Journal of Engineering Science and Technology
Special Issue on ISCoE2024 Vol. 20 No. 4 (2025) 119 - 126
© School of Engineering, Taylor's University

ENHANCING FOOD LITERACY AND SUSTAINABLE CONSUMPTION THROUGH AN INTERACTIVE E-BOOK FOR ELEMENTARY STUDENTS FOR SUPPORTING SUSTAINABLE DEVELOPMENT GOALS (SDGS)

HANA SAKURA PUTU ARGA, S. SAPRIYA*, NANA SUPRIATNA

Universitas Pendidikan Indonesia, Bandung, Indonesia
*Corresponding Author: sapriya@upi.edu

Abstract

This study developed an e-book learning media to improve food literacy and promote sustainable consumption among elementary school students, addressing the lack of interactive digital tools in nutrition education. This study is for integrating nutrition knowledge with environmental awareness. A design-based research (DBR) approach was applied through analysis, design, development, and evaluation stages. Expert validation rated the e-book as feasible in terms of content, presentation, language, visuals, and interactivity. A limited trial with 33 students showed an N-Gain of 0.28 (moderate), indicating improved food literacy. This improvement occurred because the e-book provided interactive features such as quizzes, journals, and project-based activities, fostering active learning and responsible consumption behaviours. The study offers a scalable model for integrating nutrition education and sustainability, supporting sustainable development goals (SDGs) no 12 and enhancing 21st-century skills in elementary education.

Keywords: E-Book, Food literacy, Learning media, Learning technology innovation, Sustainable consumption.

1. Introduction

Food literacy is crucial in elementary education to address students' low awareness of healthy and sustainable food choices [1, 2]. Without proper education, this gap can lead to health issues, food waste, and hinder sustainable consumption goals [3-9]. Food literacy is important since it supports current issues in the sustainable development goals (SDGs), as reported elsewhere [10-14]. Food literacy involves not only recognizing food types but also understanding nutrition, interpreting labels, and fostering responsible consumption behaviors [15-17]. However, conventional learning methods often fail to integrate digital media, limiting the depth of food literacy education.

Table 1 explains previous research on e-books and sustainable consumption, showing their potential to improve nutrition knowledge, digital engagement, and environmental awareness [18-22]. This study aims to develop an e-book integrating food literacy and sustainability using a Design-Based Research (DBR) approach. The novelties of this study are: (i) integrating food literacy with sustainable consumption in elementary education; (ii) creating accessible digital media that strengthens nutrition understanding and environmental awareness; and (iii) connecting nutrition concepts with environmental impacts, supporting SDG 12.

Table 1. Review of previous research on food literacy, e-book, and sustainable consumption.

No.	Title	References
1	Food-focused advertising literacy can increase nutrition knowledge in elementary school students.	[18]
2	Food literacy education during nutrition counselling for patients with diabetes: In-depth interviews with registered dietitians/registered dietitians nutritionists.	[19]
3	The case for e-book literacy: Undergraduate students' experience with e-books for curse work.	[20]
4	The SDG accelerator: Circular economy solutions through efficient sustainable consumption.	[21]
5	The parent advantage in fostering children's e-book comprehension.	[22]

2. Literature Review

Figure 1 explains the e-book workflow, starting from access via devices (mobile, tablet, laptop), navigation through interactive food literacy content, completing practical tasks, and submitting documentation through a learning platform for teacher feedback [23]. Many reports regarding e-books have been well-documented [24, 25]. This flow supports active learning and real-time engagement. E-books combine visual and narrative content, making nutrition education more engaging and accessible [26]. They enable students to explore balanced nutrition, healthy food choices, and sustainable consumption, fostering critical thinking and digital literacy [27]. Food literacy is essential for students to understand nutrition, interpret food labels, and make sustainable choices. Integrating food literacy with digital tools like e-books supports health education and promotes environmentally responsible behaviors, aligning with SDG 12 [28].

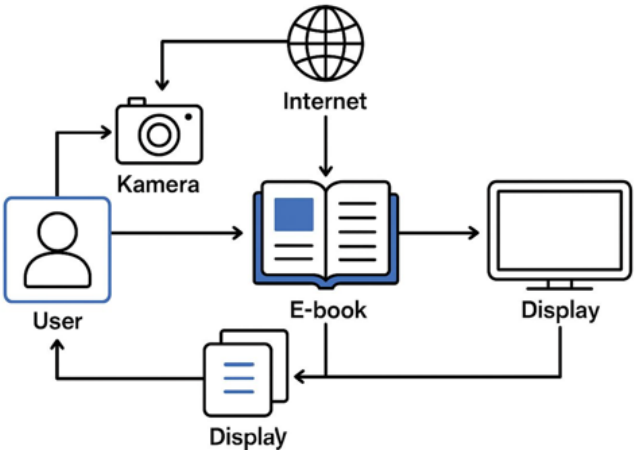

Fig. 1. E-book Workflow.

3. Method

This study applied a DBR method comprising four stages: analysis, design, development, and evaluation. Detailed information regarding this method is reported elsewhere [29]. The analysis phase identified the needs of students and teachers regarding food literacy and the necessity for engaging digital learning media. The design phase focused on developing the e-book structure, integrating nutrition and sustainable consumption content. During the development and evaluation stages, the e-book was validated by experts in food science, elementary education, and educational technology to ensure content quality, presentation, interactivity, and usability. A limited trial involving 33 elementary students was conducted, using assessment instruments to evaluate the effectiveness of the e-book in enhancing food literacy and promoting sustainable consumption.

4. Results and Discussion

Figure 2 explains the e-book development process, which began with needs analysis, followed by content planning, material collection, interactive design, expert validation, and revision. This ensured the e-book addressed student gaps in nutrition knowledge and sustainable consumption [30].

Figure 3 explains the e-book interface, presenting narrative and visual content on balanced nutrition, healthy eating habits, local food choices, and food waste management. Features like quizzes, food journals, and project-based activities enhanced student engagement and practical learning [31]. The feasibility test, validated by experts in education, food literacy, and technology, rated the e-book as feasible across content, presentation, language, visual design, interactivity, and food literacy support [32]. Trial results showed an N-Gain of 0.28 (moderate), indicating improved food literacy. This occurred because the e-book's interactive design fostered active learning and responsible consumption behaviors [33].

These findings align with prior studies showing e-books enhance digital engagement and critical thinking in nutrition education. The integration of food literacy with sustainability themes supports SDG 12, promoting environmental

responsibility from an early age. Finally, this study adds new information, especially relating to food science and technology and its education, as reported elsewhere [34-38].

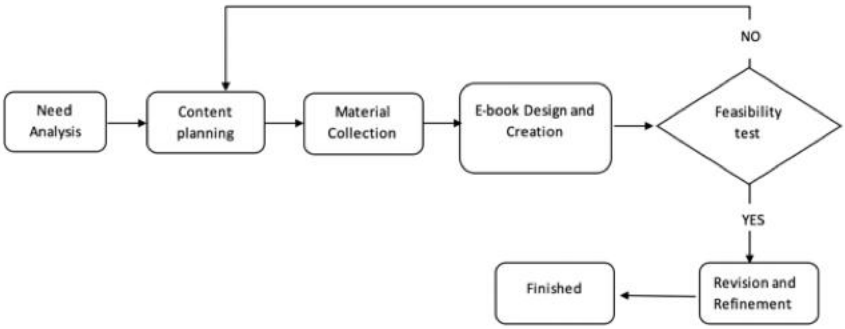

Fig. 2 E-book Media Development flowchart.

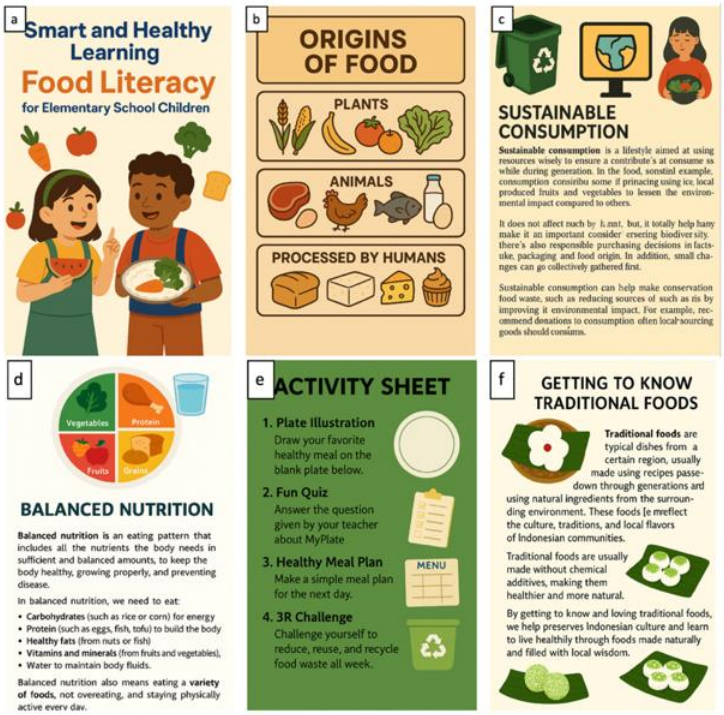

Fig. 3 Display of e-book development results: (a) E-book cover, (b) Content on food origins, (c) Content on sustainable consumption, (d) Content on balanced nutrition, (e) Student activities, (f) Content on introducing traditional foods.

5. Conclusions

This study successfully developed an e-book learning media to improve food literacy and promote sustainable consumption among elementary school students. Expert validation rated the e-book as feasible across content, presentation, language, visuals, interactivity, and food literacy support. Trial results showed a moderate increase (N-Gain of 0.28) in students' food literacy because the e-book's interactive features fostered active engagement and responsible consumption behaviours. This media offers a scalable solution for integrating nutrition education with sustainability, supporting SDG 12 and enhancing 21st-century skills in elementary education.

References

1. McManus, S.; and Pendergast, D. (2025). Exploring the intersection of food literacy and consumer research: A review, conceptualisation, and agenda for sustainability-focused research. *Food Quality and Preference*, 126(2), 105429.
2. Charlebois, S.; Music, J.; and Faires, S. (2021). The impact of COVID-19 on Canada's food literacy: Results of a cross-national survey. *International Journal of Environmental Research and Public Health*, 18(10), 5485.
3. Murakami, K.; Shinozaki, N.; Livingstone, M.B.E.; Masayasu, S.; and Sasaki, S. (2025). Food literacy and eating motivation in relation to diet quality and general and abdominal obesity: A cross-sectional study. *Appetite*, 209(1), 107968.
4. Magalhães, P.; Vilas, C.; Pereira, B.; Silva, C.; Oliveira, H.; Aguiar, C.; and Rosário, P. (2022). Children's perceived barriers to a healthy diet: The influence of child and community-related factors. *International Journal of Environmental Research and Public Health*, 19(4), 2069.
5. Jones-Garcia, E.; Bakalis, S.; and Flintham, M. (2022). Consumer behaviour and food waste: Understanding and mitigating waste with a technology probe. *Foods*, 11(14), 1-31.
6. Janssens, K.; Lambrechts, W.; and van Osch, A. (2019). How consumer behavior in daily food provisioning affects food waste at household level. *Foods*, 8(10), 428.
7. Tseng, M.L.; Lin, C.W.R.; Sujanto, R.Y.; Lim, M.K.; and Bui, T.D. (2021). Assessing sustainable consumption in packaged food in Indonesia: Corporate communication drives consumer perception and behavior. *Sustainability*, 13(14), 8021.
8. Kamilah, N.N.; and Nandiyanto, A.B.D. (2024). Balanced eating between food and healthy food for better nutritional needs. *Indonesian Journal of Educational Research and Technology*, 4(1), 1-8.
9. Rana, Z.A.; Ahsan, M.; Ali, M.; Atif, A.; and Uzair, M. (2022). Food preferences and nutritional status: Insights on nutrition transition in university community. *Indonesian Journal of Multidiciplinary Research*, 2(1), 169-178.
10. Nurramadhani, A.; Riandi, R.; Permanasari, A.; and Suwarma, I.R. (2024). Low-carbon food consumption for solving climate change mitigation: Literature review with bibliometric and simple calculation application for cultivating sustainability consciousness in facing sustainable development goals (SDGs). *Indonesian Journal of Science and Technology*, 9(2), 261-286.
11. Rahmah, F.A.; Nurlaela, N.; Anugrah, R.; and Putri, Y.A.R. (2024). Safe food treatment technology: The key to realizing the sustainable development goals

(SDGs) zero hunger and optimal health. *ASEAN Journal of Agricultural and Food Engineering*, 3(1), 57-66.

12. Nurnabila, A.T.; Basnur, J.; Rismayani, R.; Ramadhani, S.; and Zulhilmi, Z. (2023). Analysis of the application of mediterranean diet patterns on sustainability to support the achievement of sustainable development goals (SDGs): Zero hunger, good health and well beings, responsible consumption, and production. *ASEAN Journal of Agricultural and Food Engineering*, 2(2), 105-112.
13. Siahaan, H.N.; Putra, H.S.; and Hasibuan, M.F.A. (2023). Utilization of coffee commodity agricultural waste through partnership towards sustainable production and consumption. *Jurnal Biologi Tropis*, 23(2), 230-236.
14. Maulana, I.; Asran, M.A.; and Ash-Habi, R.M. (2023). Implementation of sustainable development goals (SDGs) no. 12: Responsible production and consumption by optimizing lemon commodities and community empowerment to reduce household waste. *ASEAN Journal of Community Service and Education*, 2(2), 141-146.
15. Schaafsma, H.N.; Caruso, O.T.; McEachern, L.W.; Seabrook, J.A.; and Gilliland, J.A. (2025). Understanding food literacy intervention effectiveness: Postsecondary students' perspectives on how a mHealth food literacy intervention impacted their dietary behaviors. *Journal of Nutrition Education and Behavior*, 57(4), 304-315.
16. Langdon, C.; Cammer, A.; Dobson, R.; and Lieffers, J.R.L. (2025). Experiences and perspectives of Canadian dietetic educators regarding food literacy and its incorporation into undergraduate dietetics programs. *Journal of Nutrition Education and Behavior*, 57(1), 29-39.
17. Sneed, C.; Sweet, C.; Anderson-Steeves, B.; Franck, K.; Salie, J.; Ward, J.; and Johnson, K. (2024). Smart choices start here: Engaging small food retailers and consumers through shop smart tennessee. *Journal of Nutrition Education and Behavior*, 56(8), S75.
18. Nelson, M.R.; and Kehr, D.P. (2016). Food-focused advertising literacy can increase nutrition knowledge in elementary school students. *Journal of Nutrition Education and Behavior*, 48(10), 749-751.
19. Lee, S.Y.; Renner, S.; Kovacic, M.B.; and Lee, R. (2022). Food literacy education during nutrition counseling for patients with diabetes: In-depth interviews with registered dietitians/registered dietitians nutritionists. *Current Developments in Nutrition*, 6(1), 848.
20. Muir, L.; and Hawes, G. (2013). The case for e-book literacy: Undergraduate students' experience with e-books for course work. *The Journal of Academic Librarianship*, 39(3), 260-274.
21. Khajuria, A.; Verma, P.; Vella, A.; Zanini-Freitag, D.; Xin, H.; Murthy, I.K.; Arora, J.K.; Sylva, K.; Menon, L.; Pardeshi, S.; Kral, U.; and Liu, X. (2025). The SDG accelerator: Circular economy solutions through efficient sustainable consumption. *Circular Economy*, 4(2), 100140.
22. Dore, R.A.; Hassinger-Das, B.; Brezack, N.; Valladares, T.L.; Paller, A.; Vu, L.; Golinkoff, R.M.; and Hirsh-Pasek, K. (2018). The parent advantage in fostering children's e-book comprehension. *Early Childhood Research Quarterly*, 44, 24-33.

23. Kelley, S.; McCallum, C.; and Lock, M.B. (2012). The cataloging of e-book readers: A service model-oriented approach. *Serials Review*, 38(3), 178-182.
24. Suherman, A.; Komaro, M.; and Ana, A. (2023). E-book multimedia animation implementation on concept mastery and problem-solving skills of crystal structure subjects in engineering materials course. *Indonesian Journal of Science and Technology*, 8(2), 259-280.
25. Lestari, D.A.; Suwarma, I.R.; and Suhendi, E. (2024). Feasibility analysis of the development of STEM-based physics e-book with self-regulated learning on global warming topics. *Indonesian Journal of Teaching in Science*, 4(1), 1-10.
26. Nugroho, L.E. (2016). E-book as a platform for exploratory learning interactions. *International Journal of Emerging Technologies in Learning*, 11(1), 62.
27. Krause, C.; Sommerhalder, K.; Beer-Borst, S.; and Abel, T. (2018). Just a subtle difference? Findings from a systematic review on definitions of nutrition literacy and food literacy. *Health promotion international*, 33(3), 378-389.
28. Doustmohammadian, A.; Omidvar, N.; Keshavarz-Mohammadi, N.; Eini-Zinab, H.; Amini, M.; and Abdollahi, M. (2022). The association and mediation role of food and nutrition literacy (FNLIT) with eating behaviors, academic achievement and overweight in 10-12 years old students: A structural equation modeling. *Nutrition Journal*, 21(1), 45.
29. Susilawati, A.; Al-Obaidi, A.S.M.; Abduh, A.; Irwansyah, F.S.; and Nandiyanto, A.B.D. (2025). How to do research methodology: From literature review, bibliometric, step-by-step research stages, to practical examples in science and engineering education. *Indonesian Journal of Science and Technology*, 10(1), 1-40.
30. Arslan-Ari, I.; and Ari, F. (2022). The effect of visual cues in e-books on pre-k children's visual attention, word recognition, and comprehension: An eye tracking study. *Journal of Research on Technology in Education*, 54(5), 800-814.
31. Kabasakal-Cetin, A.; Aksaray, B.; and Sen, G. (2024). The role of food literacy and sustainable and healthy eating behaviors in ultra-processed foods consumption of undergraduate students. *Food Quality and Preference*, 119, 105232.
32. Sánchez-García, E.; Martínez-Falcó, J.; Marco-Lajara, B.; and Zakimova, A. (2025). Achieving environmentally responsible production through green managerial awareness, human resource management and employee behavior. *Journal of Environmental Management*, 373(2), 123739.
33. Rosas, R.; Pimenta, F.; Leal, I.; and Schwarzer, R. (2021). Foodlit-Pro: Conceptual and empirical development of the food literacy wheel. *International journal of food sciences and nutrition*, 72(1), 99-111.
34. Nurrahma, A.H.I.; Nuraini, L.; Putri, H.H.; and Syahadat, R.M. (2024). A bibliometric analysis of seed priming: Global research advances. ASEAN *Journal of Agricultural and Food Engineering*, 3(1), 45-56.
35. Ansari, M.A.; Kumar, V.; Singh, C.; Shukla, V.; and Kumar, R. (2013). Studies on food safety management and its significance in maximizing the profit for food industry. *Internet Journal of Food Safety*, 15, 20-28.

36. Keisyafa, A.; Sunarya, D.N.; Aghniya, S.M.; and Maula, S.P. (2024). Analysis of student's awareness of sustainable diet in reducing carbon footprint to support sustainable development goals (SDGs) 2030. ASEAN *Journal of Agricultural and Food Engineering*, 3(1), 67-74.
37. Mabrukah, S.N.; Ramadan, H.A.; Al Cholifi, M.R.; and Rahmah, A. (2024). Effect of post-harvest storage temperature on physical parameters of cavendish banana (Musa Paradisiaca). *ASEAN Journal of Agricultural and Food Engineering*, 3(1), 75-80.
38. Rosmayanti, M.; and Ratnasari, I. (2024). The effect of electronic word of mouth (E-WOM) on social media TikTok to brand trust and its impact on buying interest in Mixue brand ice cream products (survey on state university students in West Java). *ASEAN Journal of Agricultural and Food Engineering*, 3(1), 81-88.