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RESEARCH ARTICLE

Integration of food literacy in language and literature learning through android-based media

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ABSTRACT
Food literacy is considered important in equipping students with knowledge, skills, and behavior related to healthy, nutritious, and sustainable food. However, many teenagers still do not care about food security issues. This research aims to describe the integration of food literacy in language and literature learning through the use of Android-based media. This research uses a qualitative descriptive method. The subjects in this research were 24 high school Indonesian language teachers on Bangkalan and class XI high school students. Data collection techniques were carried out using observation, in-depth interviews, documentation, and questionnaires. Data was analyzed through five phases, namely data management, data familiarization, generating initial codes, constructing themes/categories, and producing actionable findings. The research results show that 87.5% of Indonesian language teachers at the high school level have integrated food literacy in learning through informative and literary texts, such as procedural texts, observation reports, short stories, anecdotes, and poetry with the theme of local food. This integration not only improves students' language skills but also raises awareness of the importance of consuming healthy food and preserving local food. The use of Android-based media has proven effective in presenting multimodal material in the form of interactive text, audio, visuals, and infographics, thereby increasing student interest in learning and engagement. However, the implementation of food literacy learning faces challenges, including limited school facilities, time allocation, students' lack of interest in reading, and lack of parental support. Therefore, collaboration is needed between schools, teachers, parents, and other stakeholders to realize sustainable food literacy learning. This research confirms that the integration of food literacy in language and literature learning through Android-based media contributes to the development of life skills, ecological awareness, and food security in the younger generation.

Keywords: food literacy; language and literature learning; android-based media; food security.

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INTRODUCTION

Education in the 5.0 era requires students to possess not only cognitive competencies but also broader literacy skills, including food literacy. Food literacy is an individual's ability to understand, manage, and apply food-related information to make informed decisions regarding consumption patterns, nutrition, and environmental sustainability (Rosas et al., 2022). In an educational context, food literacy is crucial because it can shape a critical, healthy, and competitive generation, while also supporting government programs to improve national food security (Vaughan et al., 2024).

Learning Indonesian Language and Literature serves not only as a means of language acquisition but also as a vehicle for developing critical and creative thinking, as well as social and cultural awareness (Tao & Gao, 2022). By integrating food literacy into Indonesian Language and Literature learning, students not only hone language skills such as reading, writing, speaking, and listening, but also gain insight into the importance of food in everyday life. This aligns with the contextual learning paradigm, which presents material that is close to the students' realities.

The development of digital technology, particularly Android-based devices, opens up significant opportunities for creating interactive, engaging, and accessible learning media (Laseinde & Dada, 2024). Android-based media can be an innovative solution for integrating food literacy into language and literature learning, as it can present text, images, audio, and video that support deeper student understanding. Thus, integrating food literacy through Android-based media not only improves the quality of learning but also raises student awareness of the importance of healthy and sustainable food consumption patterns.

Based on this description, this research focuses on integrating food literacy into language and literature learning through the development of Android-based media. This research is expected to contribute to enriching innovative learning strategies that are relevant to the needs of students in the digital era while also supporting the improvement of literacy quality in Indonesia.

The Kurikulum Merdeka, currently implemented in Indonesia, provides teachers with more flexibility in designing project-based, contextual, and collaborative learning. This opens up significant opportunities to integrate food literacy into language and literature instruction, for example, through the analysis of narrative, descriptive, or poetic texts addressing food, culinary culture, and nutrition issues. However, its implementation remains challenging, including the availability of learning resources, teacher creativity, and the limited availability of media relevant to the needs of the digital generation.

The use of Android-based media is considered relevant given that the majority of secondary school students are already familiar with smartphones. Android-based educational applications allow for interactive, multimodal, and easily accessible presentation of materials, thereby increasing student engagement. Therefore, the integration of food literacy through Android-based media in language and literature learning provides a research context that not only aligns with the direction of national curriculum policy but also addresses the community's actual needs in increasing food awareness.

Literature reviews show that food literacy has become a global concern, particularly in relation to nutrition education and public health (Vidgen & Gallegos, 2014). Previous research has emphasized the importance of mastering food literacy in shaping healthy and sustainable consumption behaviors (Slater et al., 2018). In Indonesia, food literacy is still relatively new in formal education discourse, although several studies have linked nutritional literacy to improved academic achievement and quality of life for students.

Meanwhile, language and literature learning have great potential as a medium for integrating food literacy. Through literary texts, students can learn about culinary cultural values, local narratives related to food, and critical reflection on global food issues. Several previous studies have confirmed that a contextual approach to language learning can enhance student understanding while fostering character values.

Research on food literacy in education has been conducted; however, previous studies have only addressed food literacy education, the challenges and opportunities in implementing food literacy, barriers to food literacy learning, and the impact of the “reasurposing” learning model on food literacy (Dixon et al., 2023)(Anjasmorowati & Fathimah, 2023). Research on digital learning media has also been conducted, showing that Android-based media can improve student motivation and learning outcomes (Amil et al., 2023)(Utami & Rachmatia, 2023)(Laseinde & Dada, 2024). However, these studies did not specifically address food literacy learning media. This indicates that no research has yet specifically integrated Madurese food literacy into language and literature instruction through Android-based media. Based on previous research, the novelty of this study lies in the integration of local Madurese food into Indonesian language and literature learning texts through digital learning media. The objective of this study is to describe strategies for integrating food literacy into language and literature instruction through Android-based learning media.

METHOD

This research uses a descriptive qualitative approach. This approach was chosen because it aligns with the research objective, namely, to provide a detailed, in-depth, and natural description of the integration of food literacy into language and literature learning through Android-based media. The descriptive method focuses on depicting phenomena occurring in the field without manipulating variables or providing special treatment to research participants. Thus, this research allows researchers to understand how teachers integrate food literacy, how students respond, and how Android media can support the learning process.

Qualitative research aims to understand phenomena experienced by research subjects, such as behavior, perceptions, motivations, actions, and so on, holistically by describing them in words and language within a specific, natural context. Therefore, this research emphasizes an in-depth exploration of actual classroom learning practices.

This research was conducted at high schools on Bangkalan. These schools were selected based on their emphasis on literacy-based learning and the use of digital media in instruction. The research subjects included 1) Indonesian Language and Literature teachers, who served as facilitators and implementers of the Android-based learning program, comprising 24 teachers. They served as the primary informants for exploring how food literacy was integrated into language and literature learning, 2) the 11th-grade students, who participated in the learning program. They were selected because they were already familiar with using digital devices and were at a more mature stage of cognitive development to understand the relationship between food literacy and language and literature materials, and 3) Learning documents, such as Lesson Plans, teaching modules, Android-based media devices, and student work, were used as supporting data for analyzing the implementation of food literacy. The number of participants was determined using a purposive sampling technique, namely selecting informants who were considered to have the most understanding and relevance to the research focus.

Data Collection Technique

Participatory observation, namely direct observation of learning activities in the classroom with researchers involved in limited learning interactions. In-depth interviews, using semi-structured techniques with open questions so that participants can provide broad and detailed answers. Document analysis, by examining lesson plans, teaching modules, Android media, and student work to identify the extent to which food literacy is integrated in learning. Literacy learning questionnaire given to teachers.

In qualitative research, the main instrument is the researcher himself (human instrument). Researchers function as planners, implementers of data collection, analyzers, and interpreters of data. To support the validity and completeness of the data, auxiliary instruments are also used in the form of 1) Interview guide for teachers and students, which includes a list of open-ended questions related to their experiences, strategies, obstacles and understanding of food literacy, 2) Observation sheet which functions to record teacher and student activities during the lesson. Observations focused on classroom interactions, use of Android media, and student involvement in food literacy activities, 3) Document analysis guide, which is used to examine learning tools (RPP, modules, Android media, student work), 4) Field notes, as reflective documentation from researchers regarding phenomena that occur outside formal guidelines, and 5) Questionnaire sheet containing questions related to food literacy in the Indonesian language learning.

Bingham (2023) proposes a qualitative data analysis process consisting of five main phases 1) Data Management: The activities carried out are as follows (a) develop a data storage system (recordings of teacher and student interviews); (b) Interview transcription (Class observation); (c) organizing documents and artifacts (student assignments, Android media responses, observation notes, with the results in the form of written artifacts, namely essays, journals); (d) Providing identification labels (Pre-post questionnaire on food literacy). 2) Data Familiarization: (a) Rereading transcriptions, observations, student assignments (Textual data: transcripts, observation notes, student comments in Android; initial quantitative data from questionnaires on food literacy); (b) Compare Android media logs to what students report; and (c) mark interesting points, inconsistencies, and early patterns. 3) Generating Initial Codes: (a) developing codes from data, both deductively (based on food literacy theory, language & literary literacy) and inductively (emerging from data); (b) codes for food literacy components (for example: nutritional knowledge, choosing local food, cooking skills, food ethics), as well as language/literary aspects (vocabulary, cultural expressions, descriptive texts). 4) Construction Themes / Categories:
(a) Grouping codes into larger themes; (b) connecting themes with research questions (how is food literacy integrated, how Android media facilitates, challenges, and successes). 5) Producing Actionable Findings: (a) Prepare conclusions & recommendations based on themes; (b) present findings to stakeholders (teachers, media developers, policy makers); (c) determine practical implications for teaching language & literature & food literacy; and (4) reflection on research limitations and suggestions for improvements.

RESULTS AND DISCUSSION

The Importance of Food Literacy in Education

Literacy is a crucial foundation for building national resilience and shaping a globally competitive generation. Literacy is not merely the ability to read and write, but rather a life skill that demands critical thinking, reasoning, and innovation. Because of the crucial role of literacy as a fundamental skill for individuals to participate in society and address social and global issues, literacy competencies need to be developed in advanced literacy programs. Complex and urgent social and international issues to address include food security, malnutrition, climate change, and food waste. This highlights the crucial role of food literacy in the lives of individuals, particularly students.

The term food literacy describes everyday practices related to food systems, healthy eating patterns, and regular food intake (Truman et al., 2017; Thomas et al., 2019). Gillic et al. (2025) define food literacy as knowledge, skills, and behaviors about food. In addition, food literacy is an individual's ability to plan, manage a budget, and prepare food with available resources. Through food literacy competencies, an individual is equipped with the ability to overcome food crises (Sumner, 2024). This shows that the food literacy framework includes a healthy food system and easy access to nutritious food.

In the Indonesian Education Curriculum, literacy-based learning is the foundation for achieving graduate profile dimensions and national education goals. Likewise, food literacy needs to be taught as part of literacy competencies. This is in line with the opinion of Bereznay et al. (2019) that knowledge about food literacy can be learned through life experiences and education. In education, food literacy plays a strategic role as part of the development of comprehensive life skills for students. Food literacy education not only teaches nutritional knowledge but also trains skills in selecting, preparing, and consuming food consciously, healthily, and sustainably. According to Elsborg et al. (2022), food literacy learning in schools is defined by five competencies: knowing (food-related knowledge), doing (cooking skills), feeling, caring (concern about food issues), and wanting (willingness to take a stance and act in selecting and processing food).

Integrating food literacy into education helps students develop critical thinking and practical skills such as reading food labels, understanding the impact of food choices on health and the environment, and appreciating the role of farmers and the food production process. Introducing the concept of mindful eating, which involves eating with full attention and awareness, can strengthen the emotional and ecological connection between individuals and the food they consume, thus creating healthier and more responsible eating habits.

Research Ronto et al. (2017) indicates that high school environments are ideal for teaching food literacy to adolescents.

Food literacy learning in schools will help adolescents develop life skills related to food and enhance their role as agents of change in healthy eating behavior and consuming local foods at home and in the community. This is in line with the opinion Bereznay et al. (2019), Dallant et al (2024) that food literacy is the ability to make decisions that support personal health and a sustainable food system by considering environmental, social, economic, cultural, and political components. Through food literacy learning, students can gain knowledge about healthy and nutritious foods, choose foods, and develop skills in processing local foods, thereby helping to mitigate the food crisis.

Furthermore, food literacy in education can contribute to character development, consumption ethics, and social awareness. Food literacy education broadens students' insights into local food diversity, cultural values, and the importance of preserving natural resources for future generations (Sumner, 2024; Schaafsma et al, 2025). This aligns with 21st-century educational goals, which emphasize sustainability, life skills, and ecological awareness. Food literacy in education is a crucial foundation for developing a healthy, conscious, and responsible young generation regarding their food consumption patterns. Therefore, food literacy education integrated into the formal curriculum needs to be continuously developed to address the challenges of global food security and build a sustainable quality of life.

Integration of Food Literacy in Language and Literature Learning

Language and literature learning focuses not only on mastering language skills and appreciating literary works, but also as a medium for strengthening broader literacy, including food literacy. Integrating food literacy into language and literature learning is an innovative approach that combines the development of linguistic competence with a critical understanding of food issues related to health, culture, and the environment. Food literacy focuses not only on knowledge about food and its nutrition but also involves awareness of the social, cultural, and sustainable meanings of food consumption. Therefore, integrating food literacy into language and literature learning presents an opportunity to enrich students' learning experiences so that they not only become proficient in the language but also become individuals who are aware of and concerned about the broad impacts of food issues.

Language and literature learning emphasizes listening, reading, writing, and speaking skills, as well as the appreciation of literary works that reflect cultural values and aesthetic expression. Integrating food literacy into language and literature learning can be achieved by providing contextual and meaningful texts with local food themes. Students engage in learning activities such as listening, reading, speaking, and writing about local foods and their processing methods. This aligns with the opinion (Ubbes et al., 2024) that food literacy skills are learned through reading, writing, and speaking about food.

Based on a questionnaire administered to 24 high school Indonesian language teachers on Madura Island, Indonesia, 21 teachers (87.5%) have integrated food literacy into their language and literature lessons. Meanwhile, three other teachers (12.5%) have never integrated food literacy into their language and literature lessons. The results of the questionnaire can be seen in the following figure.

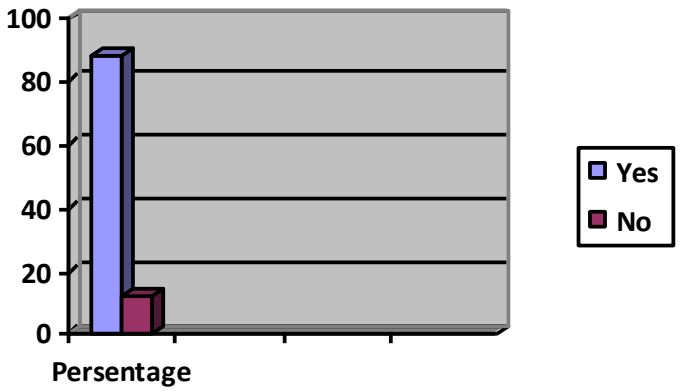


Figure 1. Number of Teachers Integrating Food Literacy (Sources: Questionnaire Result)

Figure 1 indicated that teachers were enthusiastic about providing reading materials with local food content. This is supported by research (Aydin et al., 2022), which found that teachers believe in the importance of food literacy learning and are increasing the time allocated for it.

Based on an analysis of high school curriculum documents in Indonesia, language and literature instruction, specifically Indonesian, comprises 20 texts that students must study. These texts are divided into informative or nonfiction texts and literary texts. Details of the informative and literary texts that can integrate local food are shown in table 1.

Literacy	Text Type
Informative text	Observation Reports, Negotiations, Biographies, Argumentation, Persuasion, News, Scientific Works, Descriptions, Procedures

Literary text	Anecdotes, Short Stories, Poetry, Drama, Local Wisdom Narratives

Table 1. Integration of Local Food in Indonesian Texts (Sources:Curriculum Document)

The analysis was supported by interviews with Indonesian language teachers in 18 high schools across four districts on Madura Island, who found that teachers integrated food literacy into nonfiction and fiction or literary texts. In nonfiction, teachers used procedural texts, argumentative texts, observational reports, scientific papers, posters, and news reports. Meanwhile, food literacy was integrated into literary texts in short stories and anecdotes with local Madurese food themes.

> *"Integrating food literacy into the Observation Report Text material by conducting observations about healthy food processing, then making a written report about the results of their observations"* (Teacher 18)
> *"Using the strategy of digging up information on the internet regarding local Madurese food to be re-arranged into observation report texts, procedural texts, articles"* (Teacher 13)
> *"Integration of complex procedural material and observational results. Students process the stages or steps of food processing, then observe the steps or methods involved in the process"* (Teacher 9)

The strategies employed by teachers can provide knowledge and skills about local foods and how to process them. This aligns with research findings (Kurt et al., 2022) that food literacy learning can be effective in increasing students' awareness of food selection, understanding of food origins, prevention, and food preparation.

Furthermore, in language and literature learning, teachers can utilize the school canteen as a learning resource. This was done by 12 Indonesian language teachers who were respondents in this study. The school canteen was used as a learning resource in teaching writing procedural texts, observational reports, scientific papers, negotiation texts, and poetry. This is in line with the opinion (Ronto et al., 2017) that food literacy skills can be developed through learning in the school canteen. In skills competency, food literacy requires contextual learning media or resources. By utilizing the school canteen as a learning environment, students can learn to make healthy food choices and learn to prepare food.

Food literacy can be integrated into the school curriculum, manifested in the organization of learning, particularly those related to language and literature. Learning organization related to food literacy can be developed through intracurricular, co-curricular, and extracurricular activities. Fifty-eight percent of respondents stated that food literacy can be developed through intracurricular activities, 58.3% chose co-curricular programs, and 41.7% chose extracurricular programs. This indicates that food literacy can be integrated into all three learning programs: intracurricular, co-curricular, and extracurricular. These results can be seen in Figure 2.

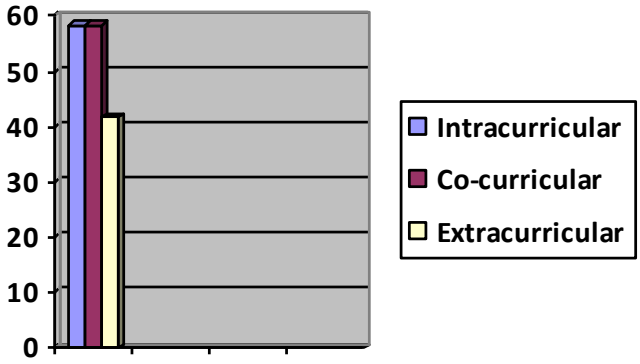


Figure 2. Food Literacy Development Program in Language and Literature Learning

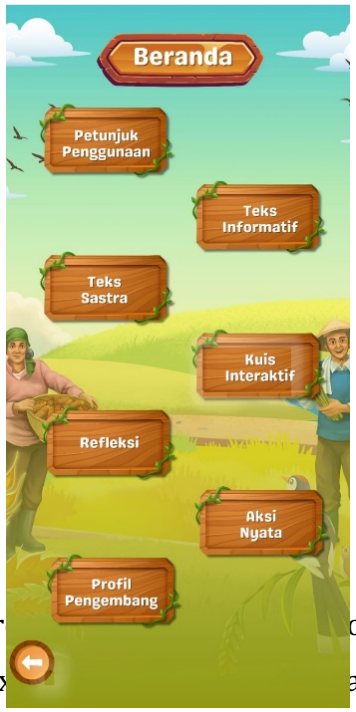
In intracurricular programs, food literacy can be achieved through language and literature learning, providing texts on local food topics using an in-depth learning approach, namely understanding, applying, and reflecting. In co-curricular programs, food literacy can be implemented through learning projects on local food topics and book reviews on local food and cuisine. In extracurricular programs, schools can create journalism programs on local food and cuisine, as well as create reading and writing communities about local food and cuisine.

Android-Based Media as a Food Literacy Learning Medium

Developing food literacy competencies requires the use of technology to meet students' needs and interests. Food literacy learning media is needed to help individuals develop critical thinking skills that can influence healthy eating behaviors (Nelson et al., 2020). Research results (Nurhasanah et al., 2023) indicate that the food literacy learning process requires game applications. One of the most popular and easily accessible media is Android-based applications. With widespread smartphone penetration, Android applications offer an interactive, easy-to-use platform that supports independent learning anytime and anywhere (Wibawa et al., 2023) (Bernacki et al., 2020)(Kayati & Farahiba, 2022).

Food literacy media contains food-themed texts to develop food literacy components, namely knowledge, skills, and behaviors about food (Palumbo et al., 2019). The knowledge component is provided in the form of an understanding of local food, food issues, and food processing presented in the form of informational texts and literary texts. In addition, students are also given quizzes to measure the level of understanding of the content of the texts read. The skills component is provided in the form of a real action menu containing an invitation to process local food ingredients into modern foods that are of interest to students.

The behavior component is taught in the form of a reflection menu that invites students to reflect on behaviors that demonstrate attitudes about choosing local food, local food processing, and the role in overcoming the food crisis that have been applied in everyday life. The interface of the Android-based food literacy learning media is shown in Figure 3 below.



Food literacy texts are pr or multimodal texts, namely written text, audio text, audiovisual tex aphics (Kress & Bezemer, 2023) (Li, 2020) (Kilby & Lennon, 2021). The purpose of presenting texts in multimodal form is to increase student engagement and motivation in reading and viewing food-themed texts (Kaowiwattanakul, 2025). In addition, students can more easily understand the content of the reading and gain meaningful learning (Twiner et al., 2021). The appearance and types of multimodal text presented in the lesson can be seen in Figure 4.

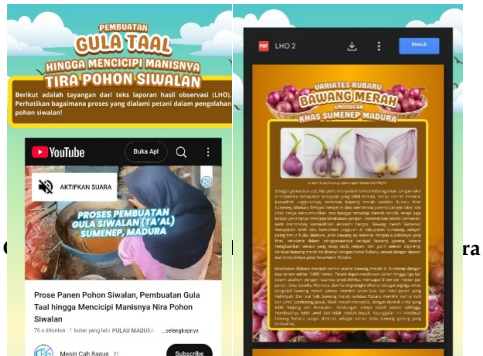


Figure 4. Multimodal Texts Display

Learning activities in food literacy media are presented using an in-depth learning approach in accordance with the approach applicable in the Indonesian National Curriculum. The learning experience consists of understanding, applying, and reflecting (McPhail, 2021). This aims to provide students with an understanding of local food, healthy food, and nutrition. The application learning experience aims to provide students with skills in processing local food into healthy and delicious meals. The reflection learning experience aims to provide students with food literacy behaviors, namely being able to choose healthy food, process food independently, and care about global food issues. The content presented in food literacy is food that is contextually relevant to the target students, namely, local Madurese food content. Local Madurese foods integrated into the Android-based media include tuber crops, such as cassava and sweet potatoes; fruits, such as snake fruit, water apple, and mango; Madurese spices; and Madurese corn.

Challenges of Food Literacy Implementation

Based on interviews with high school Indonesian language teachers on Bangkalan, Madura, the implementation of food literacy faces several challenges. The main challenge is inadequate resources. This is relevant to research findings (Malan et al., 2020) that identified challenges to food literacy as including the physical food environment, confusing information, limited capacity and resources, and social tensions.

The challenges of implementing food literacy at the high school level in Bangkalan are outlined in the following table.

Aspect	Challenges Faced
Students	Lack of interest in reading Lack of awareness of the importance of food literacy Students still prefer fast food
Facilities and Resources	Lack of facilities that support food literacy, such as canteens and school parks or gardens.

	Lack of availability of food literacy books.
Time Allocation	Time allocation for literacy learning is still insufficient
Teacher professionalism	Inadequate teacher skills in designing interesting food literacy learning
Parents	Lack of parental knowledge and support regarding local food consumption

Table 2. Challenges of Food Literacy Implementation (Sources: Questionnaire Result)

Based on table 2, the biggest challenges are student factors and resources. For students, one of the biggest obstacles is their lack of interest in reading food literacy materials. Many students don't yet realize the importance of understanding food literacy, thus lacking motivation to learn and implement healthy eating habits. Furthermore, the tendency to prefer fast food, which is convenient and delicious but lacking in nutrition, remains very prevalent among students.

In terms of resources, schools still face many limitations in providing adequate supporting facilities. For example, school canteens do not offer many healthy food options based on local ingredients that support food literacy learning. The availability of school gardens or parks as learning resources about local food sources is also very limited. Furthermore, the availability of books and reading materials specifically for food literacy that are easily accessible and engaging for students is still very limited, hindering the comprehensive learning process.

Learning time also poses a significant challenge. Within the school curriculum, dedicated time allocated for food literacy learning is still very limited. This often results in food literacy material being only a small part of a broader lesson, resulting in less than optimal learning coverage and depth. This time constraint requires teachers to find efficient and effective teaching methods to optimally convey the material. Teacher professionalism is also a crucial factor in the successful implementation of food literacy. Many teachers still lack the specific skills and competencies needed to design engaging and applicable food literacy lessons.

The role of parents is equally important, but it often acts as a barrier. Many parents lack adequate knowledge about the importance of consuming healthy and nutritious local foods. A lack of parental support in promoting and teaching healthy eating habits at home makes food literacy efforts in schools less than optimal. Collaboration or learning partnerships between schools and parents through appropriate education are essential for food literacy learning to continue within the family environment.

CONCLUSION

Food literacy is an important component of education because it equips students with the knowledge, skills, and attitudes necessary to make informed food choices, prepare local foods in accordance with available resources, and apply sustainable food consumption practices in their daily lives. Integrating food literacy into language and literature instruction provides an opportunity to develop students' listening, speaking, reading, and writing competencies through contextual materials related to local foods and food sustainability. This integration can be implemented through various genres of informative and literary texts, such as procedural texts, observation reports, argumentative texts, scientific papers, short stories, anecdotes, poetry, plays, and narratives of local wisdom. In practical terms, the findings of this study have implications for the future development of the Indonesian language curriculum, particularly in integrating knowledge of local foods, food security, and sustainability issues into learning outcomes, instructional materials, and learning activities. Food literacy can also be systematically integrated into intracurricular, cocurricular, and extracurricular programs to provide meaningful learning experiences for students through the interconnection between language and literary competencies in real-life contexts.

The findings of this study underscore the need to develop engaging and interactive digital learning media, particularly Android-based applications that incorporate multimodal content, such as written material, audio, video, and interactive assessments. Such media must be designed to support the diverse learning needs of students, encourage active participation, and facilitate contextual food literacy learning, both inside and outside the classroom. The design of digital learning media must also consider aspects of accessibility, ease of use, relevance to students' daily experiences, and the integration of local cultural knowledge. However, the successful implementation of these learning media requires collaboration among schools, teachers, parents, and various other stakeholders to address challenges related to limited learning resources, students' reading interest and food awareness, teachers' digital and pedagogical competencies, and parental involvement.

Future curriculum development for Indonesian language courses needs to adopt an interdisciplinary approach that is responsive to local culture, by incorporating food literacy as an integral dimension of language and literature instruction. These implications serve as the foundation for the development of innovative language curricula and digital learning materials, which not only strengthen students' language and literary competencies but also foster food-conscious behavior, an appreciation for local food culture, and an awareness of the importance of sustainable food security.

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DECLARATIONS

Use of artificial intelligence (AI)

This article was edited with the help of the DeepL translator.

Conflict of Interest

The authors declare no conflicts of interest.

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