

Research Article

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Author for correspondence:

Anggraeni Dian Permatasari

✉ anggraeni.dian.permatasari@brin.go.id

✉ Research Center for Education, National Research and Innovation Agency, Indonesia

Culinary Festival: Research-Based Learning Approach in Nature School to Improve Food Security Awareness

Deni Hadiana , Ibnu Salman , Novi Sylvia , Nur Alia , Anggraeni Dian Permatasari , Handewi Purwati Saliem 

Abstract

Background/purpose. Food security is a critical global issue intensified by climate change, economic pressures, and geopolitical instability, resulting in disrupted food supply chains and increased food prices. Research-based learning in nature schools offers innovative approaches to fostering food security awareness through immersive experiences and community engagement activities such as annual culinary festivals. This study aims to explore in-depth research-based learning integrated into culinary festivals as a nature school activity to enhance students' understanding and awareness of food security.

Materials/methods. This research was conducted through an instrumental case study using a qualitative approach at Kahuripan Ecology Elementary School, Purwakarta Regency, West Java Province, Indonesia. Data collection methods encompassed observation, interview, focused-group discussion, document, and questionnaire. The total participants were 360 students, 20 teachers, and respondents for in-depth interviews and focused-group discussions comprised of 60 students and six teachers.

Results. Results imply that nature school activity, specifically culinary festival, includes multiple stages that align with the principles of research conduct, leading to students' engagement in inquiry, experiential, discovery, and problem-based learning. Students' understanding and awareness of food security is confirmed, implying the nature of the school role is conceptualized within a foundation to support sustainability and food security system in the local context.

Conclusion. Research-based culinary festival exemplifies how integrating natural resources and community collaboration can enhance students' understanding of food security through experiential learning. This innovative approach fosters practical knowledge and collective action, emphasizing sustainable practices to address food security challenges on both local and global scales.



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1. Introduction

Food security is a global challenge that demands urgent and innovative educational responses. It is exacerbated by climate change, geopolitical instability, and economic pressures. Extreme weather events such as floods, droughts, and heatwaves are increasingly disrupting agricultural production, threatening food supply chains and making food availability less predictable (FAO et al., 2024; Rizwan Ullah et al., 2024). As climate change continues to worsen these conditions, crop yields are expected to decline, further destabilizing food systems. Meanwhile, ongoing geopolitical tensions—such as the war in Ukraine—have disrupted vital grain exports, deepening food shortages in vulnerable regions (El Bilali & Ben Hassen, 2024). Rising inflation, coupled with increased energy, fertilizer, and transportation costs, adds further strain to the global food system, pushing millions into food insecurity, especially in low-income countries. These factors also increase global food prices, making essential nutrition out of reach for many (El Bilali & Ben Hassen, 2024; Jagtap et al., 2022; Lin et al., 2023).

Food insecurity undermines both human health and environmental sustainability. Malnutrition, stunting, and weakened immune systems—especially in children—reduce productivity and quality of life (Meza et al., 2019; Pai & Bahadur, 2020). Chronic hunger also exacerbates poverty, creating a cycle of deprivation that is difficult to break (Bowden, 2020; Flores & Amiri, 2019). In addition, food insecurity contributes to social instability, with increased migration, social unrest, and poor educational outcomes (Coughenour et al., 2021; Payne-Sturges et al., 2018). Environmental sustainability is also at risk: when people face food shortages, they often resort to unsustainable agricultural practices, overexploiting natural resources like land and water. This leads to soil degradation, loss of biodiversity, and increased carbon emissions. As food systems become more fragile and inefficient, their ability to adapt to climate change weakens, further disrupting ecosystems and livelihoods. Ensuring food security is therefore essential for promoting long-term social, economic, and environmental sustainability.

Governments worldwide have implemented various policies to address food security through agricultural support, trade regulation, and social safety nets. In the U.S., the Farm Bill provides subsidies, crop insurance, and investments in sustainable farming (Lehrer, 2020), while the Supplemental Nutrition Assistance Program (SNAP) supports low-income households facing food insecurity (Mande & Flaherty, 2023). India's Public Distribution System (PDS) offers subsidized food grains (George & McKay, 2019), and the National Food Security Act guarantees affordable food for two-thirds of the population (Lindgren & Lang, 2022). The European Union promotes food security through the Common Agricultural Policy (CAP), which supports farmers, rural development, and sustainable agriculture (Fusco, 2021). In Africa, countries like Nigeria focus on diversifying agricultural production, investing in technology, and improving rural infrastructure (Otekunrin et al., 2019). Similarly, Brazil has launched conditional cash transfer programs like Bolsa Família to support vulnerable populations and improve food access (de Mattos & Bagolin, 2017). These policies aim to stabilize food supplies, promote sustainability, and reduce hunger.

Locally, cultural values and practices are deeply intertwined with food security. In many societies, food is not just a necessity but a key aspect of identity, community, and heritage (Alonso et al., 2018; Croxford & Itsiopoulos, 2020). Cultural norms shape dietary habits, farming techniques, and food distribution practices (Croxford & Itsiopoulos, 2020). For example, traditional agricultural knowledge passed down through generations can contribute to sustainable food production, while cultural diets often prioritize locally grown, seasonal foods, enhancing food security. However, food insecurity can disrupt cultural practices, particularly when communities face poverty, displacement, or changing climates. When people lack access to culturally appropriate foods, it impacts their nutrition and undermines their cultural identity (Alonso et al., 2018). Policies that respect and incorporate cultural

preferences—such as supporting indigenous agricultural practices or ensuring culturally relevant nutrition—can be more effective in maintaining long-term food security and community resilience.

National food security policies also influence household behaviours. Programs like food assistance and subsidies enable families to access more consistent and affordable food, alleviating food scarcity concerns (de Amorim et al., 2022; Johnson & Markowitz, 2018; Petralias et al., 2016). This stability allows households to focus more on education, work, and community engagement, promoting better meal planning and reducing food waste. Families may adopt healthier eating habits as they gain reliable access to nutritious food. Children, for example, benefit from better physical and cognitive development, while adults experience improved health and productivity (de Amorim et al., 2022; Shankar et al., 2017). Concerning cultural practices, local and seasonal ingredients should be encouraged to improve food security. These policies foster healthier, more stable lifestyles, that can be taught intentionally through formal education.

Schools play a pivotal role in shaping individual habits and lifestyles, particularly by educating students about nutrition, health, and sustainability. By incorporating lessons on the importance of balanced diets, physical activity, and mental well-being, schools help children develop healthier habits from a young age. Nutrition education can empower students to make informed food choices, reducing the risk of obesity and chronic diseases in the long run (Newman et al., 2023). Schools also promote values like time management, responsibility, and environmental consciousness, influencing students' overall lifestyle choices (Daniati et al., 2019; Deal & Peterson, 2016). Extracurricular activities like sports or environmental clubs further encourage physical activity and social engagement, including learned food habits. As students grow into adulthood, the habits and knowledge developed in school often carry over, influencing their future behaviours and decisions. In the long run, school culture related to food is crucial to determine students' food perceptions and habits.

Amidst this context, nature schools emerge as an underexplored educational model that offers a unique platform to address food security through immersive, experiential learning. One of the pedagogical strengths of nature schools is their use of research-based learning, which encourages students to investigate real-world issues in depth through observation, questioning, data collection, and reflection. In addressing the complex issues surrounding food security, research becomes essential because it encompasses a range of interconnected factors such as climate change, economics, agriculture, health, and policy. These elements interact in ways that are often difficult to untangle, making it crucial for students to develop a comprehensive understanding of how food systems operate. Research-based learning allows students to explore these complexities deeply, helping them grasp not only the symptoms of food insecurity but also its root causes. Moreover, it cultivates students' ability to evaluate evidence critically and recognize the role of data in shaping effective food policies (Boaz et al., 2022; Revai, 2022; Sylvia & Hadiana, 2023). Nature schools—where the natural and social environment becomes a living classroom—can significantly shape children's understanding of sustainability. These schools emphasize hands-on, outdoor learning, allowing children to engage directly with nature and develop an appreciation for biodiversity and ecological balance (Burns & Manouchehri, 2021; Hadiana et al., 2024; Meghdari & Yousefi, 2022; Nurellah et al., 2018; Sjamsir & Yuliani, 2021).

Previous research examining the role of schools in promoting food security has primarily focused on various programming initiatives aimed at improving students' access to nutritious food and raising awareness about sustainable food practices. For instance, studies on school gardening (e.g., Austin, 2022; Holloway et al., 2023) have explored how cultivating food on school grounds provides students with hands-on experiences in growing their food and fosters a greater understanding of where food comes from and the importance of local, sustainable agriculture. School meal programs (e.g., de Amorim et al., 2022; Wall et al., 2022) have been a key area of focus, as they directly address the

issue of food insecurity by ensuring that students have access to consistent, healthy meals during school hours, which can improve both physical health and cognitive performance. Nutrition education has also received significant attention (Holley & Mason, 2019), as it equips students with the knowledge and skills to make healthier food choices, understand the relationship between diet and health, and engage in informed decision-making regarding their food consumption.

Additionally, studies have explored the impact of local food programs (Prescott et al., 2020), which encourage schools to source food from local farms and producers, thus supporting regional economies and reducing the environmental footprint of food transportation. Programs such as complimentary breakfast (Byrne et al., 2018) and lunch programs (Lindberg et al., 2022) are essential in combating food insecurity among students, particularly those from low-income families, by providing essential meals that support learning and overall well-being. Furthermore, research on healthy food programs (Burkhart et al., 2023) has highlighted the importance of feeding students and ensuring that the food provided is nutritionally balanced and promotes long-term health benefits. These studies collectively emphasize schools' vital role in fostering food security and improving students' nutrition, whether through direct access to food or educational interventions.

However, the potential of nature-based schools in addressing food security remains underexplored. While the existing studies provide valuable insights into various food security-related programs within traditional school settings, the exploration of food security within the context of nature-based education is limited. Nature schools typically offer students immersive, outdoor experiences that connect them directly with the natural world, making them an ideal setting for exploring sustainability and food security. Nature-based learning environments have the potential to teach students about the full spectrum of food security issues, from the environmental challenges posed by climate change to the social and economic barriers that limit access to nutritious food. Given the growing interest in nature-based education and the increasing importance of sustainability in food systems, further investigation into how food security is addressed in nature schools is both necessary and timely. This study aims to address this gap by exploring how research-based learning, integrated within a culinary festival as a school-wide dissemination activity at Kahuripan Ecology Elementary School, enhances students' awareness and understanding of food security. By integrating this approach within a culturally relevant and experiential activity such as a culinary festival, the study highlights how nature schools can foster students' awareness of food security.

2. Literature Review

2.1. Culinary Festival in Nature School

The "nature school" educational approach integrates the natural environment directly into its teaching framework, promoting a deep connection between students and nature. This model encourages outdoor learning activities designed to foster environmental awareness and cultivate a greater understanding of the world around them (Mann et al., 2022). The nature school approach shares similarities with other nature-based educational paradigms, such as forest schools (Cudworth & Lumber, 2021), outdoor schools (Largo-Wight et al., 2018), and nature-based environmental education programs (Collado et al., 2020). At its core, this educational model emphasizes the use of natural resources within the school setting, not only as a medium for teaching but also as the environment in which learning takes place.

One key element of this approach is the incorporation of research-based and evidence-based educational methodologies (e.g., Brew & Saunders, 2020; Sylvia & Hadiana, 2023). These frameworks guide students in problem-solving tasks, allowing them to engage with complex issues in a meaningful way. This approach extends beyond traditional experiential learning, including problem-based learning and contextual teaching strategies, where students actively apply relevant practices to real-world problems. Central to this is an inquiry-based learning model, which shifts the focus from

teacher-centered instruction to student-centered exploration. This method encourages students to take ownership of their learning through open-ended inquiry and research, cultivating complex learning experiences (Lower-Hoppe et al., 2021).

Within the context of nature schools, the concept of "culinary education" is also explored, though it lacks a precise, universally agreed-upon definition. Culinary education in nature schools is seen as a hands-on discipline that promotes practical learning in the kitchen, but it is also profoundly connected to the broader educational philosophy of the nature school model. In this context, culinary festivals in nature schools resemble the more structured programs seen in conventional schools, such as the Creativity, Activity, and Service (CAS) programs, which include field trips and community visits designed to support holistic student development (Jose & Mathai, 2021). However, culinary festivals in nature schools are distinctive in their emphasis on nature-based learning processes, using the outdoor environment as both a classroom and a resource (Mann et al., 2022; Otto & Pensini, 2017).

The outdoor nature of the culinary festival provides a platform for assessing students' learning, where they not only study and practice culinary skills but also engage with the natural world. The nature school model incorporates implicit learning (Cleeremans et al., 2019), where students absorb complex knowledge unconsciously from their environment, including the local community, playing a key role in their cognitive and social development. This holistic involvement encourages students to engage with their surroundings, further enriching their learning experiences. Despite the clear connection between nature-based learning and culinary festivals, limited evidence supports the effectiveness and structure of culinary festivals within the nature school framework. This lack of research is a primary concern of this study, which seeks to explore and better understand the implementation and impact of culinary festivals in nature schools. By examining how these festivals can be integrated into nature-based education, the study aims to provide a clearer framework for future educational practices and highlight the potential of combining culinary education with outdoor learning.

2.2. Foundation of Research-Based Learning

Students in nature schools engage in various physical activities and exploratory experiences designed to enhance learning within the natural environment. These activities include, but are not limited to, outdoor play, nature walks, gardening, and investigations into topics such as environmental pollution, natural habitats, recycling practices, and biodiversity (Barani, 2024; Cutter-Mackenzie et al., 2014; Wilson, 2007). By immersing students in these hands-on experiences, nature schools aim to foster a deeper connection to the environment, nurturing both cognitive and emotional growth.

The research-based approach integrated into nature schools further enriches the learning experience by encouraging inquiry and critical thinking. This framework supports a range of research initiatives that require the active involvement of school leaders, educators, and other stakeholders. The success of these initiatives depends on the school leadership's commitment to creating a research-oriented environment that prioritizes collaboration and continuous improvement in educational quality (Forssten Seiser & Portfelt, 2024). As a result, the research efforts not only deepen students' understanding of natural concepts but also contribute to a school culture that values evidence-based learning and innovation (Sylvia et al., 2024).

The benefits of engaging in nature-based activities extend beyond academic achievement, contributing significantly to the development of students' environmental attitudes and affective sensitivity toward living organisms (Genc et al., 2018). Research has also shown that spending time in nature improves students' mood, concentration, and self-discipline while also reducing physiological stress levels (Goldenberg, 2024). As students gain confidence in their abilities and feel more connected to the world around them, they develop attributes crucial for lifelong well-being,

including resilience and emotional intelligence (Schweitzer & Gionfra, 2018). In essence, nature schools not only foster academic growth but also nurture the holistic development of students, preparing them for future challenges in both academic and personal spheres.

2.3. Encouragement of Food Security Awareness

Food security refers to individuals having consistent, reliable access to safe, nutritious, and culturally appropriate food through physical, social, and economic means (FAO et al., 2024). This concept is built on four essential pillars: availability, accessibility, utilization, and stability. A lack in any of these areas can lead to food insecurity, affecting individuals' ability to meet their basic nutritional needs (FAO, 2009; Holloway et al., 2023). In educational contexts, various initiatives have been developed to address food insecurity and improve students' nutritional intake. These include school-based nutrition assistance programs (Burke et al., 2021), school lunch and breakfast programs (Forrestal et al., 2021), and food aid programs (Petralias et al., 2016). These programs aim to support students' physical and social development while alleviating the cognitive strain caused by inadequate nutrition. A well-nourished student is better equipped to retain critical information, facilitating long-term memory retention and academic success (Kennedy & Romig, 2021). Conversely, students struggling with hunger often face barriers to effective learning, affecting all areas of their education, including subjects related to food security.

To truly foster sustainable food practices, it is essential for students to have a thorough understanding of key concepts related to food, nutrition, and sustainability. Food literacy is crucial in this regard, as it helps students recognize the broader implications of their food choices on human health and the environment (Kelly & Nash, 2021; Ljungmann et al., 2019; Ruiz et al., 2019). Alongside food literacy, environmental education is also vital, as it imparts knowledge about natural resources, sustainable practices, and ecosystem health (Angelos et al., 2016). This interdisciplinary knowledge can be integrated into a specialized curriculum that combines nutrition and culinary arts, focusing on food security and students' overall well-being (Matias et al., 2021).

A particularly effective way to integrate these concepts is through experiential learning, where students engage in hands-on activities that connect classroom learning with real-world applications. In the context of culinary festivals, for example, students participate in activities that are deeply rooted in their local cultural and social contexts, which helps them understand the complexities of food security within those frameworks. These experiential approaches not only engage students with global challenges but also encourage them to address local community needs. In particular, targeted initiatives within schools have been shown to foster practical skills, such as reducing food waste, and to empower students to contribute to broader systemic changes in the food sector (Ahmed et al., 2018). Interestingly, while experiential learning is a well-established pedagogical approach, there is a noticeable gap in documented initiatives focused on food security within nature-based educational settings. This gap highlights the novelty and significance of exploring the potential for such programs in nature schools. Given the increasing relevance of food security in both local and global contexts, integrating food literacy and sustainability education within nature schools could offer valuable insights and create unique opportunities for students to develop a deeper, more actionable understanding of food security.

3. Methodology

To investigate the integration of research-based learning in the culinary festival at Kahuripan Ecology Elementary School, this study adopts an exploratory research design within a case study framework (Hardwick, 2017). The study was conducted from October to November 2023, aligning with the third phase of the exploration research model, which aims to understand phenomena in an open, non-controlled setting without predefined variables (Singh, 2021). This approach allows for a detailed exploration of the unique aspects of the learning environment at the school.

3.1. Case Selection

The case selection process was designed to offer a holistic understanding of the nature school model at Kahuripan Ecology Elementary School. Initially, the study focused on identifying key elements of the school's research-based learning practices, which form the foundation of its educational process. The research then narrowed its scope to examine the culinary festival, with particular attention to the involvement of school principals, teachers, and students. Finally, the study aimed to assess students' awareness of food security by comparing the learning activities and outcomes within the school.

3.2. Data Collection and Procedures

A combination of data collection methods was used, including observation, interviews, focused group discussion (FGD), document analysis, and questionnaires. Observations were conducted to examine the integration of research-based learning during the school's educational activities and the culinary festival. Interviews and FGD were designed to gather students' and teachers' perspectives on the learning activities, the relevance of the content, and the overall experience. Document analysis focused on reviewing teachers' lesson plans and other supporting materials.

The data collection process was initiated through coordination between the researchers, the principal, and teachers to clarify the research objectives, particularly regarding the integration of research-based learning and the promotion of food security within the nature school context. Following this, the researchers conducted site visits to Kahuripan Ecology Elementary School, located in West Java, Indonesia, to observe various educational activities and the implementation of the culinary festival. These visits were documented through detailed field notes that captured teaching practices and student engagement. Interviews were then conducted with the principal and selected teachers to explore the conceptual understanding and application of research-based learning. Supporting documentation, such as lesson plans and school documents, was also collected. During the culinary festival, researchers observed student involvement and program flow, while also conducting informal interviews with students to gauge their comprehension of food security themes. The festival itself was attended by approximately 360 students and 20 teachers, involving all grade levels in a school-wide celebration of local food culture and research-based learning outcomes. Questionnaires were also administered to students to support the triangulation of data. The data collection process concluded with an FGD involving principals, teachers, and students to gather multiple perspectives. In total, 60 students and six teachers were purposively selected to participate in in-depth interviews and FGD, representing diverse levels and roles in the research and festival activities.

3.3. Instrumentation

The primary goal of the data collection was to understand the meaning and impact of the culinary festival experience at Kahuripan Ecology Elementary School. To address this, the research employed several instruments: documents, interview guides, FGD protocols, and an observation checklist.

The interview guide was designed to explore the perspectives of school principals, teachers, and students on how research-based learning was implemented and how it contributed to students' awareness of food security. The FGD protocol was used to facilitate in-depth group discussions on students' experiences during culinary festival and their understanding of food-related learning. The observation checklist was applied to document learning activities, student engagement, and the integration of food security themes during the event. The development of these instruments was guided by relevant literature on experiential and inquiry-based learning, as well as the contextual characteristics of the nature school setting. All qualitative instrument were developed in alignment with the research focus and were validated through expert review to ensure clarity and contextual

relevance (Miles et al., 2014). A structured questionnaire consisting of 14 items was administered to students to assess their awareness and understanding of food security concepts. The Rasch Model approach was applied to analyze the questionnaire responses, ensuring high item reliability (0.96) and functional item metrics (Boone & Noltemeyer, 2017). Ethical approval for the study was granted by the Indonesian National Research and Innovation Agency, under reference number 670/KE.01/SK/10/202.

3.4. Data Analysis and Interpretation

The analysis of qualitative data followed the three-step process outlined by Miles et al. (2014): data condensation, data display, and conclusion drawing/verification. Data from observations, interviews, discussions, and documents were condensed to focus on the core aspects of the learning processes at the nature school and the culinary festival. This condensed data was then displayed in matrices based on research-based learning indicators such as inquiry-based learning, experiential learning, discovery learning, and problem-based learning. The coding procedures were conducted in three stages: initial coding based on emerging themes, focused coding to identify core strategies, and axial coding to examine relationships among themes. In the initial coding phase, descriptive codes such as “local ingredients,” “student-led cooking,” and “group preparation” were identified from interview and observation data. Focused coding then grouped these codes into broader categories like “research-based food exploration” and “experiential learning practices.” Finally, axial coding connected these categories to core findings such as “culinary festival as a culmination of research-based learning” and “enhancement of food security awareness through hands-on activities.” The data display also included detailed information on the scientific concepts introduced during the festival, as well as the various stages and levels of participation observed. To ensure the validity and consistency of the conclusions, the researchers continuously verified their findings against other collected data. This verification process was supported by direct observations before and during the culinary festival, providing a comprehensive view of the learning environment and the impact of the event on the students.

4. Results

This study investigated how the integration of research-based learning into the culinary festival activities at Kahuripan Ecology Elementary School enhanced students' understanding and awareness of food security within the context of a nature school environment. The study employed a combination of data collection methods—observations, interviews, FGD, document analysis, and questionnaires—to assess the effectiveness of the culinary festival in promoting food security awareness. Two key findings emerged from this process: the festival served as the culmination of research-based learning and effectively increased students' awareness of food security.

The first key conclusion that the culinary festival is a culmination of research-based learning is derived from the structured and purposeful design of the event. At Kahuripan Ecology Elementary School in Purwakarta Regency, West Java, Indonesia, the culinary festival plays a central role in celebrating food diversity by using locally sourced ingredients from the school's natural environment. Unlike conventional culinary festivals, which are often centered on tourism or culinary branding, this event is focused on promoting local food traditions, supporting food security, and celebrating regional culinary heritage. The festival is organized around booths where students from grades 1 through 6 collaborate to prepare dishes that showcase the local culinary identity of Purwakarta. The event follows a four-stage research process: (1) defining research objectives, (2) identifying local food ingredients and cuisines, (3) collecting data during festival activities, and (4) evaluating and monitoring the process. This process aligns with typical research stages, including problem identification, analysis, and dissemination.

The second key finding highlights the success of the festival in promoting food security awareness among students. During the first stage of the research process, students define the goals and motivations for their research, which are grounded in problem-based learning. This stage encourages students to consider food security issues and explore the rationale behind using sustainable, locally sourced materials in food production. In the second stage, students actively engage in identifying and exploring a variety of local food ingredients. They gather data through various means, including surveys, interviews with community members, and field studies. These activities contribute to food literacy and stimulate critical thinking about food systems at both local and global levels.

In the third stage, students apply the knowledge and skills they have acquired during their research by participating in the actual festival. This experiential learning phase allows students to transition from theory to practice by preparing and serving dishes based on the local ingredients they have researched. This stage emphasizes skills such as collaboration, communication, organization, and task management, which are crucial for real-world applications. Furthermore, the festival includes cultural performances and panel discussions focused on sustainability, which add a multidimensional dimension to the students' understanding of food security issues. These elements help students connect food security to broader themes such as cultural heritage and environmental responsibility.

The results derived from multiple data collection methods further confirm the effectiveness of this research-based learning approach. Student survey analysis using the Rasch Model indicated a strong level of food security awareness, with a mean measure of 3.91 and a person reliability of 0.81, reflecting consistent and meaningful responses across participants. Teachers reported that students engage in environmental observations and interactions with their communities, significantly contributing to their understanding of food security. The combination of these research-based activities—such as participating in food production, exploring local food systems, and engaging in cultural exhibitions—allowed students to deepen their understanding of food security challenges, both locally and globally. Furthermore, FGD and interviews with teachers revealed that the students' awareness of food security issues had increased through their involvement in the culinary festival, particularly through direct, hands-on experiences with local food production practices.

The findings from this study highlight the importance of integrating research-based learning and experiential activities into educational programs to foster a deeper understanding of complex issues such as food security. By using multiple forms of data, this study provides a comprehensive account of how the culinary festival functions not only as a practical learning activity but also as a holistic approach to strengthening food security awareness among students. The detailed Rasch output is summarized in Table 1.

Table 1. Result of Data Analysis of Students' Food Security Awareness

	Total Score	Count	Measure	Model Error	Infit		Outfit	
					MNSQ	ZSTD	MNSQ	ZSTD
Mean	49.50	14.00	3.91	.63	.99	.10	.96	.10
S.D.	4.70	.00	1.51	.17	.18	.60		.60
Max.	55.00	14.00	6.21	1.046	1.53	2.00		1.80
Miin.	25.00	14.00	-2.41	.46	.56	-		-1.60
Real Rmse .67		True Sd 1.35		Separation 2.01		Person Reliability .80		
Model Rmse .65		True Sd 1.36		Separation 2.07		Person Reliability .81		
S.E. Of Person Mean = .07								
Person Ram Score-To-Measure Correlation = .99								
Cronbach Alpha (Kr – 20) Person Ram Score “Test” Reliability = .86								

5. Discussion

The integration of research-based learning into the culinary festival at Kahuripan Ecology Elementary School exemplifies an innovative approach to teaching food security within a nature-based educational context. By combining research and experiential learning within a cultural event, the school has effectively leveraged the festival to raise students' awareness of food security, making the learning experience both relevant and engaging. This approach goes beyond conventional classroom instruction by emphasizing practical, hands-on learning that deepens students' understanding of food systems and sustainability.

The culinary festival offers a unique platform for students to connect with their local food systems. Through researching local ingredients, students engage in problem-based learning (Gijbels et al., 2019), which enables them to explore issues such as food security from both theoretical and practical perspectives. Their participation in identifying food sources, conducting field studies, and collaborating with community members aligns with research that highlights the positive effects of active, experiential learning on environmental literacy and food system awareness (Ahmed et al., 2018; De Leeuw, 2024). These activities not only foster a deeper understanding of food systems but also critical thinking about the intersections between food security, environmental sustainability, and cultural identity. Consequently, food literacy education is encouraged to be deeply contextualized, incorporating students' lived experiences, social values, and environmental awareness to support meaningful and sustainable engagement with food.

The festival also provides a platform for students to explore the social and cultural dimensions of food security. Through engaging with local culinary traditions, students are introduced to the importance of preserving local food heritage in the face of globalization. This aligns with the argument that re-localizing food systems—by promoting locally sourced ingredients and celebrating regional food traditions—can contribute to addressing global food security challenges (Pelletier et al., 1999). The inclusion of cultural performances and panel discussions on sustainability further enriches the event, offering a multidimensional perspective that emphasizes the interconnections among food security, culture, and community resilience. As Berry (2022) suggests, preserving local traditions in the context of food security not only safeguards cultural heritage but also supports the sustainability of food systems.

The collaborative nature of the event has been pivotal in its success. By involving teachers, students, parents, community institutions, and local leaders, the festival ensures that food security is a shared responsibility among all stakeholders. Collaboration, as noted by Huxham & Macdonald (1992), plays a critical role in raising awareness and fostering collective action toward addressing food security challenges. The involvement of diverse stakeholders contributes to a more comprehensive understanding of food security and its local implications. This collaborative model is also supported by Edge and Meyer (2019), who argue that collaboration enhances communication, facilitates knowledge-sharing, and promotes an inclusive understanding of food security.

In addition to its educational merits, the festival helps students to develop practical skills related to food production and sustainability. Through participating in self-reliance practices, students gain firsthand knowledge of the challenges associated with creating healthy, sustainable diets (Buruleanu et al., 2018). This approach aligns with the principles of inquiry-based and problem-based learning, which emphasize critical thinking, problem-solving, and innovation (Gijbels et al., 2019; Pedaste et al., 2015). The festival not only enhances students' cognitive development but also contributes to their personal growth by fostering a sense of responsibility and commitment to sustainable food practices. As Jelas et al. (2016) implied, cognitive engagement plays a significant role in predicting academic achievement and mediates the influence of various forms of learning support. Moreover, student engagement encompasses not only cognitive aspects, but also behavioral and affective

aspects, all of which shape how students participate in and benefit from learning experiences such as this festival.

Ultimately, the success of the culinary festival at Kahuripan Ecology Elementary School can be attributed to the integration of research-based learning, experiential activities, and collaborative engagement. This model is consistent with the findings of Assmann (2024), who underscores the value of a holistic, community-based approach to food security education. By bridging academic learning with real-world practice, the festival equips students with the skills and knowledge necessary to address food security issues, while also fostering agency and innovation in building more sustainable food systems. Through this nature-based learning model, students not only gain a deeper understanding of food security but also develop the values, competencies, and collaborative spirit essential for promoting sustainable food practices in their communities.

While the integration of research-based learning into the culinary festival at Kahuripan Ecology Elementary School yields significant educational benefits, several elements contribute to both its novelty and its limitations. A key innovation of this study lies in its focus on combining academic research with experiential learning in a non-traditional educational setting. The culinary festival provides a dynamic environment in which students engage with food security issues in a hands-on manner, allowing them to apply theoretical concepts to real-life contexts. This stands in contrast to conventional classroom methods and presents a novel perspective on how food security can be taught in nature-based schools. Additionally, the study highlights the importance of community involvement in food security education, enriching the learning experience by incorporating local cultural traditions and sustainability practices.

Nonetheless, there are several limitations that warrant consideration. Although the study employed a range of data collection methods—including observations, interviews, FGD, document analysis, and surveys—much of the evidence relies on self-reported data from teachers and students. While these insights are valuable, the subjective nature of self-reporting may introduce potential bias, particularly in assessing students' awareness and understanding of food security. Furthermore, the study was conducted within a single school in Purwakarta Regency, which may limit the generalizability of its findings. Different communities and schools may have varying resources, cultural contexts, and engagement levels with food security, potentially affecting the outcomes of similar initiatives elsewhere.

In addition, while the study clearly demonstrates the short-term effectiveness of research-based learning in enhancing food security awareness, it does not investigate the long-term impacts on students' attitudes or behaviors following the festival. Future research could examine whether the increased awareness leads to sustained changes in students' food-related choices or future involvement in sustainability initiatives. Expanding the scope of future studies to include broader stakeholder perspectives—such as parents, local leaders, and policymakers—could also provide a more comprehensive understanding of the societal impact of such educational programs.

In conclusion, while the study presents a novel and promising approach to food security education through research-based learning and cultural engagement, its limitation must be taken into account when interpreting the results. Further exploration of long-term outcomes, as well as comparative analysis across different educational and community contexts, will be essential in fully understanding the potential of this model to foster learning awareness and action toward food security.

6. Conclusion

Research-based nature schools, like Kahuripan Ecology Elementary School, employ innovative approaches to foster meaningful learning about food security. Central to this approach is the

integration of the school's natural environment, which provides a rich context for exploring sustainable food practices. The school's culinary festival plays a pivotal role by offering students a staged, research-based learning experience that nurtures inquiry and hands-on exploration of food security issues within their local setting.

Unlike conventional culinary festivals that primarily serve as a cultural or tourism showcases, the Kahuripan festival emphasizes the interconnectedness of food literacy, local food systems, and sustainability. Through activities such as ingredient research, field studies, cultural performances, and educational discussions, students deepen their understanding of food security while also strengthening their critical thinking and sense of community.

The festival's success also stems from the inclusive collaboration among various stakeholders—teachers, students, community members, and local leaders—who collectively engage in addressing food security. This collaborative spirit highlights the importance of viewing food security not merely as a school subject, but as a shared societal responsibility. As demonstrated in this study, educational initiatives grounded in research-based, experiential learning and community participation can empower students with the skills, values, and awareness necessary to contribute to more sustainable food systems in their communities.

7. Suggestion

Moving forward, future research should further examine the perspectives and experiences of the various stakeholders involved in research-based learning initiatives like the culinary festival at Kahuripan Ecology Elementary School. Exploring how teachers, students, parents, and community members engage with food security education can provide a more comprehensive understanding of its impact at the local level. Such investigations will strengthen the development of educational models that integrate theoretical learning with real-world, community-based practices, supporting more meaningful and contextually relevant approaches to food security education.

Declarations

Author Contributions. All authors have read and approved the published on the final version of the article.

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About the Contributor(s)

Deni Hadiana, is a senior researcher at Research Center for Education, Organization for Science and Humanities Research, National Research and Innovation Agency (BRIN). Field of Expertise in Educational Learning and Evaluation. Deni completed his doctoral education in Educational Research and Evaluation at the State University of Jakarta (2020). His current research interest includes educational learning and evaluation, science education, and STEM education.

Email: deni.hadiana@brin.go.id

ORCID: <https://orcid.org/0000-0002-6690-1587>

Ibnu Salman, is a junior researcher at Research Center for Education, National Research and Innovation Agency (BRIN). He is a graduate of the Postgraduate Program in Educational Research and Evaluation UNJ. He actively writes and is a reviewer in various global and national journals. His current research interests includes educational learning and evaluation, religious education, and character education.

Email: ibnu.salman@brin.go.id

ORCID: <https://orcid.org/0000-0001-8791-8372>

Novi Sylvia, is a junior researcher at Research Center for Education, National Research and Innovation Agency (BRIN) specializing in guidance and counseling, educational psychology, and language. She is currently pursuing a doctoral degree in Guidance and Counseling at the Indonesian Education University (UPI). Previously, she completed her master's degree in Educational Psychology (M.Ed.) at the University of New South Wales, Australia. Her research activities include studies focusing on ethno-pedagogy, research-based education, and learning innovation in guidance and counseling.

Email: novi.sylvia@brin.go.id

ORCID: <https://orcid.org/0000-0001-9807-8188>

Nur Alia, is a junior researcher at Research Center for Education, National Research and Innovation Agency (BRIN) with an educational background in psychology. She earned her BA and MA in Psychology from the State Islamic University (UIN) Syarif Hidayatullah Jakarta. Her research interests focus on psychology and religious education.

Email: nur.alia@brin.go.id

ORCID: <https://orcid.org/0000-0003-1101-7580>

Anggraeni Dian Permatasari, is a junior researcher at Research Center for Education, National Research and Innovation Agency (BRIN). She received her Master of Science (M.Sc.) from the Department of Chemistry, Universitas Gadjah Mada. Her current research interests include science education, STEM education, and educational technology.

Email: anggraeni.dian.permatasari@brin.go.id

ORCID: <https://orcid.org/0000-0002-1828-5556>

Handewi Purwati Saliem, is a principal researcher at the Research Center for Behavioral and Circular Economics, Research Organization of Governance, Economics and Public Welfare, National Research and Innovation Agency (BRIN). Field of Expertise in Natural Resources and Environmental Economics/Food and Nutrition Policy. In her field of expertise, she has done a lot of research and writing related to food policy, food security, and nutrition. She has produced 137 scientific papers written by herself and with other authors in the form of books, parts of books, journals, proceedings, and other papers.

Email: handewi.purwati.saliem@brin.go.id

ORCID: <https://orcid.org/0000-0001-5480-3624>

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