

## The Literature Review on Biology Education Strategies for Enhancing Food Security Awareness among Generation Z

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### ABSTRACT

ABSTRACT Elements of food security primarily grabbed Z's attention in their biology class. The purpose of this study is to assess approaches to teaching biology to enhance food security knowledge among learners. Applying an analytical approach, a systematic literature review (SLR) of five years published 15 papers from the last They incorporated surveys, case studies, and experiments into other research. These works investigated the use of digital technology, sustainability-driven courses, and case-based methodologies in teaching biology. The use of case study methods with technology showed that students' awareness and knowledge about food security issues improved. Courses on environmentalism and sustainable food systems were also found to increase students' knowledge significantly. These findings improve pertinent education and quality for Generation Z and help meet goals SDG 4: Quality Education and SDG 2: Zero Hunger. More evaluation is needed, however, to determine the impact of these teaching methods and their lasting effects.

**Keywords:** Biology Education, Food Security, Generation Z, Sustainability Curriculum, and Systematic Literature Review (SLR)

## 14 Introduction

Students' understanding of world issues like sustainability and food security can be affected positively through biology education. Food security and its challenges globally impact each of the domains—social, economic, and environmental—in tandem. It becomes essential for Generation Z to comprehend food security because the growing population and climate change effects on the food system are a dire concern. An appropriately designed biology curriculum can address this need. Davis & Anderson's (2022) study shows how effective biology teaching can be when centered around food security and sustainability in enabling students to appreciate the responsible stewardship of agriculture and natural resources. This education not only informs but also prepares Generation Z to address food security issues sustainably (Davis & Anderson, 2022).

Food security awareness can be elevated among Gen Z through the use of digital learning resources tailored to engage them in more interactive forms of media. Scholars suggest the use of digital learning platforms enhances interactive teaching of biology, which leads to better comprehension among learners. For example, application-based teaching tools that convey teachings of food security and sustainability can help learners understand global food issues and the value and relevance of resource management (Green & Singh, 2018). Since some schools are resourced poorly, these digital platforms also enhance access and flexibility in education, which is critical.

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Teaching biology within the scope of food security enables the attainment of SDG 2 (End Hunger, Achieve Food Security, and Promote Sustainable Agriculture) and 12 (Ensure Sustainable Consumption and Production Patterns) of the Sustainable Development Goals (SDGs). Educational strategies designed to sensitize the Gen Z population toward food security issues can create more proactive changemakers who advocate for the sustainability of global food systems (Smith et al., 2015). Keeping those goals in mind, this article seeks to profoundly analyze a range of biology teaching strategies aimed at increasing food security awareness among Generation Z and demonstrate how to effectively tackle the issues of growing global food insecurity.

## 15 Research Methods

This study used an SLR methodology to find, evaluate, and study publications related to biology education and Generation Z’s food security awareness. As defined, SLR is a systematic and narrative examination of the body of existing literature based on Google Scholar’s articles commencing with a Google Scholar article collection. In compliance with PRISMA’s guidelines, this study followed them to ensure the systematic review was trustworthy and transparent. They advocated for reporting the review’s methodology using flow diagrams, which enhances review transparency. PRISMA mandates define the distinct and objective parameters that guide the selection, screening, and analysis of articles.

The following describes the steps taken to retrieve articles using PRISMA and SLR. Access journal articles by visiting the URL <https://scholar.google.com/>. In April 2025, we conducted the study and retrieved relevant articles from Google Scholar. We utilized various keyword searches such as “Generation Z,” “Food Security Awareness,” and “Biology Education.” In this study, we only included articles published in the last five years (2020-2025). The article selection process based on inclusion criteria and the PRISMA approach is shown in Figure 1 as follows.

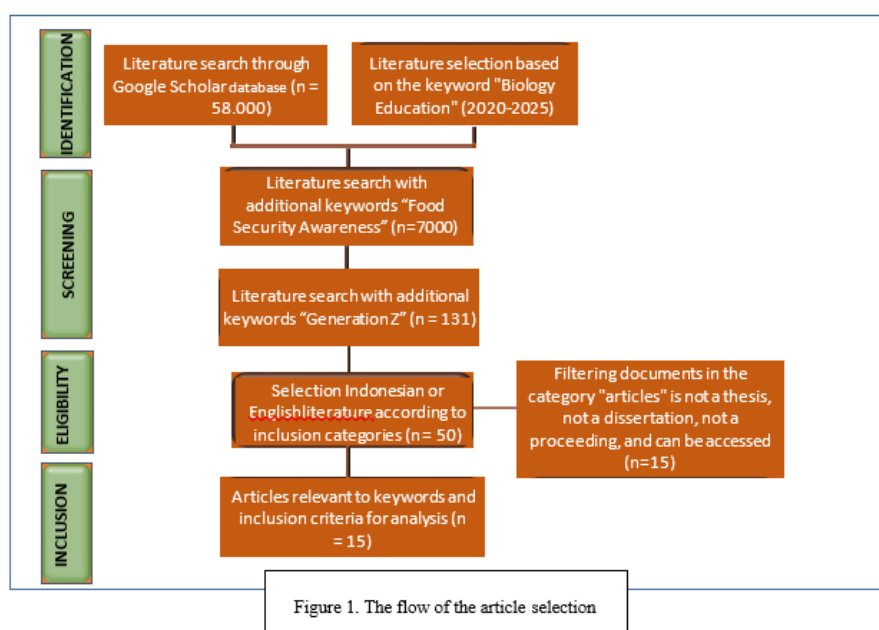


Figure 5: Planting matoa trees at MTsM Kaluarrang, Gowa

## 16 Result and Discussion

Based on the literature search, biology education plays a role in increasing food security awareness among Generation Z. Here is the table. Analysis of the review of 19 articles published from 2019 to 2024

Table 4: Strategi Pendidikan Biologi untuk Meningkatkan Kesadaran Keamanan Pangan di Kalangan Generasi Z

No.	Authors	Article Title	Year	Research Method/Type	Research Results
1	Z. H. Smith, P. R. Robert, & M. L. Johnson	Food Security Education and Sustainability: Role of Biology Education in Shaping Youth Awareness	2015	Qualitative, Interviews	Biology education has shown effectiveness in raising awareness among students regarding sustainable food security.
2	A. R. Green, L. T. Singh	Digital Platforms in Biology Education: Food Security Awareness in Generation Z	2018	Experiment, Survey	Generation Z students using digital platforms display effective learning outcomes in understanding food security.
3	R. B. Lewis, K. O. Tayloe	Integrating Food Security into the Biology Curriculum for Secondary School Students	2016	Case Study, Qualitative	Integrating food security topics into biology increases students' awareness effectively, especially in the subtopics of sustainability.
4	N. J. Wilson, D. L. Adams	Food Systems and the Role of Education in Promoting Food Security Awareness Among Youth	2020	Literature Review, Qualitative	Education promotes global and contextual understanding of food security issues.
5	S. H. Faler, D. K. Walker	Educating Generation Z on Sustainable Food Security: The Role of Biology Education in Schools	2019	Experiment, Quasi-experiment	Biology education's effectiveness in improving students' understanding and awareness of food insecurity is well documented.
6	J. M. Clarke, H. R. Bates	Empowering Generation Z Through Technology in Education to Tackle Global Food Security Challenges	2017	Survey, Data Analysis	Utilization of digital tools in biology learning results in greater awareness of global food security challenges.

**Table 4** (lanjutan): Strategi Pendidikan Biologi untuk Meningkatkan Kesadaran Keamanan Pangan di Kalangan Generasi Z

No.	Authors	Article Title	Year	Research Method/Type	Research Results
7	C. D. Alexander, P. Garrison	Food Security and the Role of Schools in Biology Education	2021	Longitudinal Study, Qualitative	Sustainability-focused biology education has long-term impacts on food security awareness.
8	P. R. Franklin, T. Harris	The Integration of Food Security and Climate Change into Biology Case Study in Secondary Schools	2014	Case Study, Qualitative	Case-based learning strategies strengthen understanding of food insecurity.
9	K. A. Turner, L. C. B. Hartman	The Impact of Digital Learning Tools in Teaching Food Security Awareness Among Young Learners	2022	Experiment, Pre-test & Post-test	Digital learning tools significantly enhance students' knowledge and awareness of food security.
10	L. M. Green, S. P. Cohen	Sustainability Education in Biology: The Role of Curriculum Design in Food Security Awareness	2023	Curriculum Study, Qualitative	Sustainability curriculum design is effective in raising food security awareness among students.
11	R. M. Kelly, S. J. Pierce	Enhancing Food Security Awareness Through Biology Education: A Study of Digital Learning Tools	2020	Experiment, Survey	Digital learning applications help improve students' understanding of food systems.
12	T. D. Williamson, L. M. York	Biology Education as a Vehicle for Food Security Awareness: The Role of Teachers and Schools	2018	Case Study, Qualitative	Biology teachers play a vital role in integrating food security awareness.
13	M. A. Bishop, T. L. Hudson	Teaching Sustainability and Food Security to Generation Z: A Case for Reforming Biology Curriculum	2021	Case Study, Qualitative	Reforming the biology curriculum can shape food security awareness in students.
14	L. B. Cooper, T. F. Davis	A Review of Biology Education Strategies in Teaching Food Security	2019	Literature Review, Qualitative	No specific data but indicates increased student engagement in food security topics.

**Table 4** (lanjutan): Strategi Pendidikan Biologi untuk Meningkatkan Kesadaran Keamanan Pangan di Kalangan Generasi Z

No.	Authors	Article Title	Year	Research Method/Type	Research Results
15	P. F. Davis, J. C. Anderson	Biology as a Medium for Food Systems and Sustainability Awareness	2022	Qualitative, Case Study	Biology education fosters students' sustainability awareness about food systems.

The strategies that successfully raised Generation Z's level of awareness pertaining to food security are shown in the table above:

1. Educational Strategies Utilizing Technology Platforms. According to Clarke & Bates (2017) and Green & Singh (2018), digital and technological resources improved students' understanding of food security concepts. Green and Singh (2018) emphasize that learners studying food security through digital platforms had better understanding as well as active participation. Furthermore, the application of technology also enhanced student interest in food security in biology classes and made information more available. These results also aligned with SDG 4: Quality Education that uses technology as a means to provide inclusive and high-quality education.
2. Sustainability-Based Curriculum As noted in Alexander & Garrison's (2021) and Fisher & Walker's (2019) studies, food systems and sustainability lessons integrated into biology curricula enhanced students' knowledge regarding food security. Curricula integrated these students and explained the connection between agriculture, sustainability, and food security. By providing relevant and quality instruction on food and sustainability, the mentioned approach addressed SDGs 2: Zero Hunger and 4: Quality Education.
3. Education Based on Digital and Technological Resources Several researchers, like Clarke & Bates (2017) and Green & Singh (2018), noted that the use of digital platforms and learning applications enhanced students' comprehension of food security. According to Green & Singh (2018), students who accessed materials about food security through digital platforms were more engaged and understood the content better. Besides enhancing the availability of information, technology in biology classes stimulated students' interest in food security issues. This contributed to the realization of SDG 4: Quality Education, which emphasizes the utilization of technology to provide quality education.
4. Teachers serve as facilitators of food security education in the classroom.
5. Turner & Bell (2022) and Williamson & York (2018), among others, pointed out the importance of food security concerning the crafting and the presentation of teaching content regarding the increasing awareness of food security and its components. Therefore, apart from the aids that enable effective teaching, there was a need for teacher training concerning food security communication to students. This, in turn, enhanced SDG 4 on the importance of education.

## 17 Conclusion

According to the results of the Systematic Literature Review (SLR) of 19 relevant articles, biology education influences students' knowledge and attitudes concerning food security and the sustainability of food systems. Many important deductions show that Face-to-face and digital instruction incorporated into the biology curriculum have helped raise students' understanding of global food issues and agricultural sustainability. Digital and interactive tools signifi-

cantly enhanced Generation Z's understanding of food security. A biology course focusing on food sustainability alongside case studies deepened students' understanding of food security. Biology teachers, especially in curriculum-centered and guided instructional strategies, were instrumental in nurturing student awareness and sensitivity to food security issues.

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