The integration of digital technology in education provides new opportunities for delivering local food–based nutrition education in a fun and interactive way. Animated videos, for example, can effectively convey nutrition messages in a manner that is both participatory and culturally grounded. By combining cultural values, family involvement, formal education, and digital innovation, balanced nutrition education based on local foods can become a comprehensive and impactful strategy for fostering a generation that is healthy, intelligent, and competitive in the global context.

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