FONDATIA
Jurnal Pendidikan Dasar

p-ISSN: 2656-5390
e-ISSN: 2579-6194

Terindeks: SINTA 4, DOAJ, Dimensions, Scilit, Lens, Garuda, Semantic, Google, Base, etc

https://doi.org/10.36088/fondatia.v10i2.6318

ECO-FOOD LEARNING DESIGN: ASSURE MODEL INSTRUCTIONAL BASED SDGS TO ELEMENTARY STUDENTS' ECO-LITERACY AND FOOD LITERACY

Irni Rachmawati Putri & Rizal Taufik
Universitas Cipasung Tasikmalaya, Indonesia
irnirachmawati@uncip.ac.id; rizaltaufik@uncip.ac.id

Abstract

This study is motivated by the need to develop an ASSURE-based instructional design integrated with the Sustainable Development Goals (SDGs) to enhance elementary students' eco-literacy and food literacy. The study aims to construct a conceptual framework for Eco-Food Learning Design through three main stages: literature exploration, bibliometric analysis using VOSviewer, and conceptual synthesis. This study adopts a conceptual research design without direct empirical testing. The findings indicate that previous studies have predominantly focused on instructional effectiveness, while the integration of sustainability issues into instructional design remains limited. To address this gap, the proposed Eco-Food Learning Design model systematically embeds sustainability values into the ASSURE stages. The model consists of four logically interconnected components: input, process, integration, and output. Eco-literacy and food literacy are integrated across all instructional stages to create contextual, participatory, and behavior-oriented learning experiences. The study concludes that the proposed model has strong potential to improve students' environmental awareness, food literacy, and sustainable behavior. This study contributes theoretically to the development of sustainability-based instructional design and offers practical implications for elementary education by providing a structured model for integrating eco-literacy, food literacy, and SDG-oriented learning.

Keywords: ASSURE Model; Eco-Literacy; Elementary Education; Food Literacy; Sustainability-Based Instructional Design

INTRODUCTION

In the context of 21st-century education, ideal learning is not only oriented toward academic achievement but also toward the development of global competencies relevant to future challenges. Education is expected to shape individuals who possess awareness of environmental issues and sustainability as part of their global responsibility (Pouresmaieli et al., 2024). The integration of Sustainable Development Goals (SDGs) values has become a strategic approach to achieving this objective (Leal Filho et al., 2023). In this regard, strengthening eco-literacy and food literacy among elementary school students is crucial as a foundational step in building environmentally responsible character. Instructional design models such as ASSURE provide a systematic framework that enables the integration of objectives, strategies, media, and evaluation (Abuhassna et al., 2024). This model also supports student-centered and contextually relevant learning experiences. Therefore, ASSURE-based instructional design integrated with SDGs has the potential to create meaningful learning experiences (Akşab & Özyurt, 2025). Such an approach transforms learning into not only a knowledge transfer process but also a process of fostering ecological awareness among students.

On the other hand, existing studies indicate that the ASSURE model has been widely implemented in various learning contexts to enhance instructional effectiveness. Several studies confirm that this model improves student engagement and learning outcomes through the appropriate use of media and technology (Alalwan, 2022). Furthermore, the integration of technology in learning through frameworks such as TPACK has strengthened innovative instructional design practices. However, the primary focus of previous research remains on instructional effectiveness and cognitive achievement (Jibril & Adedokun-Shittu, 2023). These studies tend to overlook the integration of global issues such as environmental sustainability and food security. This suggests that the application of the ASSURE model remains largely technical and has not fully addressed value-based and character-oriented dimensions. Meanwhile, education that is relevant to global challenges is increasingly necessary for preparing future generations. Therefore, there is a need to develop more contextual and sustainability-oriented instructional designs.

The results of bibliometric analysis using VOSviewer further support these findings by showing that dominant keywords include instructional design model, ASSURE learning

model, and effectiveness. The density visualization indicates that research has been heavily concentrated on instructional effectiveness and classroom implementation (Wilkerson et al., 2025). Meanwhile, terms related to sustainability, such as eco-literacy and food literacy, do not appear significantly. The overlay visualization also reveals that recent research trends still revolve around implementation and training rather than SDGs-based content development (Aguilar-Cruz & Olaya-Marín, 2025). This indicates that the direction of current research has not fully accommodated the needs of sustainability-based education. In addition, the network visualization shows limited connections between instructional design and environmental issues. This condition highlights that the integration of sustainability values in instructional design remains minimal. Therefore, there is a significant opportunity to develop research that bridges these aspects.

Further examination of previous studies reveals that most research still separates instructional design from the development of ecological literacy. Some studies have addressed eco-literacy or food literacy independently, but they have not been integrated into a systematic instructional design framework (Husamah et al., 2025). Moreover, studies using the ASSURE model tend to focus on improving learning outcomes without considering sustainability dimensions. This indicates that previous approaches remain partial rather than holistic. Additionally, limited research has explored the implementation of SDGs in elementary education contexts (Eliana et al., 2024). In fact, primary education plays a critical role in shaping students' character and values. The lack of integration results in learning that is less relevant to current global challenges. Therefore, innovation in instructional design is needed to bridge this gap.

Based on these conditions, a significant research gap can be identified in the development of ASSURE-based instructional design integrated with SDGs. This gap lies in the absence of instructional models that explicitly combine ASSURE stages with the enhancement of eco-literacy and food literacy. Furthermore, there is a lack of comprehensive studies examining how instructional design can support environmental awareness and food sustainability among students (Darmody, 2023). This gap also reflects the limited integration between instructional design theory and sustainability-based educational practices. As a result, previous research has not fully addressed the demands of future-oriented education. Therefore, developing innovative and contextual instructional designs is essential. Such an approach is expected to address global challenges while

improving the quality of elementary education. Hence, this research holds strong urgency and relevance.

In response to this gap, this study offers a novel contribution through the development of an Eco-Food Learning Design based on the ASSURE model integrated with SDGs. The novelty lies in the systematic integration of ASSURE stages with learning content focused on environmental and food-related issues. This approach emphasizes not only cognitive aspects but also the development of students' attitudes and behaviors toward the environment (McDonagh et al., 2025). In addition, the instructional design is contextualized by connecting learning activities with students' daily experiences. The integration of eco-literacy and food literacy into every stage of learning represents a key distinguishing feature of this study. This approach enhances the relevance and meaningfulness of learning for students. Consequently, this research contributes a new perspective to sustainability-based instructional design (Darmody, 2023). This novelty is expected to enrich both theoretical and practical dimensions of education.

The objective of this study is to develop an ASSURE-based instructional design integrated with SDGs to enhance eco-literacy and food literacy among elementary school students. This study also aims to analyze the effectiveness of the developed instructional design in real classroom settings. Furthermore, it seeks to identify how sustainability values can be systematically integrated into each stage of the instructional process. The findings are expected to provide theoretical contributions to the development of SDGs-based instructional design models. Practically, this study aims to serve as a guideline for teachers in designing innovative and contextual learning experiences. Ultimately, this research is expected to contribute not only to improving students' learning outcomes but also to fostering ecological awareness and food sustainability from an early age.

METHODS

This study employed a conceptual framework approach to develop an Eco-Food Learning Design based on the ASSURE instructional model integrated with the Sustainable Development Goals (SDGs). This approach aims to construct a theoretical model through the synthesis of relevant literature, identification of research gaps, and integration of key concepts into a systematic and innovative instructional design. The study does not involve direct experimentation but focuses on generating a conceptual framework that can be

tested in future empirical research. The research process was conducted over a period of four months, from January to April 2026, through three main stages: literature exploration, bibliometric analysis, and conceptual synthesis (Schreiber & Cramer, 2024). In the first stage, conducted during January 2026, a comprehensive literature review was carried out to examine key concepts, including the ASSURE model, SDGs in education, eco-literacy, and food literacy. The selected literature was based on its relevance to instructional design, sustainability education, and elementary school context s. This stage aimed to establish a strong theoretical foundation for the development of the conceptual framework.

In the second stage, a bibliometric analysis using VOSviewer was conducted to identify research trends, dominant themes, and existing research gaps. The analysis focused on keywords such as instructional design model, ASSURE learning model, and effectiveness, as well as their connections to sustainability-related concepts. The visualizations analyzed included density visualization, overlay visualization, and network visualization. The results indicated that previous studies have predominantly focused on instructional effectiveness and classroom implementation, with limited integration of eco-literacy and food literacy into ASSURE-based instructional design(Luft et al., 2022). The third stage involved conceptual synthesis, which focused on developing the proposed Eco-Food Learning Design. In this stage, the six phases of the ASSURE model, Analyze Learners, State Objectives, Select Methods, Media and Materials, Utilize Media and Materials, Require Learner Participation, and Evaluate and Revise were integrated with SDGs principles and eco-food contexts (Schreiber & Cramer, 2024). Eco-literacy and food literacy were positioned as core competencies embedded across all instructional stages. This integration emphasized contextual learning, active student engagement, and sustainability-oriented outcomes. In detail, the research procedure flow is presented in Figure 1 below.

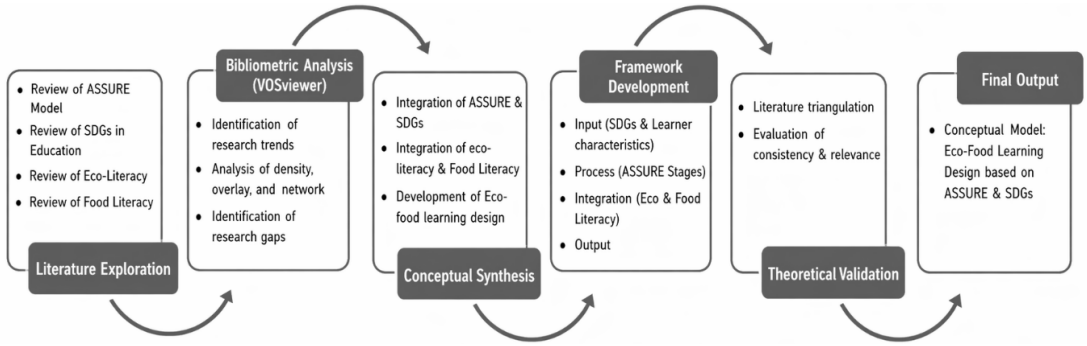

Figure 1. Research Procedure

Referring to Figure 1 the resulting conceptual framework was systematically organized into four main components: input, process, integration, and output. The input component includes SDGs values and learner characteristics, while the process component is represented by the ASSURE instructional stages. The integration component reflects the incorporation of eco-literacy and food literacy within each stage. The output component focuses on the expected learning outcomes, including improved environmental awareness, food literacy, and sustainable behavior among elementary school students (Luft et al., 2022) . To ensure the validity of the proposed framework, this study employed theoretical triangulation by comparing and synthesizing multiple relevant sources. Additionally, the framework was evaluated based on its internal consistency, relevance to current educational challenges, and alignment with sustainability principles(Schreiber & Cramer, 2024). The outcome of this study is a conceptual model that provides a foundation for future empirical research and practical implementation in elementary education.

RESULTS

Literature Exploration

The results of the literature exploration indicate that the ASSURE model is one of the systematic and learner-centered instructional design models. This model emphasizes the importance of analyzing learners' characteristics as the foundation for designing effective instruction. In addition, it requires the formulation of clear and measurable learning objectives. The selection of appropriate methods, media, and instructional materials is also a crucial component in achieving these objectives (USMAN A. A. & SAMUEL JEREMIAH MOKOTSO, 2026). Continuous evaluation is another key feature of the ASSURE model in ensuring the ongoing improvement of learning quality. Previous studies have demonstrated that the ASSURE model is effective in enhancing the quality of learning, particularly in technology and media-based instructional contexts. Its flexibility allows teachers to adapt instructional strategies according to students' needs and characteristics. This makes ASSURE an adaptable model for various learning environments. In the context of elementary education, the model has also been shown to increase student engagement (Abuhassna & Alnawajha, 2023). Therefore, ASSURE has strong potential to be further developed within innovative instructional approaches.

On the other hand, the education literature based on the Sustainable Development Goals (SDGs) highlights the importance of integrating sustainability values into the learning process. Education is no longer solely focused on cognitive development. It must also foster ecological awareness and social responsibility among students. This aligns with the demands of 21st-century education, which emphasize character development and global awareness. Therefore, integrating SDGs into education has become an essential priority (USMAN A. A. & SAMUEL JEREMIAH MOKOTSO, 2026). In this context, eco-literacy and food literacy emerge as two critical competencies that need to be developed from an early age. Eco-literacy enables students to understand the relationship between humans and the environment in a holistic manner. Meanwhile, food literacy equips students with the knowledge and skills to make healthy and sustainable food choices (Kazazoglu, 2025). These two competencies complement each other in shaping responsible behavior. Thus, strengthening eco-literacy and food literacy is a key component of sustainability education.

However, the literature review reveals that the four main components of the ASSURE model, SDGs, eco-literacy, and food literacy are still largely studied separately. Research that integrates instructional design with sustainability issues remains very limited. This condition indicates a gap in both theoretical and practical development. Therefore, a conceptual framework is needed to systematically connect instructional design models with the enhancement of ecological and food literacy (Pouresmaieli et al., 2024). Such a framework is expected to support the development of more holistic and globally relevant learning approaches.

Bibliometric Analysis

The results of the bibliometric analysis using VOSviewer provide a more objective overview of research trends in the field of instructional design. The results of the density visualization analysis are presented in Figure 2 below.

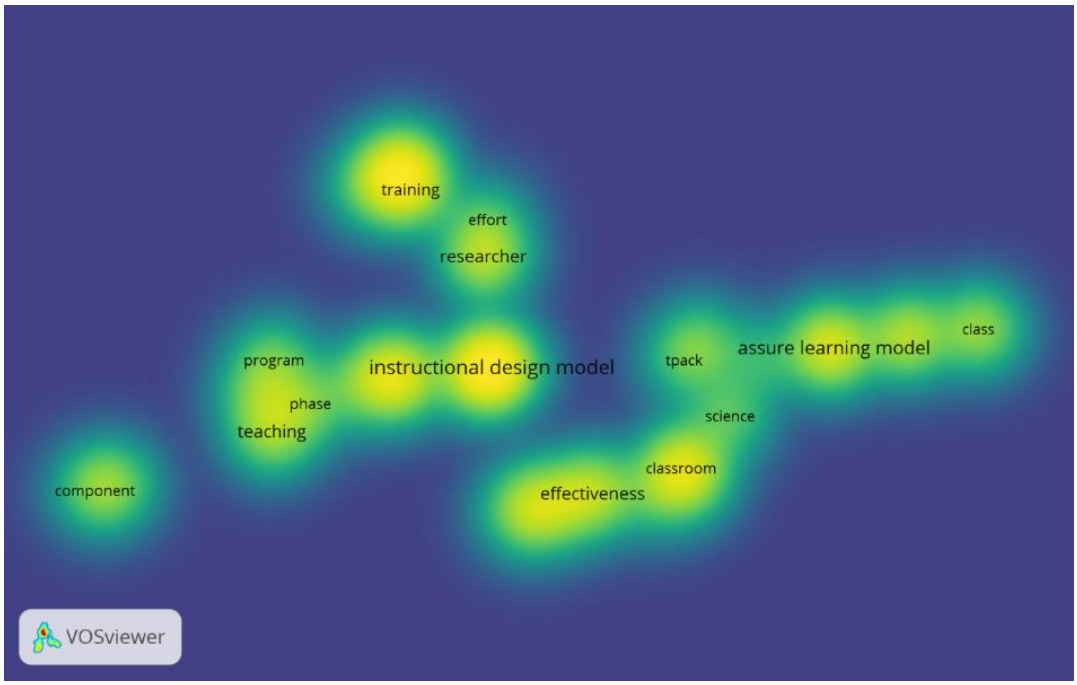

Figure 2. Density Visualization Analysis

Referring to Figure 2, it can be observed that keywords such as instructional design model, ASSURE learning model, and effectiveness show high intensity. This indicates that research to date has primarily focused on the effectiveness of instructional models and their implementation in classroom settings (Wilkerson et al., 2025). This focus reflects a research orientation that is still predominantly centered on learning outcomes and instructional performance. Furthermore, the results of the overlay visualization analysis are presented in Figure 3 below.

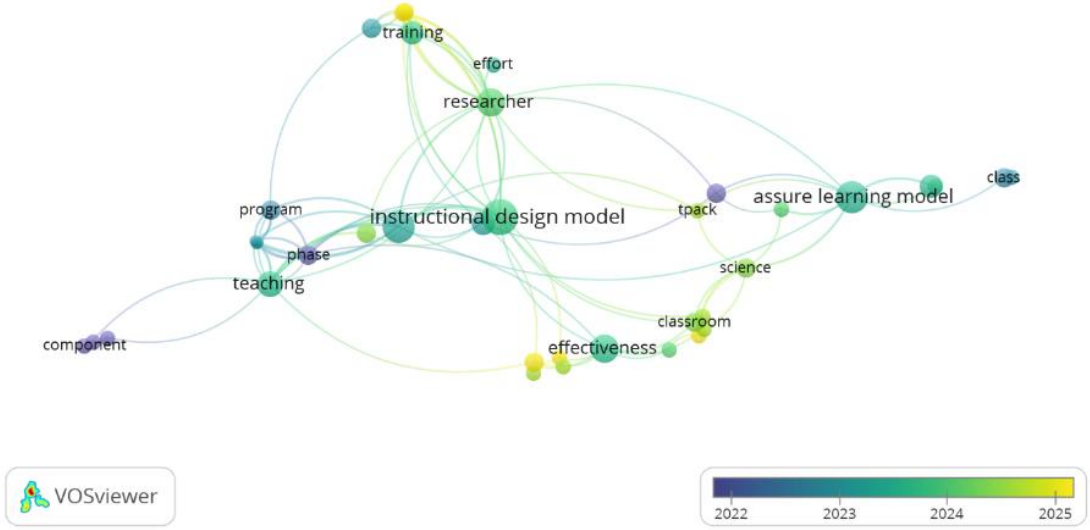

Figure 3. Overlay Visualization Analysis

Figure 3 shows that the overlay visualization indicates that recent research trends still revolve around instructional implementation and training. The yellow color, which represents more recent studies, appears predominantly in keywords related to effectiveness and instructional practices (Mishra et al., 2024). However, terms related to sustainability, such as eco-literacy and food literacy, do not appear significantly. This suggests that the integration of sustainability issues into instructional design has not yet become a primary focus in recent research. Meanwhile, the results of the network visualization analysis are presented in Figure 4 below.

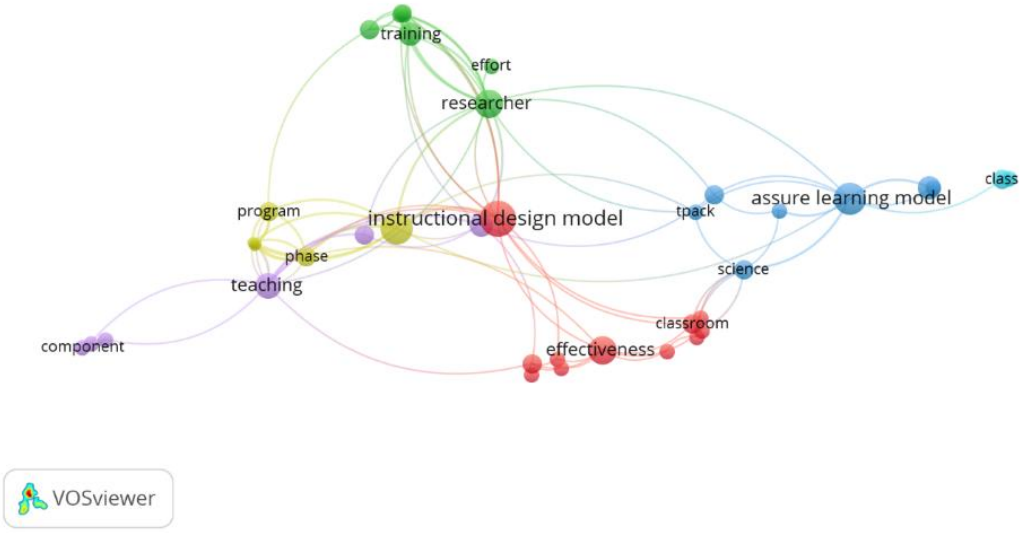

Figure 4. Network Visualization Analysis

Referring to Figure 4, it can be seen that the instructional design model serves as the central node connecting various concepts. Although there are links with teaching and training aspects, there is no strong connection with environmental or sustainability-related concepts (Wilkerson et al., 2025). This indicates that previous research remains fragmented and has not yet moved toward multidimensional integration. Therefore, this bibliometric analysis reinforces the finding of a significant research gap in integrating instructional design with eco-food issues and the SDGs.

Conceptual Synthesis

Based on the findings from the literature exploration and bibliometric analysis, a conceptual synthesis was conducted to integrate various components into a unified

framework. This synthesis aims to bridge the gap between conventional instructional design and the needs of sustainability-based education. The process was carried out systematically by examining the relationships among the ASSURE model, the values of the Sustainable Development Goals (SDGs), and the competencies of eco-literacy and food literacy (Amalia, 2024). The results indicate that integrating these components enables the development of a more contextual and relevant instructional design. Therefore, this conceptual synthesis serves as an initial step in constructing a holistic learning model. This approach also emphasizes the importance of innovation in addressing global challenges through education.

The initial stage of this synthesis involved remapping the stages of the ASSURE model to align with SDGs principles and the eco-food context. This process did not merely retain the structural framework of ASSURE but also adjusted the content and orientation of learning. Each stage was analyzed to identify opportunities for integrating sustainability values. This ensures that instructional design goes beyond effectiveness and incorporates social and environmental relevance (Murti et al., 2025). As a result, the ASSURE model is transformed into a more contextual framework. This remapping process provides the foundation for enriching each stage of learning. In the Analyze Learners stage, the synthesis expands the scope of learner analysis. The analysis includes not only cognitive aspects but also students' environmental awareness and food consumption habits. This is essential to ensure that learning is aligned with students' real-life contexts (Husamah et al., 2025). By understanding students' backgrounds and experiences, teachers can design more targeted instructional strategies. This approach reinforces the principle of learner-centered education. Consequently, the analysis stage becomes more comprehensive and contextually grounded.

In the State Objectives stage, learning objectives are formulated by explicitly incorporating eco-literacy and food literacy indicators. This formulation reflects a shift in learning orientation from purely cognitive outcomes to affective and behavioral dimensions. Learning objectives are designed not only to achieve content mastery but also to foster students' awareness and attitudes toward environmental and food-related issues (Amalia, 2024). This represents a strategic step in embedding sustainability values into the learning process. With more comprehensive objectives, the learning process becomes more focused and meaningful. Therefore, this stage plays a crucial role in guiding the transformation of learning. The subsequent stages, namely Select Methods, Media, and

Materials and Utilize Media and Materials, are enriched through the integration of eco-food contexts (Husamah et al., 2025). The selection of methods and media is directed toward learning resources that are relevant to environmental and food issues. Examples include case studies, environment-based projects, and contextual teaching materials (Murti et al., 2025). Learning activities are designed to encourage active student participation through direct experience. This approach allows students to construct deeper understanding. As a result, learning becomes more interactive and meaningful.

In the Require Learner Participation and Evaluate and Revise stages, emphasis is placed on active engagement and reflective learning. Evaluation goes beyond measuring knowledge to include changes in students' attitudes and behaviors. This indicates that learning is designed to produce broader and more meaningful impacts. The synthesis ultimately results in a more comprehensive and contextual conceptual framework. This framework serves not only as a guide for instructional design but also as a transformative approach to education. Therefore, this conceptual synthesis contributes significantly to the advancement of sustainability-based learning.

Framework Development

The results of the conceptual synthesis were then realized in the development of the Eco-Food Learning Design framework. This framework is systematically structured by integrating four main components: input, process, integration, and output. These components are logically interconnected and form a unified structure within the instructional design. The development of this framework is based on the need to create learning that is not only effective but also relevant to sustainability issues. Therefore, the framework serves as a foundation for designing contextual and meaningful learning experiences. The input component of this framework includes the values of the Sustainable Development Goals (SDGs) and learners' characteristics as the primary foundation for instructional design. SDGs values provide a global direction that should be achieved through education (Abuhassna & Alnawajha, 2023). Meanwhile, learners' characteristics ensure that instruction is designed according to students' needs, experiences, and developmental levels. The combination of these two aspects enables the creation of adaptive and contextual learning. Thus, the input component becomes a crucial foundation for determining the effectiveness of instructional design.

The process component is represented by the modified stages of the ASSURE model. Each stage is designed to accommodate the integration of eco-literacy and food literacy into the learning process. Learning is not merely focused on content delivery but also on creating meaningful learning experiences (Murti et al., 2025). In addition, the approach emphasizes active student participation through various interactive activities. As a result, the learning process becomes more dynamic, engaging, and oriented toward the comprehensive development of students' competencies. The integration component represents the core of this framework, where eco-literacy and food literacy are embedded in every stage of the learning process (Murti et al., 2025). This integration ensures that sustainability values are not merely supplementary but become an inherent part of instructional design. Through this approach, students are not only able to understand concepts but also relate them to their daily lives. This comprehensive integration also enhances the relevance of learning in addressing global challenges. Therefore, the integration component serves as a key element in creating transformative learning experiences.

Meanwhile, the output component focuses on the expected outcomes of the learning process, including improvements in eco-literacy, food literacy, and students' sustainable behavior. These outcomes reflect the success of learning in developing cognitive, affective, and behavioral aspects in a balanced manner. As changes occur across these dimensions, learning impacts not only students' knowledge but also their real-life actions (Amalia, 2024). The framework provides a clear representation of the flow and interconnections among its components within instructional design. Thus, the Eco-Food Learning Design serves as a comprehensive and relevant approach to supporting sustainability education.

Theoretical Validation

Theoretical validation was conducted to ensure that the developed framework has a strong scientific foundation and is relevant to current educational contexts. The validation process involved theoretical triangulation by comparing various relevant literature sources. This aimed to ensure that each component of the framework is supported by adequate and consistent theoretical foundations (Luft et al., 2022). In addition, validation was carried out by examining the internal consistency of the framework. Each component was analyzed to

ensure logical connections between input, process, integration, and output. The analysis results indicate that the developed framework has a coherent and systematic structure. This demonstrates that the model can serve as a foundation for designing sustainability-based learning. The validation also considered the relevance of the framework to current educational challenges, particularly those related to environmental and food issues (Alkhawaldeh et al., 2023). The framework is considered capable of addressing the need for contextual and future-oriented learning. Therefore, the developed framework has strong potential for implementation in elementary school learning practices.

Conceptual Model of Eco-Food Learning Design based on ASSURE & SDGs

The final output of this study is a conceptual model of Eco-Food Learning Design based on the ASSURE model integrated with SDGs. This model offers a new approach to instructional design by embedding sustainability values into every stage of the learning process. It serves not only as a guide for designing instruction but also as a framework for developing students' competencies holistically (Akşab & Özyurt, 2025). This conceptual model emphasizes the importance of contextual, participatory, and behavior-oriented learning. By integrating eco-literacy and food literacy, the model is expected to foster students' environmental awareness and their ability to manage food consumption sustainably (Pouresmaieli et al., 2024). This aligns with global educational goals in supporting sustainable development.

Overall, this model makes a significant contribution to both the theory and practice of instructional design. It also opens opportunities for future research to examine its effectiveness in real-world contexts. Therefore, the ASSURE and SDGs-based Eco-Food Learning Design can serve as an innovative approach in elementary education that is relevant to global challenges (Mishra et al., 2024). The conceptual model of Eco-Food Learning Design developed in this study represents a systematic integration of the ASSURE instructional design model with the values of the Sustainable Development Goals (SDGs), as well as the enhancement of eco-literacy and food literacy competencies among elementary school students (Pouresmaieli et al., 2024). This model not only functions as an instructional design framework but also as a transformative approach that connects the learning process with global sustainability issues. In detail, the visualization of the Eco-Food Learning Design conceptual framework is presented in Figure 5 below.

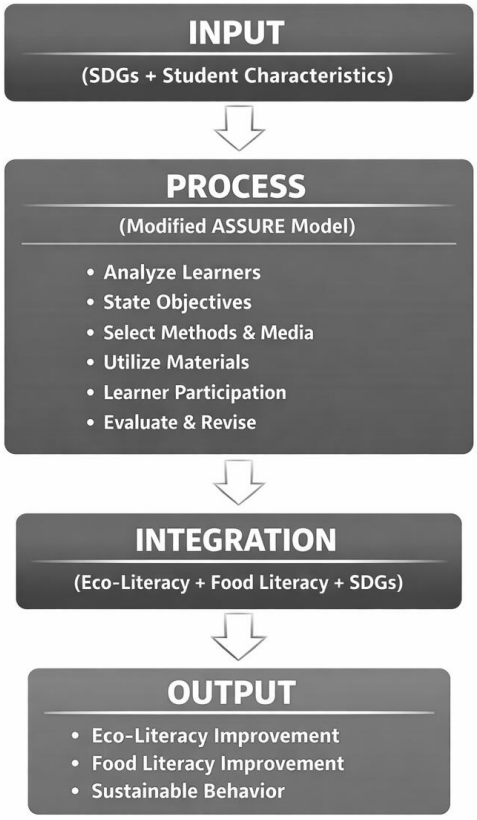

Figure 5. Eco-Food Learning Design Conceptual Framework

DISCUSSION

The development of the Eco-Food Learning Design model based on the ASSURE framework and the Sustainable Development Goals (SDGs) demonstrates a significant conceptual contribution in addressing the demands of 21st-century education, particularly in integrating instructional design with sustainability issues. The findings of this study indicate that instructional design has predominantly focused on instructional effectiveness, without explicitly linking learning processes to global challenges such as environmental degradation and food sustainability (Engeness, 2021). This tendency is clearly reflected in the bibliometric analysis, which shows the dominance of keywords such as instructional design model and effectiveness, while concepts such as eco-literacy and food literacy remain underrepresented. Therefore, this study addresses this gap by proposing an integrative approach that systematically combines the ASSURE model with sustainability values embedded in the SDGs (Kücükgül et al., 2022).

From a theoretical perspective, the integration of ASSURE and SDGs in this model represents a paradigm shift from knowledge transmission-oriented learning toward

value- and behavior-oriented transformative learning. The ASSURE model, traditionally recognized as a framework for media- and technology-based instructional design, is extended in this study to function as a vehicle for embedding sustainability values. This suggests that conventional instructional design models have the potential to be restructured into more contextual and globally relevant frameworks (Schreiber & Cramer, 2024). Thus, the innovation of this study does not lie in creating an entirely new model, but rather in reconstructing and enriching an existing model with sustainability dimensions that align with contemporary educational needs.

The input component of the model highlights the importance of positioning SDGs as a foundational element in instructional design. The selection of SDG 2 (Zero Hunger), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action) is not merely symbolic, but strategic, as these goals are directly related to students' daily lives. This reinforces the idea that meaningful learning must connect abstract concepts with real-life contexts (Guan & Zhang, 2023). Furthermore, the inclusion of learner characteristics as cognitive development, environmental awareness, and food consumption habits reflects a constructivist approach in which learners' prior knowledge and experiences are central to the learning process (Balakhanova, 2024). In this regard, the input component is not only descriptive but also normative, guiding the direction of contextual and relevant instructional design.

In the process component, the modification of the ASSURE stages reflects a significant innovation in instructional implementation. Each stage of the ASSURE model is enriched with eco-food contexts, resulting in learning experiences that are more meaningful and relevant. For example, in the Analyze Learners stage, the analysis extends beyond cognitive aspects to include ecological awareness and consumption behaviors (Husamah et al., 2025). This indicates a shift from traditional needs analysis toward a more holistic and context-sensitive approach. Similarly, in the State Objectives stage, learning objectives are formulated to explicitly incorporate eco-literacy and food literacy indicators, reflecting a broader orientation of learning goals.

Moreover, the stages of selecting and utilizing methods, media, and materials emphasize contextual and experiential learning. The use of environmental case studies and local food-based projects demonstrates that learning is designed to bridge the gap between theoretical knowledge and real-life applications (Murti et al., 2025). This aligns with the

principles of experiential learning, where knowledge is constructed through direct experience. In addition, active student participation is a key strength of this model. Through discussions, hands-on activities, and reflective practices, students are not only exposed to knowledge but also encouraged to internalize sustainability values. Consequently, the process component is not merely instructional but transformative, as it aims to influence students' ways of thinking and acting in relation to environmental and food issues.

The integration component represents the most distinctive feature and primary novelty of the Eco-Food Learning Design model. The embedding of SDGs values, eco-literacy, and food literacy across all stages of the ASSURE model differentiates this approach from conventional instructional designs, which often treat sustainability as an additional topic rather than an integral element (Akşab & Özyurt, 2025). In this model, integration is comprehensive and systematic, ensuring that sustainability is embedded in every learning activity. This approach enables deeper learning, as students are not only acquiring knowledge but also developing a meaningful understanding of sustainability concepts and their implications. Conceptually, this integration reflects a multidisciplinary approach to learning. Eco-literacy and food literacy encompass not only environmental and health aspects but also social, economic, and cultural dimensions. As a result, the learning process becomes more complex and enriched with diverse perspectives (Amalia, 2024) . This is particularly important in fostering students' critical thinking and systems thinking skills, which are essential for addressing global challenges. Therefore, the integration component serves not only as a connector among concepts but also as a mechanism for enhancing the relevance and depth of learning.

The output component of the model reflects a shift from traditional cognitive learning outcomes toward more comprehensive and holistic outcomes. The expected outcomes include improvements in eco-literacy, food literacy, and sustainable behavior. The enhancement of eco-literacy is indicated by students' ability to understand the relationship between humans and the environment, as well as their increased awareness of ecological issues. This demonstrates that the learning process successfully fosters both conceptual understanding and affective engagement with environmental issues. Similarly, improvements in food literacy are reflected in students' ability to understand healthy eating patterns and make sustainable food choices(Kazazoglu, 2025). This competency is crucial in shaping responsible consumption behaviors from an early age. Therefore, the impact of

learning extends beyond knowledge acquisition to influence students' daily practices. This aligns with the broader goal of education for sustainable development, which emphasizes the importance of equipping learners with the skills and values needed to make informed decisions.

Furthermore, sustainable behavior change is considered the ultimate indicator of the model's effectiveness. Students are expected to demonstrate responsible consumption habits and environmentally friendly actions in their daily lives. However, it is important to recognize that behavior change is a complex and gradual process that cannot be achieved instantly. As such, the successful implementation of this model requires support from multiple stakeholders, including teachers, schools, and families (Dursun & Aykan, 2025) (Dursun & Aykan, 2025). Additionally, comprehensive assessment strategies are needed to measure behavioral changes validly and reliably. This presents both a challenge and an opportunity for future research to develop appropriate evaluation instruments for sustainability-based learning (Darmody, 2023). When viewed in relation to the bibliometric findings, the proposed model clearly addresses the identified research gap. The lack of strong connections between instructional design and sustainability issues in previous studies indicates that this area remains underexplored. Therefore, the Eco-Food Learning Design model can be seen as an initial contribution toward establishing a new paradigm in sustainability-oriented instructional design. While this study focuses on elementary education, the model has the potential to be adapted to other educational levels, making it relevant for broader applications.

From a practical perspective, this model provides a clear and systematic guide for teachers in designing contextual and meaningful learning experiences. By following the modified ASSURE stages, educators can effectively integrate sustainability values into their instructional practices. The model also encourages the use of innovative teaching methods, such as project-based learning and experiential activities, which can enhance student engagement and learning outcomes. This is particularly important in fostering active learning environments that support the development of 21st-century skills (Guan & Zhang, 2023). Overall, the findings of this study suggest that the Eco-Food Learning Design model offers a comprehensive approach to integrating cognitive, affective, and behavioral dimensions in learning. It not only addresses the need for effective instructional design but also responds to the growing demand for sustainability-oriented education. As such, the

model represents a promising innovation in elementary education that is aligned with global educational priorities.

Nevertheless, this study has certain limitations, as it is primarily conceptual and has not yet been empirically tested. Future research is needed to examine the effectiveness of this model in real-world educational settings. Such studies may employ experimental or design-based research approaches to validate the model's impact on students' eco-literacy, food literacy, and sustainable behavior (Alkhawaldeh et al., 2023). Additionally, further investigation is required to explore how the model can be adapted to different cultural and environmental contexts. By addressing these limitations, future research can contribute to the refinement and broader implementation of the Eco-Food Learning Design model in education.

CONCLUSION

This study developed a conceptual model of Eco-Food Learning Design based on the ASSURE instructional model and the Sustainable Development Goals (SDGs) to support the enhancement of eco-literacy and food literacy among elementary school students. Based on the results of literature exploration, bibliometric analysis, and conceptual synthesis, it was found that instructional design research has predominantly focused on instructional effectiveness and has not optimally integrated sustainability issues. This gap is addressed through the development of a model that systematically and contextually integrates SDGs values, particularly SDG 2, SDG 12, and SDG 13, into the stages of the ASSURE model. The developed model consists of four main components: input, process, integration, and output, which are logically interconnected to create meaningful learning experiences. The input component emphasizes the importance of learner characteristics and global contexts as the foundation of instructional design. The process component demonstrates that the ASSURE stages can be modified to accommodate contextual and participatory eco-food-based learning. The integration component represents the core novelty of the model, where eco-literacy and food literacy are embedded across all stages of learning. Meanwhile, the output component indicates that learning outcomes extend beyond cognitive aspects to include changes in students' attitudes and sustainable behaviors.

Based on these findings, it can be concluded that the Eco-Food Learning Design model has strong potential as an innovative approach to instructional design that is not only instructionally effective but also relevant to global challenges. The model bridges the gap between instructional design and sustainability-based education while contributing to the development of students' environmental awareness and character from an early age. Several suggestions can be proposed based on this study. First, the model needs to be implemented in real classroom settings to examine its empirical effectiveness. Teachers are encouraged to adapt the model according to local contexts and students' characteristics. In addition, the development of comprehensive assessment instruments to measure eco-literacy, food literacy, and sustainable behavior is essential. For future research, it is recommended to conduct empirical testing of the model through experimental or advanced design-based research approaches. Further studies may also expand the scope to different educational levels and integrate digital technologies into the implementation of the model. Therefore, the ASSURE and SDGs-based Eco-Food Learning Design model is expected to be continuously refined and to contribute more broadly to the advancement of sustainability-oriented education.

REFERENCES

Abuhassna, H., Adnan, M. A. B. M., & Awae, F. (2024). Exploring the synergy between instructional design models and learning theories: A systematic literature review. *Contemporary Educational Technology, 16*(2), Article ep499. https://doi.org/10.30935/cedtech/14289

Abuhassna, H., & Alnawajha, S. (2023). Instructional design made easy! Instructional design models, categories, frameworks, educational context, and recommendations for future work. *European Journal of Investigation in Health, Psychology and Education, 13*(4), 715–735. https://doi.org/10.3390/ejihpe13040054

Aguilar-Cruz, P. J., & Olaya-Marín, E. J. (2025). Gamification and eco-literacy: A bibliometric analysis of research trends. *International Journal of Serious Games, 12*(3), 29–46. https://doi.org/10.17083/8mzab045

Akşab, H. V., & Özyurt, M. (2025). Use of ASSURE MODEL in ELT: Reflections on the learning and teaching process. *International Journal of Assessment Tools in Education, 12*(4), 1034–1054. https://doi.org/10.21449/ijate.1571335

Alalwan, N. (2022). Actual use of social media for engagement to enhance students' learning. *Education and Information Technologies, 27*(7), 9767–9789. https://doi.org/10.1007/s10639-022-11014-7

Alkhawaldeh, A., Albashtawy, M., Rayan, A., Abdalrahim, A., Musa, A., Eshah, N., Abu Khait, A., Qaddumi, J., & Khraisat, O. (2023). Application and use of Andersen's

behavioral model as theoretical framework: A systematic literature review from 2012–2021. *Iranian Journal of Public Health, 52*(7), 1346–1354. https://doi.org/10.18502/ijph.v52i7.13236

Amalia, D. (2024). The Integration of Eco-Literacy in Teaching-Learning Activities as An Effort to Reduce Environmental Crisis. *Madinah: Jurnal Studi Islam, 11*(2), 257–274. https://doi.org/10.58518/madinah.v11i2.2962

Balakhanova, G. (2024). Green choices: The environmental impact of consumption habits. *Nature & Science International Scientific Journal, 6*(10), 5–9. https://doi.org/10.36719/2707-1146/49/5-9

Darmody, M. (2023). *Circular Food Education: Developing a Food Education Programme Based on Sustainability, Experiential Learning and Pleasure in Irish Primary Schools* [Doctoral dissertation, Technological University Dublin]. ARROW@TU Dublin. https://doi.org/10.21427/WFDZ-XH19

Dursun, F., & Aykan, A. (2025). Exploring Teachers' Narratives: Challenges and Strategies for Enhancing the Teaching Process. *SAGE Open, 15*(1). https://doi.org/10.1177/21582440251332557

Eliana, N., Wati, U. A., & Rahmadona, S. (2024). Leveraging the ASSURE Model for Optimized Information Technology-Based Learning Media. *AL-ISHLAH: Jurnal Pendidikan, 16*(3), 3614–3626. https://doi.org/10.35445/alishlah.v16i3.5639

Engeness, I. (2021). Developing teachers' digital identity: Towards the pedagogic design principles of digital environments to enhance students' learning in the 21st century. *European Journal of Teacher Education, 44*(1), 96–114. https://doi.org/10.1080/02619768.2020.1849129

Guan, T., & Zhang, Q. (2023). Value orientations, personal norms, and public attitude toward SDGs. *International Journal of Environmental Research and Public Health, 20*(5), Article 4031. https://doi.org/10.3390/ijerph20054031

Husamah, H., Rahardjanto, A., Permana, T. I., & Lestari, N. (2025). The relationship between environmental literacy, ecological literacy, and science for sustainability: A systematic literature review. *Research and Development in Education (RaDEn), 5*(1), 351–364. https://doi.org/10.22219/raden.v5i1.39957

Jibril, M., & Adedokun-Shittu, N. A. (2023). Enhancing education: A comprehensive framework for integrating technological pedagogical content knowledge (TPACK) into teaching and learning. *Indonesian Journal of Multidiciplinary Research, 4*(1), 181–188. https://doi.org/10.17509/ijomr.v4i1.72044

Kazazoglu, S. (2025). Environmental education through eco-literacy: Integrating sustainability into English language teaching. *Sustainability, 17*(5), Article 2156. https://doi.org/10.3390/su17052156

Kücükgül, E., Cerin, P., & Liu, Y. (2022). Enhancing the value of corporate sustainability: An approach for aligning multiple SDGs guides on reporting. *Journal of Cleaner Production, 333*, Article 130005. https://doi.org/10.1016/j.jclepro.2021.130005

Leal Filho, W., Salvia, A. L., & Eustachio, J. H. P. P. (2023). An overview of the engagement of higher education institutions in the implementation of the UN Sustainable Development Goals. *Journal of Cleaner Production, 386*, Article 135694. https://doi.org/10.1016/j.jclepro.2022.135694

Luft, J. A., Jeong, S., Idsardi, R., & Gardner, G. (2022). Literature Reviews, Theoretical Frameworks, and Conceptual Frameworks: An Introduction for New Biology Education Researchers. *CBE—Life Sciences Education, 21*(3), Article rm33. https://doi.org/10.1187/cbe.21-05-0134

McDonagh, M., Moloney, R., Moran, A., & Ryan, L. (2025). Exploring Nutrition and Agri-Food Educators' Knowledge of Food Sustainability: Insights Addressing Sustainability Education. *Sustainability, 17*(20), Article 9119. https://doi.org/10.3390/su17209119

Mishra, M., Desul, S., Santos, C. A. G., Mishra, S. K., Kamal, A. H. M., Goswami, S., Kalumba, A. M., Biswal, R., da Silva, R. M., dos Santos, C. A. C., & Baral, K. (2024). A bibliometric analysis of sustainable development goals (SDGs): A review of progress, challenges, and opportunities. *Environment, Development and Sustainability, 26*(5), 11101–11143. https://doi.org/10.1007/s10668-023-03225-w

Murti, W., Rohman, F., Sari, M. S., & Ibrohim. (2025). Ecoliteracy competencies: A systematic literature review of domains, approaches, and impacts in education. *Eurasia Journal of Mathematics, Science and Technology Education, 21*(8), Article em2677. https://doi.org/10.29333/ejmste/16658

Pouresmaieli, M., Ataei, M., Nouri Qarahasanlou, A., & Barabadi, A. (2024). Building ecological literacy in mining communities: A sustainable development perspective. *Case Studies in Chemical and Environmental Engineering, 9*, Article 100554. https://doi.org/10.1016/j.cscee.2023.100554

Schreiber, F., & Cramer, C. (2024). Towards a conceptual systematic review: Proposing a methodological framework. *Educational Review, 76*(6), 1458–1479. https://doi.org/10.1080/00131911.2022.2116561

Usman, A. A., & Mokotso, S. J. (2026). Utilization of ASSURE model instructional design in facilitating effective teaching and learning of social studies education in Nigeria. *International Journal of Education Effectiveness Research*.

Wilkerson, M. H., Kim, J., Lee, H. S., Stokes, D. J., & Ferrell, M. (2025). How Teachers Envision Using Data Visualization Discussion Tasks in Classroom Instruction. *International Journal of Science and Mathematics Education, 23*(7), 2653–2687. https://doi.org/10.1007/s10763-024-10521-y