

From Literacy to Multiliteracy: Validity and Practicality of The Multiliteracy Integrative Learning (MULGRANING) Model

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ABSTRACT

A learning model capable of integrating various literacies and disciplines is urgently needed to face the challenges of 21st-century learning. This need drives the development of the Multiliteracy Integrative Learning Model (MULGRANING) which focuses on language learning through the integration of various fields of science. This study aims to analyze the validity and practicality of the MULGRANING model. The research method used is research and development (R&D) using the Plomp & Nieveen model which consists of preliminary research, prototyping stage, and assessment stage. Data were obtained through expert validation and limited trials on teachers and students at the high school level, namely at SMAN 2 Padang and SMAN 9 Padang. The results of the study indicate that the MULGRANING model has high validity in terms of material (92%), presentation (96%), language (84%), graphics (77%), model syntax (88%), social system (90%), reaction principle (84%), support system (91%), instructional and accompanying impact (88%). Furthermore, teachers and students rated this model as practical to implement, with an average student practicality score of 91% and a teacher practicality score of 95%. The model is categorized as very practical because it provides a clear learning flow, varied activities, and allows for the development of language skills and 21st-century skills. Based on these findings, it can be concluded that this model can be used as an alternative in the language learning process.

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INTRODUCTION

Literacy is a fundamental human right, which has great potential to improve the quality of education and individual life (Buvabaevna, 2021). The presence of a society skilled in literacy is often used as an indicator of a nation's progress; therefore, the integration of literacy in the educational process in schools is important (Purwanto et al., 2023). However, literacy assessment standards have changed over time. In the 21st century, reading and writing skills are no longer considered the only indicators of literacy. Literacy today includes not only understanding printed texts, but also various digital and multimodal formats (Dahlström, 2022). In addition, writing skills are no longer limited to writing on paper, but include various media. This development broadens and complicates the meaning of literacy. Therefore, literacy in the modern era is viewed as a multidimensional competency that necessitates understanding across various media and learning contexts (Belvončíková & Čiderová, 2022).

The development of technology and communication has expanded and reconstructed the meaning of literacy to be more complex, adaptive, and interconnected (Boche, 2014; Honan, 2012). Literacy is no longer understood merely as the ability to read and write in print, but as an integral part of the learning process that includes the ability to consume, produce, evaluate, and distribute information in various multimedia formats (Cope & Kalantzis, 2009; Kahn & Kellner, 2023). In this context, educators have a responsibility to guide students in mastering multiliteracy skills, which include the use of technology and digital media as part of the modern literacy process (Huot et al., 2025; Schlindwein, 2013). Recognition of the dramatic changes in literacy in the information age also emphasizes the importance of multiliteracies as a prerequisite for critical and equal participation in a 21st-century democratic society (Brown et al., 2010; Cope & Kalantzis, 2000; Haythornthwaite & Andrews, 2011). A multiliteracy pedagogical approach enables learners to use a variety of multimodal resources in constructing new meanings and understandings, and encourages the formation of a socially and culturally responsive curriculum (Lim & Tan-Chia, 2022).

Recent research confirms that multiliteracies approaches to language learning have a strategic role in broadening students' horizons in an increasingly diverse and globalized world, while adapting to the ever-evolving forms of text resulting from advances in information and multimedia technology (Akhtar, Gaffar, & Arifin, 2023; Draji et al., 2018; Ganapathy & Seetharam, 2016; Navehebrahim, 2011; Wang, 2015). This approach enables students to succeed in the context of a global society by building cross-cultural connections through language and channelling ideas and thoughts using cutting-edge technology, thereby strengthening learning networks that extend beyond the classroom (Başaran & Turan, 2025). Understanding the concept of multiliteracies is also important in developing an awareness of how to communicate and construct meaning, as well as its implications for language and literacy teaching (Breuer & Van Steendam, 2021; Han, 2021), which are directly related to future economic opportunities (Dawson & Sleemans, 2014). Even in the context of the industrial era, multiliteracies are still considered essential due to their contributions to strengthening democratic values, economic growth, and social stability (Kalman, 2018).

Previous research indicates that the implementation of multiliteracies in learning continues to face various obstacles, including the mismatch between theory and practice in the field (Elsner, 2011; Pishol & Kaur, 2015). Although there is awareness of the importance of multiliteracies and the potential of media such as graphic novels in enhancing student understanding, their application in a comprehensive learning model remains limited (Alobaid, 2025; Aguskin, 2024). Therefore, a more effective multiliteracies learning model design is needed, integrating technology and a multimodal pedagogical approach. One alternative solution is an integrative learning approach that unites various disciplines in an integrated manner to increase the interrelationships between materials (Barber, 2012; Gxekwa & Satyo, 2017). This approach is considered capable of equipping students with the ability to integrate multiple perspectives, an important competency in the 21st century (Higgs et al., 2010; Leonard, 2012). In addition to creating contextual and meaningful learning, the integrative approach also supports the development of key skills and deep conceptual understanding (Mpaata & Mpaata, 2019; Sweeney et al., 2015).

A key factor in integrative learning is encouraging students to apply theories learned in class to real-life situations (Lewis, 2017). This approach provides students with opportunities to strengthen and apply their knowledge and skills in various contexts through the integration of disciplines, methods, and forms of educational organization (Gxekwa & Satyo, 2017; Vedishenkova & Mironina, 2016). Integrative learning has been recognized as a crucial skill in supporting student success and is a component of high-impact educational practices (Selznick et al., 2022; Sullivan, 2023). This approach is also positively correlated with holistic learning outcomes, including literacy, social leadership, moral development, and attitudes toward diversity (Bhuttah et al., 2024). In addition, this approach

supports the cognitive development and identity formation of students more effectively than traditional methods (Abraham & Shih, 2015), while increasing motivation and creating a dynamic classroom atmosphere (Bruce, 2012; Litualy, 2016). In the context of language learning, Rivers' (1976) statement, which calls language teachers of all subjects, underscores that language is the foundation for other academic skills (Hassen, 2015). Therefore, integrating multiliteracies is important to expand the scope and context of teaching.

In response to the dynamics of education and the need for pedagogical renewal, the integration of multiliteracies with integrative learning is realized through the development of the Multiliteracy Integrative Learning Model (MULGRANING). This model integrates elements of multiliteracies, such as digital texts, multimedia, and multimodal forms, with an integrative learning approach that connects various knowledge and skills across disciplines in an integrated manner through reading and writing literacy, as well as digital media literacy (Barber, 2012; Gxekwa & Satyo, 2017). By implementing this model, language learning can be expanded to encompass contextual and applicable 21st-century literacy competencies. The development of the MULGRANING Model was motivated by the need for a learning approach that effectively integrates multiliteracy theory with classroom practice. In the context of globalization, students are required not only to master conventional literacy but also to develop skills in understanding and producing various types of texts, both printed and digital. Therefore, the MULGRANING Model is designed as a contextual interdisciplinary solution to create a learning process that is more relevant to the needs of today's students. Based on this explanation, the purpose of this study is to explain the quality of the valid and practical Multiliteracy Integrative Learning (MULGRANING) model in language learning. This research focuses on examining the model's fidelity to relevant theoretical foundations, its practical implementation in the classroom, and its ability to optimally support the achievement of learning objectives. Furthermore, it aims to provide a detailed overview of the components that comprise the MULGRANING model, thereby serving as a practical reference for teachers in designing innovative learning processes.

METHOD

This study employs the Plomp Model, which comprises three phases: preliminary research, prototype phase, and assessment phase (Plomp & Nienven, 2013). This model was chosen because it is flexible and allows adjustments to the educational context through a systematic development process. In this article, the results of the study are described during the prototype phase, specifically by analyzing the validity and practicality values of the developed learning model. In the prototype phase, there are three main activities: designing a product prototype, conducting formative evaluations, and making revisions. Each activity in this stage is explained in detail, along with the corresponding procedures, as follows. Designing a product prototype involves formulating and designing a support system that will be utilized in the MULGRANING model. The implementation of formative evaluation aims to see the validity and practicality of the prototype that has been designed. The formative evaluation used in prototype development refers to Wedman and Tessmer (1993), as seen in Figure 1.

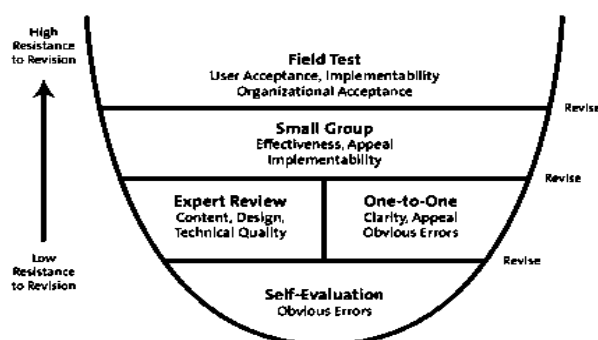


Figure 1. Prototype Formative Evaluation Process

The evaluation process of the MULGRANING model development was carried out through five systematic stages to ensure the quality, feasibility, and practicality of the product. The first stage involved self-evaluation, where researchers checked for apparent errors, such as spelling, punctuation, layout, and the use of visual elements, in the initial prototype using a checklist document, resulting in the second prototype. The second stage, expert review, was conducted by experts in the fields of education, learning technology, and language to validate the contents of the second prototype through a questionnaire, resulting in the third prototype. The third stage, one-to-one evaluation, involved six 11th-grade students from two schools with varying academic abilities to assess the practicality and implementation of the third prototype, resulting in the development of the fourth prototype. In the fourth stage, small group evaluation, nine students from each school assessed the fourth prototype in groups to ensure the product's suitability to user needs and real learning contexts, resulting in the fifth prototype. The final stage, field test evaluation, involved all 11th-grade students (64 students) from two schools to assess the practicality of the 5th prototype as a whole. This was achieved through observation of learning activities and assessment questionnaires, with the aim of obtaining data on skill achievement and the overall effectiveness of the model.

The population in this study consisted of all public high school students in Padang City, encompassing 17 schools. The sample selection was carried out purposively, considering several criteria, including registration as public high school students in Padang City, openness to innovation, ability to work collaboratively, availability of adequate facilities and infrastructure, ability to learn via mobile phones, and implementation of the Merdeka Curriculum. Based on these considerations, SMAN 2 Padang and SMAN 9 Padang were chosen as research locations because they have different geographical distributions and are expected to represent the diversity of student characteristics. The research instrument used in this study was a model book validation sheet, which aims to assess the completeness and accuracy of the learning model book components from an expert perspective. The assessment aspects in the MULGRANING learning model book validation sheet are presented in Table 1. Furthermore, the product's practicality was tested at the one-to-one evaluation, small group evaluation, and field test evaluation stages using a questionnaire. These practicality sheets are used to assess how easily students can understand and use the developed product. In addition, a practicality questionnaire is also used by the teacher.

Table 1. Assessment of MULGRANING Model Book Components

Assessment Aspects	Assessment Indicators
Book material/content	Model book according to learning needs
Presentation	Clarity of objectives to be achieved from the presentation of material
Language	in the model book
Graphics	Clarity and suitability to the substance of learning
Model syntax	Benefits of the presentation of material to increase insight Presentation of the main ideas of the material.
Social system	Presentation of material that is well-organized, logical, and structured
Reaction principle	Standardity of the language used
Support system	Suitability of the language used with the reader
Instructional and	Layout of content
accompanying impact	Selection of letters
Book material/content	Selection of illustrations
Presentation	
Language	Scope of aspects of learning syntax
Graphics	Presentation of phases in syntax
Model syntax	Implementation of learning syntax
Social system	Clarity of the role of teachers and students in implementing the learning model
Reaction principle	Clarity of the principles of implementing learning
Support system	Contribution of support systems in implementing the learning model
Instructional and	Scope of instructional and accompanying impacts in implementing the
accompanying impact	learning model.

The data collection techniques used in this study are presented in Table 2.

Table 2. Data collection technique

Activity	Instrument	Purpose of Data Collection
Self-evaluation	Research note sheet	Analyze errors through a checklist of intervention designs.
Expert validity	Product validity sheet	Obtain information on the feasibility of interventions from an expert/specialist perspective.
One-to-one evaluation	Practicality assessment sheet	Test the practicality of implementing the product to potential individual users.
Small Group Evaluation	Practicality assessment sheet	Test the practicality of implementing part of the product to users on a small scale.
Field test	Practicality assessment sheet	Test the practicality of implementing the entire model in large-scale user settings and typical learning environments.

Descriptive data analysis in this study serves to evaluate the level of validity and practicality of the prototype product development. This analysis technique involves calculating the average value and percentage of achievement for each assessed aspect, as shown in Table 1. Product validity is assessed based on the evaluation of experts or validators regarding the content, presentation, language, and usefulness of the material within the learning context, as detailed in Table 3. Meanwhile, the practicality aspect is analyzed through the responses of teachers and students given after a series

of limited and extensive field trials. These responses include ease of use of the media, clarity of material delivery, and its usefulness in the teaching and learning process. This descriptive analysis aims to provide an empirical and objective assessment of the product's quality. The findings from this analysis are used as a basis for revising and refining the prototype before its wider implementation in educational settings.

Table 3. Product Validator

Component	Validator
Materials and Content Component	Dr. Nursaid, M.Pd. & Dr. Afnita, M.Pd.
Presentation	Dr. Nursaid, M.Pd. & Dr. Afnita, M.Pd.
Language	Dr. Tressyalina, M.Pd & Dr. Ridha Hasnul Ulya, M.Pd.
Graphics	Prof. Dr. Darmasyah, S.T. M.Pd. & Dr. Ulfia Rahmi, M.Pd.
Model Syntax Components	Dr. Nursaid, M.Pd. & Dr. Afnita, M.Pd.
Model Social System	Dr. Nursaid, M.Pd. & Dr. Afnita, M.Pd.
Model Reactions Principles	Dr. Nursaid, M.Pd. & Dr. Afnita, M.Pd.
Model Support Systems	Dr. Nursaid, M.Pd. & Dr. Afnita, M.Pd.
Model Instructional and Accompanying Impacts	Dr. Nursaid, M.Pd. & Dr. Afnita, M.Pd.

RESULTS AND DISCUSSION

Based on the results of interviews with teachers, the needs in learning, especially for the MULGRANING model, include several important aspects, including flexibility in adjusting learning to students' needs and interests, cross-disciplinary integration, contextualization of materials through application projects, strengthening character through a social-emotional approach such as the Pancasila Student Profile Strengthening Project (P5), and suitability with facilities and infrastructure including the use of digital technology such as PowerPoint and Google Classroom. Teachers also expect learning tools, such as books and modules, to have a simple yet attractive format, transparent and communicative language, and visual displays that support understanding. Additionally, the model should encourage active and participatory learning through discussions, collaborative projects, and the use of interactive technology to enhance student engagement. The evaluations used are also expected to be diverse, including formative, summative, and project-based assessments to obtain a comprehensive picture of student development. During the implementation process, the model must be tailored to accommodate student characteristics and provide clear activity steps to facilitate collaboration in the development and implementation of learning. Meanwhile, from the students' perspective, the ideal learning model, according to them, involves hands-on activities such as discussions and projects, strengthens language skills, provides complete learning tools and access to digital media, integrates cross-field knowledge such as culture and environment, and equips them with relevant competencies in the era of disruption through the use of technology and interdisciplinary approaches.

Based on the explanation of the needs analysis, the Multiliteracy Integrative Learning (MULGRANING) model was developed in language learning. Based on the literature reviewed, several studies have explored various aspects of multiliteracy theory and integrative learning approaches; however, few have integrated the two in the form of a comprehensive learning model, such as MULGRANING. Kalantzis and Cope (2005), in their work on multiliteracy, describe basic processes such as experiencing, conceptualizing, analyzing, and applying, but they do not explicitly link these processes to the syntax of a particular learning model. Their research focuses more on theoretical understanding and practice of multiliteracy rather than practical application in a specific learning model.

Leonard (2007) emphasized the importance of application, comparison, understanding context, and synthesis in interactive learning, but also did not directly develop a learning model that combines all of these elements in a structured syntax. Leonard's research emphasizes conceptual frameworks and practical applications, but does not develop a systematic model that can be widely adopted in education. Thus, the development of the MULGRANING model, which integrates the syntax of multiliteracy and integrative learning, is a significant innovation in the field of education, particularly in language learning. This model offers a more holistic and structured approach, which has not been fully explored in previous research, thereby providing new contributions that can enrich educational practices and inform further research. Based on this, the Grand Design of the MULGRANING model was developed in accordance with the two theories presented previously. Based on this, the MULGRANING model was developed, as shown in Figure 2. Learning using the MULGRANING model is illustrated in Indriyani et al. (2023).



Figure 2. Conceptual Framework for Developing the MULGRANING Model

The findings of errors in prototype one were obtained after the researcher conducted a self-evaluation by re-reading the designed product. The main errors to be noted are typos, sentence structure errors, and the appropriateness of Indonesian spelling, as well as the consistency of image and table numbering. These errors can be revised directly before proceeding to the next stage. Based on self-assessment, several errors were identified, including inconsistencies in sub-chapter numbering, term use, paragraph coherence, typos, and citation consistency. Prototype 1 was revised by addressing the identified errors before proceeding to the expert review stage for validation. Revision of prototype one is necessary to ensure that all errors are corrected before obtaining feedback from experts. This process is important because validation by experts will provide a more in-depth evaluation of the prototype's suitability for the desired objectives. By conducting revisions first, it is hoped that prototype two will be more mature and ready for further testing. After improvements are made, prototype one is then developed into prototype two.

Self-assessment ensures the logical consistency and suitability of the model to the theoretical framework and the stated objectives (Wright et al., 2024). Expert validation was conducted to assess technical and display validity, with iterative feedback used to correct any weaknesses identified. Practical testing in a real environment by students and teachers aimed to evaluate the operational validity and practicality of the model (Kerimoğlu et al., 2023). The prototype of this model was revised and improved based on the feedback obtained from each evaluation stage. The main criteria in the

evaluation include internal validity, which ensures logical consistency between model components (Kerimoğlu et al., 2023), external validity to assess the applicability and reliability of the model in various contexts (Wright et al., 2024), and the practicality aspect, which evaluates the ease of implementation based on input from end users. The revision process was carried out iteratively based on feedback from experts and practical users. Additionally, data-driven adjustments were made to ensure the model achieved the desired results, based on an analysis of evaluation results (Noh et al., 2017). Overall, the comprehensive research results show that the MULGRANING Model is theoretically valid, practical to apply in various learning contexts, and effective in improving the quality of education in the era of disruption.

The process of revising and validating educational prototypes involves self-assessment and expert validation to ensure the quality and reliability of the materials developed. In the self-assessment stage, prototype one was revised to correct identified errors, ensuring that prototype 2 was more mature before expert validation was carried out (Kunwar et al., 2023; Navarro et al., 2023). This self-assessment is a crucial step in developing a learning model, emphasizing that thorough self-evaluation allows for the identification and correction of errors before the model is introduced for expert validation. Additionally, self-evaluation is crucial in ensuring the quality and accuracy of the prototype before involving external assessors (Wylie & Lyon, 2019).

The validity test was conducted to ensure that prototype 2 met the expected quality standards before being widely implemented. This process involved a comprehensive evaluation by a team of validators who assessed various aspects of the product. The results of the calculation provide an overview of the extent to which the prototype has met the criteria required for use in a learning context. Thus, the development of model books, teaching modules, and teacher guides becomes more focused and in accordance with the objectives to be achieved through the MULGRANING learning model. The consensus data from expert assessments of the MULGRANING model book prototype are presented in Figure 3.

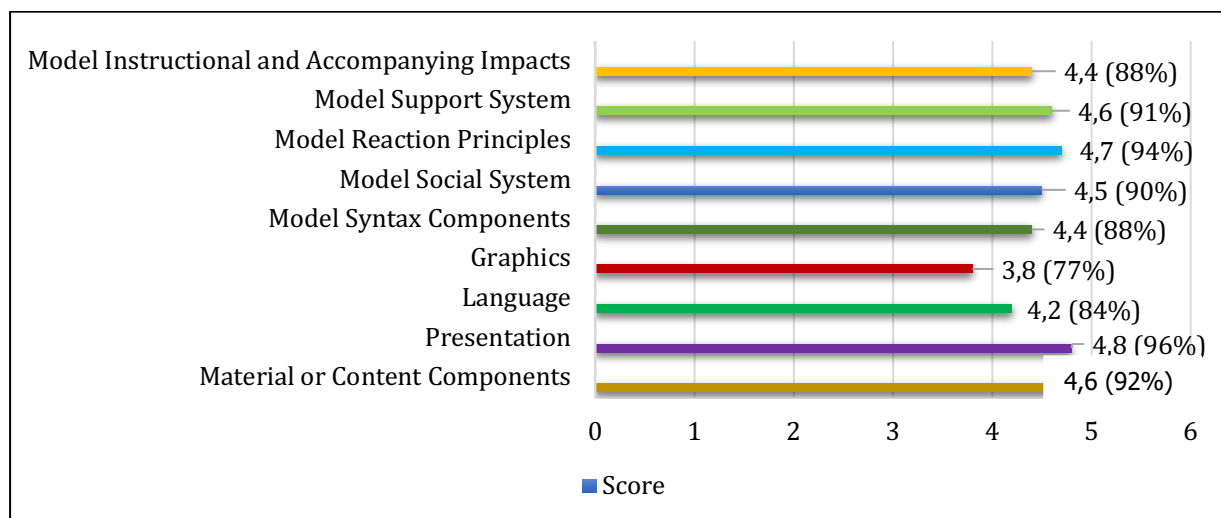


Figure 3. Validation Results of the MULGRANING Model Book Prototype

Based on Figure 3, the MULGRANING model book prototype generally meets very valid criteria, with a holistic average of 4.4 and an achievement percentage of 89%. There are several suggestions regarding each component of the model book assessment, such as the theoretical basis of the model book, the explanation of learning syntax, and model book graphics, including image selection and the addition of illustrations. Additionally, it is essential to consider the language of the model book, including the assessment of foreign terms, EYD, and the selection of diction.

Based on expert validation, all components of the developed product—namely, model books, teaching modules, student books, and teacher books—were assessed as "very valid" due to consistently high average scores across evaluation instruments. The validation process covered multiple aspects, including curriculum alignment, clarity of presentation, linguistic accuracy, and practical usability in real classroom contexts. This holistic validation approach aligns with [Navarro et al. \(2023\)](#), who emphasized the importance of expert review in ensuring content relevance and instructional quality. [Indahwati et al. \(2020\)](#) and [Lidiastuti et al. \(2020\)](#) also support the use of integrated evaluation criteria in assessing educational resources, emphasizing the value of involving experts from various fields. This comprehensive validation ensures not only content accuracy but also structural consistency and practical feasibility. According to [Cheng et al. \(2024\)](#), such expert-led validation minimizes potential design flaws before broader implementation. The process also aligns with [Teferra et al. \(2014\)](#), who consider expert validation a crucial stage for guaranteeing the educational value and scalability of learning innovations. Thus, expert validation in this study serves not merely as a procedural necessity, but as a central mechanism for ensuring the quality and readiness of instructional products.

This study presents a distinct novelty in the application of integrated, multi-component validation. The innovation lies in validating all instructional components—model books, modules, student books, and teacher books—simultaneously within a single, complementary system. Unlike previous studies that tend to evaluate components in isolation, this approach acknowledges the interdependence between instructional tools and promotes cohesion from the outset ([Shibani et al., 2023](#)). This integration enhances internal consistency, minimizes implementation redundancy, and enables teachers to apply the learning system without needing to realign materials individually. It also strengthens alignment among learning goals, instructional processes, and assessment strategies, ensuring a more fluid instructional experience. Compared to fragmented validation practices, this model achieves greater efficiency and ensures instructional harmony across devices. In practical terms, this facilitates smoother implementation and reduces teachers' cognitive load. From a development standpoint, this structured, cross-component validation method establishes a higher standard for model coherence and instructional integration. It also opens possibilities for replicable frameworks in future learning model development.

Beyond its novelty, the study reaffirms expert validation as a critical phase in educational model development. Experts contributed significantly to identifying weaknesses and providing constructive feedback that informed targeted revisions. This aligns with [Dawood et al. \(2021\)](#), who emphasized the role of expert review in increasing the reliability and usability of instructional designs. Validation also ensured alignment with curricular standards while supporting pedagogical flexibility, making the model applicable across diverse learning contexts. As [Mallpress and Špinka \(2023\)](#) noted, models lacking rigorous expert evaluation often struggle with classroom acceptance due to misalignment between design and implementation realities. The experts involved in this study brought diverse expertise in curriculum, pedagogy, instructional media, and evaluation, ensuring that the prototype is both academically grounded and field-ready. Their insights not only enhanced model credibility but also contributed to its adaptability for varied user needs. This reinforces the perspective that validation must be an integrated part of model development, especially for instructional systems targeting 21st-century learning competencies. Hence, expert validation serves as both a theoretical filter and a practical instrument for refining and optimizing learning innovations.

The contribution of this research to educational science lies in its advancement of an integrated, systemic validation methodology for instructional design. In the context of the Kurikulum Merdeka (Independent Curriculum), which emphasizes flexibility, contextualization, and multimodal literacy, this approach is timely and relevant. The study bridges theoretical models—particularly

multiliteracies frameworks—with practical considerations, including usability, feasibility, and scalability. By demonstrating that validation across components can be conducted holistically, this research offers a blueprint for future model development grounded in both rigor and relevance. Furthermore, it emphasizes the importance of expert feedback as a crucial quality assurance tool in the development of learning resources. In practical terms, this model reduces developmental lag and expedites the refinement process before mass implementation. The product prototype assessed in the one-to-one evaluation is the implementation of learning using the MULGRANING syntax, assisted by student books. The implementation of this evaluation was carried out by six students, with two students assigned to each of the low, medium, and high ability groups. The results of this evaluation were based on a practicality questionnaire completed by students. The results of the student assessment analysis at the one-to-one evaluation stage are presented in Figure 4.

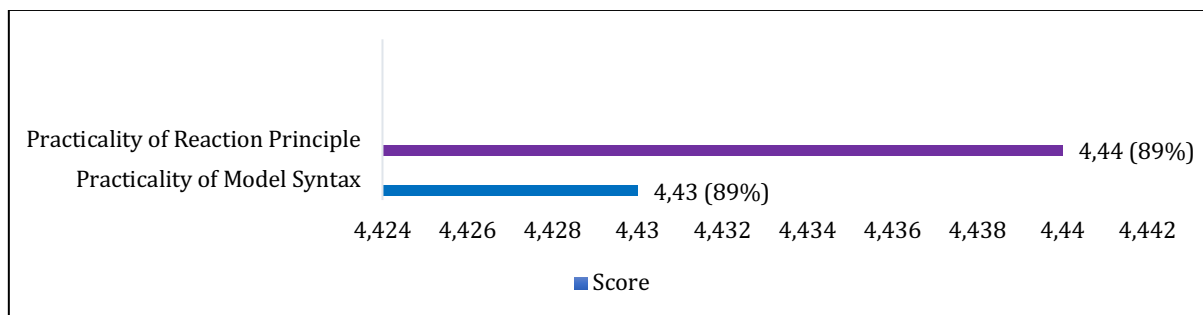


Figure 4. Results of One-to-one Evaluation

Based on Figure 4, the prototype learning model generally meets very practical criteria, with a holistic average of 4.3 and an achievement percentage of 89%. Based on this, it is indicated from the student's perspective that the implementation of the learning process provides convenience and supports learning. In addition to the quantitative data analyzed above, qualitative data were also obtained from the practicality test questionnaire, assessed by students, in the form of comments and suggestions. From the results of observations carried out during the One-to-one Evaluation activity, qualitative data were also obtained in the form of research notes. Data on comments, suggestions, and research notes at the One-to-one Evaluation stage are presented in Table 4.

Table 4. One-to-one Evaluation Results Report

Comments and Suggestions	Researcher's Notes	Follow-up
Use simple and clear sentences.	Students often experience a lack of	Fixed by
Illustrations should not be too long.	time to complete the questions.	adjusting time
Time is too fast for each learning step.	Students with low abilities often	allocation
So, completing the worksheet too	struggle to match the rhythm of	
hastily is not advisable.	completing exercises, even though	
The letters are too small and the	they can complete them accurately.	
spacing is tight.		

The product prototype assessed in the small group evaluation is the implementation of learning using the MULGRANING syntax, assisted by student books. The implementation of this evaluation was carried out by nine students, with three students assigned to each of the low, medium, and high ability groups. The results of this evaluation were based on a practicality questionnaire completed by students. The results of the student assessment analysis at the small group evaluation stage are presented in Figure 5.

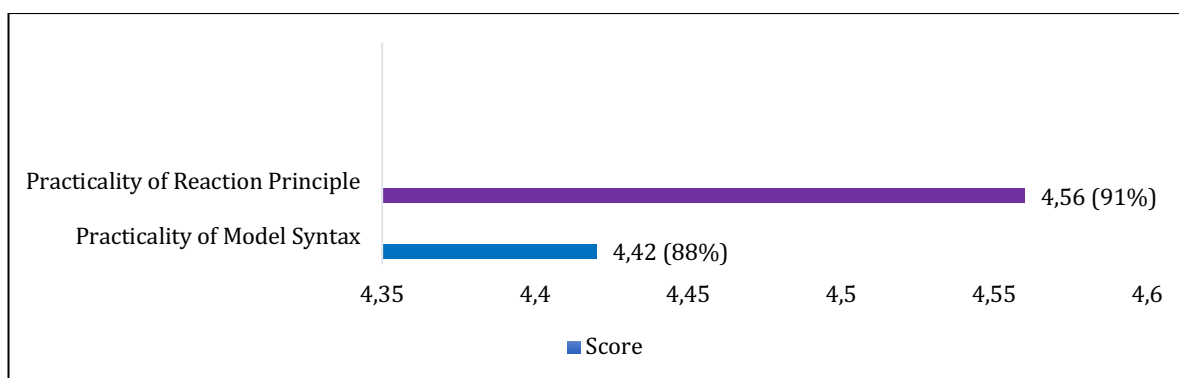


Figure 5. Results of Small Group Evaluation

Based on Figure 5, the prototype learning model generally meets very practical criteria, with a holistic average of 4.45 and an achievement percentage of 89%. Based on this, it is indicated from the student's perspective that the implementation of the learning process provides convenience and supports learning. In addition to the quantitative data analyzed above, qualitative data were also obtained from the practicality test questionnaire, assessed by students, in the form of comments and suggestions. From the results of observations carried out during the Small Group Evaluation activity, qualitative data were also obtained in the form of research notes. Data on comments, suggestions, and research notes at the One-to-one Evaluation stage are presented in Table 5.

Table 5. Comments and Suggestions on Small Group Evaluation Results

Comments and Suggestions	Researcher's Notes	Follow-up
Learning is carried out in a fun way.	Learning activities carried out in	Already
The learning process is easy for students to follow.	small groups run well if the	repaired
Learning time is sufficient to complete tasks well.	group members come from	
Some learning activities are too fast; teachers are expected to give students time to think.	diverse abilities.	
	Learning has progressed well;	
	the rhythm of learning is	
	smooth.	
	All students can participate well.	

This practicality test was conducted during the trial stage of the research, which lasted eight weeks. The trial was conducted within the actual classroom learning process, comprising 16 meetings, each lasting 2 hours and 45 minutes. The learning process took place face-to-face, with 1-2 meetings conducted via Google Meet. Students used digital student books and were also equipped with e-learning tools using Google Classroom. The implementation of learning was carried out directly by the Indonesian language subject teacher, assisted by two observers at each meeting. Students were also allowed to ask if there was any information that was not understood during the implementation of learning using this MULGRANING model, either with the teacher or the observer. To obtain this practicality value, a questionnaire was distributed, which was completed by both the teacher and students after the learning process had taken place. This practicality assessment is the final assessment to determine the implementation of learning through the MULGRANING syntax, assisted by student books and interactive learning media. Additionally, it assesses the reaction principle of the developed model. The results of the practicality assessment by students at this stage are shown in Figures 6 and 7.

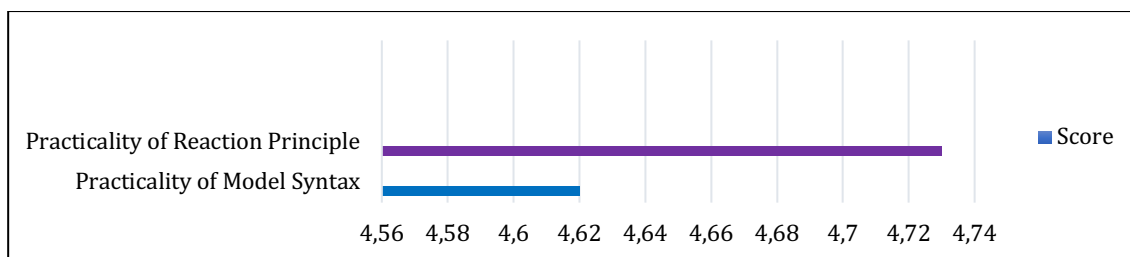


Figure 6. Practical Learning Model by Students of SMAN 2 Padang

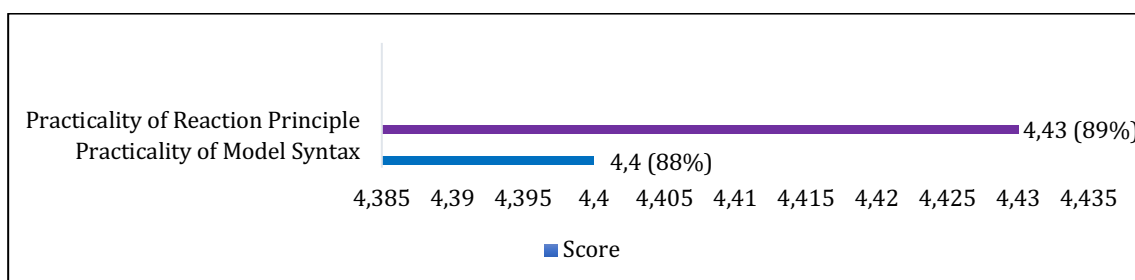


Figure 7. Practical Learning Model by Students of SMAN 9 Padang

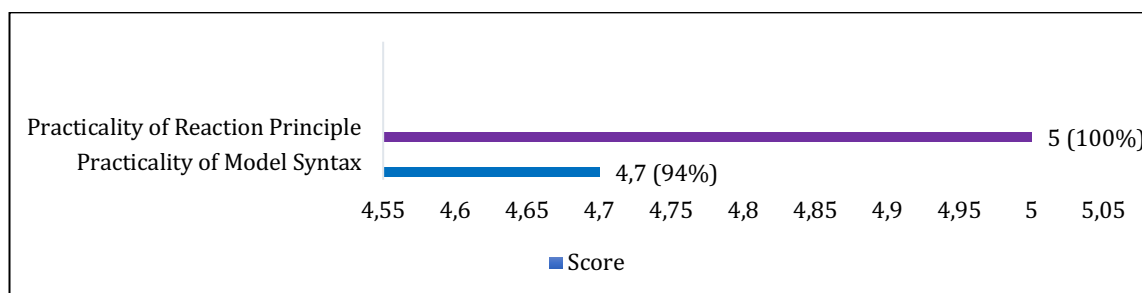


Figure 8. Practical Learning Model by Teacher

Based on Figure 6, it can be observed that the prototype of the learning model assessed by students of SMAN 2 Padang, the research subject, generally meets very practical criteria with a holistic average of 4.64 and an achievement percentage of 93%. Furthermore, based on Figure 7, it can be observed that the prototype of the learning model assessed by students of SMAN 9 Padang, the research subject, generally meets very practical criteria, with a holistic average of 4.41 and an achievement percentage of 88%. Based on this, it is evident from the students' perspective that the implementation of the learning process provides convenience and supports learning. Based on Figure 8, it can be observed that the prototype of the learning model assessed by the Indonesian language subject teacher at the research location generally meets very practical criteria, with a holistic average of 4.74 and an achievement percentage of 95%. Based on this, it is evident from the teacher's perspective that implementing the learning process provides convenience and supports learning. Although the practicality of implementing the MULGRANING model is considered very good, several notes can be made to improve the model. User notes are presented as follows.

First, the notes by Fanny Falma Masful, M.Pd., the Indonesian language teacher at SMAN 2 Padang, regarding the implementation of the MULGRANING model, are as follows. (1) The implementation of learning can be carried out based on the steps in the teaching module, but the completion of each meeting sometimes does not go according to plan if there are students who take a long time to complete their assignments. (2) The use of Google Classroom in helping students learn together through interactive media, but the implementation of direct discussions in class may be more

effective if learning is carried out face-to-face. (3) Teachers are interested in using the MULGRANING learning model for Indonesian language learning in other classes. However, training may be needed to develop modules using the MULGRANING model, considering that at the time of the study, the teaching module had already been provided, making it easier.

Second, the notes by Veronika Julia Putri, S.Pd., the Indonesian language teacher at SMAN 9 Padang, regarding the implementation of the MULGRANING model, are as follows. (1) The steps in MULGRANING learning, although consisting of 8 steps, are easy to follow. (2) The implementation of learning is less effective during the fasting month, so there is a break in this learning. Although learning is carried out virtually, I think it is more practical when it is conducted face-to-face. (3) Teachers are interested in using the MULGRANING learning model for Indonesian language learning by integrating learning with other topics, such as arts, which are integrated into drama learning.

Third, the following are some summaries of notes submitted by students through questionnaires. (1) Learning by utilizing information from various sources is very interesting, especially when looking for more reliable sources. Typically, sources from Google are often used in learning. Currently, we have recognized articles and papers as reliable sources of information for learning. (2) Assignments done through Google Classroom are fun because they are easy to revise compared to handwriting. However, some students stated that they prefer assignments written on paper. (3) Presentation activities carried out in groups are better when performed alone, and students feel more confident. (4) Making projects at the end of learning, when implementing and applying learning, feels impressive and meaningful, because students, together with their groups, can create short works based on the knowledge they have gained to be applied through a group project.

At the practicality test stage, the MULGRANING learning model demonstrated a very high level of practicality, as assessed by both teachers and students. The test was conducted in stages, comprising three main phases: one-on-one testing, small group testing, and large group testing. Each stage of testing was designed to evaluate the ease of use, clarity of the material, and effectiveness of the model's implementation in real learning situations. The test results showed that both teachers and students felt helped by the systematic syntactic structure and multimodal teaching materials. This finding aligns with [Mallpress and Špinka \(2023\)](#), who emphasize the importance of practicality assessments from various end users as a key indicator of the success of a learning model. Furthermore, [Yerimadesi et al. \(2019\)](#) also emphasized that user involvement in different environments can reveal the strengths and weaknesses of the model, thus providing a strong basis for improvement. Therefore, user involvement in practicality testing is a crucial part of the evaluation process of this model. Based on the research results, the following is a summary of the validity and practicality values of the MULGRANING model, as shown in Table 6.

Table 6. Recapitulation of Validity and Practicality Values of the Model

Assessment Components	Average value	Category
Self-Evaluation	-	-
Expert Validation	89%	Very Valid
One-to-one Evaluation	89%	Very Practical
Small Group Evaluation	90%	Very Practical
Field Test Evaluation (Students)	91%	Very Practical
Field Test Evaluation (Teachers)	97%	Very Practical

The novelty of the MULGRANING model lies explicitly in the integration of the multiliteracies approach with syntax-based integrative learning that is oriented towards collaborative processes and the application of real-world contexts. Unlike previous models that only emphasize printed texts or

linguistic aspects alone, this model is designed to encourage 21st-century skills through the use of digital, multimodal, and collaborative media. This approach enables students not only to understand texts in various forms but also to relate them to authentic and cross-disciplinary experiences. The practicality test proves that the structure of this model is flexible and can be adapted in various contexts of Indonesian language learning at the junior high school level. This makes MULGRANING not only relevant in the context of the national curriculum but also responsive to the development of global digital literacy. This finding supports the view of [Kastur et al. \(2020\)](#) that models that involve teachers and students in the development and evaluation process have a greater chance of being successfully implemented widely. In addition to showing a high level of practicality, this test makes a real contribution to strengthening the empirical basis for the development of multiliteracies-based learning models. This study directly supports the multiliteracy theory, which emphasizes the importance of using multimodal materials in learning to improve students' understanding of various forms of communication ([Eteokleous et al., 2015](#)). On the other hand, this model also considers critical factors in implementing multiliteracies in secondary schools, as stated by [Kangas and Rasi \(2021\)](#), namely the need for flexibility, active participation, and interdisciplinary connectivity. By considering these three aspects in designing the model, MULGRANING presents a new approach that not only equips students with functional literacy skills but also critical and creative literacy.

The scientific contribution of this study lies in the development of a learning model based on multiliteracies theory and has been thoroughly tested through validation and practicality stages. This model aligns with the latest learning evaluation guidelines, which recommend integrating feedback from various stakeholders to enhance effectiveness ([Ching et al., 2013](#)). Thus, the MULGRANING model not only provides solutions to the challenges of 21st-century literacy but also expands the discourse in the development of multiliteracies-based instructional design. This research is expected to serve as a reference for the development of other innovative learning models that emphasize the integration of scientific fields, multimodality, and a focus on language learning.

The widespread application of this model has the potential to significantly impact the quality of the process and outcomes of Indonesian language learning, particularly in developing students' multimodal literacy skills. Through integrative learning, syntax, and activities oriented towards active participation, students not only understand the material conceptually but are also able to communicate ideas creatively in various media formats. Another impact is the creation of a more inclusive learning environment, where teachers and students interact dynamically in the process of constructing meaning. This model is also relevant to the demands of the Merdeka Curriculum, which emphasizes strengthening 21st-century competencies. If implemented sustainably and supported by the development of adaptive teaching tools, the MULGRANING model has the potential to become a strategic innovation in creating language learning that is not only oriented towards academic outcomes, but also towards developing students' long-term literacy capacity in the digital era.

Although this study demonstrates that the Multiliteracy Integrative Learning Model (MULGRANING) has high validity and practicality, several limitations should be noted. First, the model was tested on a limited scale, both in terms of the number of schools and the diversity of student backgrounds, so the results cannot be fully generalized to all Indonesian language learning contexts in various regions. Second, this study was conducted on scientific texts, so its application in learning other types of texts is explored more broadly. Furthermore, external factors such as technological infrastructure support, the availability of learning media, and teacher competence in integrating multiliteracy principles into the curriculum can also influence the successful implementation of this model. Therefore, further research with a broader scope and more prolonged duration is needed to strengthen these findings and identify optimal strategies for implementing the MULGRANING model in various learning contexts.

CONCLUSION

Based on the results and discussions in this study, it is concluded that the Multiliteracy Integrative Learning Model (MULGRANING) has valid and practical characteristics in learning Indonesian. The validity of this model is reflected in the results of expert assessments of the components of material, presentation, language, graphics, and content in the model book, which is designed to be relevant to the curriculum, student needs, and the theory and philosophy of multiliteracy learning. The material is arranged logically and interactively, the use of communicative Indonesian language pays attention to readability and consistency of terms, and the graphic display supports understanding with informative illustrations and typography. The learning syntax in this model aligns with the principles of multiliteracy and an integrative approach, and is designed to systematically develop students' multiliteracy skills while integrating them with the 21st-century curriculum. This model has also proven to be practical in its implementation, as shown by the positive responses of teachers and students to the clear syntactic flow and activities that encourage active involvement. Students experience a more meaningful learning experience because this model facilitates relationships between information and encourages independent expression of ideas. With high flexibility in various materials and classroom conditions, the MULGRANING model can be implemented effectively. Based on these conclusions, it is recommended that the Multiliteracy Integrative Learning (MULGRANING) model be implemented more widely in Indonesian language learning to improve students' multiliteracy skills. Teachers are advised to undergo training related to the syntax and basic principles of this model in order to apply it optimally at various levels of education.

REFERENCES

- Abraham, S., & Shih, L. (2015). Instructional Perspective: Towards an Integrative Learning Approach in Cybersecurity Education. *Information Security Education Journal*, 2(2), 84–90.
- Aguskin, L. C. (2024). Exploration of Multiliteracy Practices Among Indonesian University Students and Multiliteracies Pedagogy in the Reading Classroom. *ESBB*, 10(2), 94–125.
- Akhtar, J. A., Gaffar, A., & Arifin, S. (2023). Implementation of Multiliteration Pedagogy in Education: A Socio-Cultural Perspective. *FIKROTUNA: Jurnal Pendidikan dan Manajemen Islam*, 12(2), 29–47.
- Alobaid, A. (2025). A Didactical Framework for Raising Awareness of Digital Multiliteracies Among University Students: Objectives, Expectations and Challenges. *Discover Education*, 4(1), 1–17.
- Başaran, O., & Turan, S. (2025). Reimagining Local Solutions to Global Challenges in Education: A Cross-Cultural Examination. In *Cultural Awareness and Diversity Management in Contemporary Education* (pp. 99–192). IGI Global Scientific Publishing.
- Barber, J. P. (2012). Integration of Learning: A Grounded Theory Analysis of College Students' Learning. *American Educational Research Journal*, 49(3), 590–617.
- Belvončíková, E., & Číderová, D. (2022). One Literacy and Multiple Intelligences? The Case of Media Literacy. *Media Literacy and Academic Research*, 5(2), 54–70.
- Bhuttah, T. M., Xusheng, Q., Abid, M. N., & Sharma, S. (2024). Enhancing Student Critical Thinking and Learning Outcomes Through Innovative Pedagogical Approaches in Higher Education: The Mediating Role of Inclusive Leadership. *Scientific Reports*, 14(1), 24362.
- Boche, B. (2014). Multiliteracies in the Classroom: Emerging Conceptions of Firstyear Teachers. *Journal of Language & Literacy Education*, 10(1), 114–135.
- Breuer, E. O., & Van Steendam, E. (2021). Multiple Approaches to Understanding and Working with Multilingual (Multi-) Literacy. *Multilingual Literacy*, 1–18.
- Brown, I., Lockyer, L., & Caputi, P. (2010). Multiliteracies and Assessment Practice. In *Multiliteracies in Motion: Current Theory and Practice* (pp. 191–206). Routledge.
- Bruce, T. D. (2012). *Theories of Language Learning in Second Language*. Hurst & Company.

- Buvabaevna, K. Y. (2021). Issues of Civil Literacy Development in the Education System. *Annals of the Romanian Society for Cell Biology*, 25(4), 5477–5489.
- Cheng, L., Fang, G., Zhang, X., Lv, Y., & Liu, L. (2024). Impact of Social Media Use on Critical Thinking Ability of University Students. *Library Hi Tech*, 42(2), 642–669.
- Ching, A. T., Erdem, T., & Keane, M. P. (2013). Learning Models: An Assessment of Progress, Challenges, and New Developments. *Marketing Science*, 32(6), 913–938.
- Cope, B., & Kalantzis, M. (2000). *Multiliteracies: Designing Social Futures*. Routledge.
- Cope, B., & Kalantzis, M. (2009). 'Multiliteracies': New Literacies, New Learning. *Pedagogies*, 4(3), 164–194.
- Dahlström, H. (2022). Students as Digital Multimodal Text Designers: A Study of Resources, Affordances, and Experiences. *British Journal of Educational Technology*, 53(2), 391–407.
- Dawood, K. A., Sharif, K. Y., Ghani, A. A., Zulzalil, H., Zaidan, A. A., & Zaidan, B. B. (2021). Towards a Unified Criteria Model for Usability Evaluation in the Context of Open Source Software Based on a Fuzzy Delphi Method. *Information and Software Technology*, 130, 106453.
- Dawson, S., & Sleemans, G. (2014). Analytics to Literacies: The Development of a Learning Analytics Framework for Multiliteracies Assessment. *The International Review of Research in Open and Distance Learning*, 15(4), 284–305.
- Drajati, N. A., Tan, L., Haryati, S., Rochsantiningsih, D., & Zainnuri, H. (2018). Investigating English Language Teachers in Developing TPACK and Multimodal Literacy. *Indonesian Journal of Applied Linguistics*, 7(3), 575–582.
- Elsner, D. (2011). Developing Multiliteracies, Plurilingual Awareness & Critical Thinking in the Primary Language Classroom with Multilingual Virtual Talkingbooks. *Encuentro*, 20, 27–38.
- Eteokleous, N., Pavlou, V., & Tsolakidis, S. (2015). Integrating the Multimedia Builder Software as an Education Tool to Deliver Fairy Tales: Promoting Multiliteracies and Multimodality. *Journal of Interactive Learning Research*, 26(1), 65–88.
- Ganapathy, M., & Seetharam, S. A. (2016). The Effects of Using Multimodal Approaches in Meaning-Making of 21st Century Literacy Texts Among ESL Students in a Private School in Malaysia. *Advances in Language and Literary Studies*, 7(2), 143–155.
- Gxekwa, N., & Satyo, N. (2017). The Use of isiXhosa Children's Poetry as a Tool to Integrate Literacy, Mathematics and Life Skills in Foundation Phase: Grade R-3 Research Method. *South African Journal of Childhood Education*, 7(1), 1–7.
- Han, Y. (2021). Understanding Multilingual Young Adults and Adolescents' Digital Literacies in the Wilds: Implications for Language and Literacy Classrooms. *Issues and Trends in Learning Technologies*, 9(1), 27–46.
- Hassen, R. (2015). Implementation of Online Reading Assessment of Encourage Reading Interests. *English Language Teaching*, 18(11), 197–206.
- Haythornthwaite, C., & Andrews, R. (2011). *E-Learning Theory and Practice*. Sage Publications.
- Higgs, B., Kilcommmins, S., & Ryan, T. (2010). *Making Connections: Intentional Teaching for Integrative Learning*. NAIRTL.
- Honan, E. (2012). Literacy and Pedagogical Routines in the 21st Century Digital Classroom. In *Digital Literacy in the Early Years: Old Questions, New Tools, Shifting Spatialised Practices*. Symposium Organized by the Centre for Research in Educational Future and Innovation (CREFI). Deakin University, Melbourne, Australia.
- Huot, S., Loch, S., Nget, R., & Em, S. (2025). Exploring Multiliteracies in the Digital Era: A Framework for 21st-Century Learning. *Cambodian Journal of Educational and Social Sciences (CJESS)*, 2(1), 7–27.
- Indahwati, T., Dafik, & Irvan, M. (2020). The Development of Islamic-Based PISA Question Models on the Topics Concerning Quantity and Its Enhancement to Improve Student Problem Solving Skills. *Journal of Physics: Conference Series*, 1563(1).
- Indriyani, V., Atmazaki, A., & Ramadhan, S. (2023). Development of Multiliteracy Integrative Learning (MULGRANING) Model in Language Learning. *Egitim ve Bilim*, 48(215), 261–275.

- Kahn, R., & Kellner, D. (2023). Reconstructing Technoliteracy: A Multiple Literacies Approach. In *The Critical Pedagogy Reader* (pp. 409–423). Routledge.
- Kalantzis, M., & Cope, B. (2005). *Learning by Design*. Common Ground.
- Kalman, J. (2018). Beyond Definition: Central Concepts for Understanding Literacy. *International Review of Education*, 54(5/6), 532–538.
- Kangas, M., & Rasi, P. (2021). Phenomenon-Based Learning of Multiliteracy in a Finnish Upper Secondary School. *Media Practice and Education*, 22(4), 342–359.
- Kastur, A., Mustaji, M., & Riyanto, Y. (2020). The Practicality and Effectiveness of Direct Learning Model by Using Life-Based Learning Approach. *Studies in Learning and Teaching*, 1(3), 165–174.
- Kerimoğlu, E., Ülker, M. N. Ö., & Berk, Ş. (2023). How to Conduct a Metaevaluation?: A Metaevaluation Practice. *Canadian Journal of Program Evaluation*, 38(1), 57–78.
- Kunwar, R., Sharma, L., & Acharya, R. (2023). Construction and Validation of Self-Assessment Instrument for Students' Mathematics Classroom Learning Behaviour. *International Journal of Innovation in Science and Mathematics Education*, 31(2), 1–18.
- Leonard, B. J. B. (2007). *Integrative Learning as a Developmental Process: A Grounded Theory of College Students' Experiences in Integrative Studies* [Disertasi, University of Maryland, College Park].
- Leonard, J. B. (2012). Integrative Learning: A Grounded Theory. *Issues in Integrative Studies*, 30, 48–74.
- Lewis, E. C. (2017). Promoting Undergraduate Research Through Integrative Learning. *International Journal of Teaching and Learning in Higher Education*, 29(3), 545–550.
- Lidiastuti, A. E., Susilo, H., & Lestari, U. (2020). The Development Exair Based on Brain-Based Learning and Whole Brain Teaching (Exair-Brain Learning) and Its Effect on Learning Outcome for Senior High School. *Journal of Physics: Conference Series*, 1440(1), 1–7.
- Lim, F. V., & Tan-Chia, L. (2022). *Designing Learning for Multimodal Literacy: Teaching Viewing and Representing*. Routledge.
- Litually, S. J. (2016). Integrative Teaching Techniques and Improvement of German Speaking Learning Skills. *Journal of Education and Practice*, 7(9), 56–61.
- Mallpress, D. E., & Špinka, M. (2023). The Practicality of Practice: A Model of the Function of Play Behaviour. *Ecology and Evolution*, 13(9), e10521.
- Mpaata, K. A., & Mpaata, Z. (2019). The Leadership Role of Secondary School Head Teachers in Delivering Integrative Quality Education in Uganda. *International Journal of Educational Leadership and Management*, 7(2), 203–230.
- Navarro, M. M., Lauren, L., Hardy, E., Lázaro, P., & Suárez, R. (2023). Una Propuesta de Guía de Autoevaluación Integral para las Entidades de Ciencia Tecnología e Innovación. *Revista Cubana de Información En Ciencias de La Salud*, 34.
- Navehebrahim, M. (2011). Multiliteracies Approach to Empower Learning and Teaching Engagement. *Procedia - Social and Behavioral Sciences*, 29, 863–868.
- Noh, H., Seo, J. H., Yoo, H. S., & Lee, S. (2018). How to Improve a Technology Evaluation Model: A Data-Driven Approach. *Technovation*, 72, 1–12.
- Pishol, S., & Kaur, S. (2015). Teacher and Students' Perceptions of Reading a Graphic Novel Using the Multiliteracies Approach in an ESL Classroom. *Malaysian Journal of Learning and Instruction*, 12, 21–47.
- Plomp, T., & Nieveen, N. (2013). Educational Design Research: An Introduction. In T. Plomp & N. Nieveen (Eds.), *Educational Design Research - Part A: An Introduction* (pp. 10–51). SLO.
- Purwanto, M. B., Hartono, R., & Wahyuni, S. (2023). Essential Skills Challenges for the 21st Century Graduates: Creating a Generation of High-Level Competence in the Industrial Revolution 4.0 Era. *Asian Journal of Applied Education (AJAE)*, 2(3), 279–292.
- Rivers, W. (1976). *Speaking in Many Tongues: Essay in Foreign Language Teaching*. Newbury House.
- Sch lindwein, A. F. (2013). Facing the Challenge – Developing an Instructional Plan for Portuguese as Foreign Language in Brazil Based on Multiliteracy. *IADIS International Conference on Cognition and Exploratory Learning in Digital Age (CELDA 2013)*, 337–380.

- Selznick, B. S., Dahl, L. S., Youngerman, E., & Mayhew, M. J. (2022). Equitably Linking Integrative Learning and Students' Innovation Capacities. *Innovative Higher Education*, 47(1), 1–21.
- Shibani, A. S. M., Mohd, M., Ghani, A. T. A., Zakaria, M. S., & Al-Ghuribi, S. M. (2023). Identification of Critical Parameters Affecting an E-Learning Recommendation Model Using Delphi Method Based on Expert Validation. *Information (Switzerland)*, 14(4), 1–15.
- Sullivan, W. M. (2023). *The Power of Integrated Learning: Higher Education for Success in Life, Work, and Society*. Routledge.
- Sweeney, C., Sullivan, E. O., & McCarthy, M. (2015). Keeping It Real: Exploring an Interdisciplinary Breaking Bad News Role-Play as an Integrative Learning Opportunity. *Journal of the Scholarship of Teaching and Learning*, 15(2), 14–32.
- Vedishenkova, M. V., & Mironina, A. Y. (2016). The Methodology of Foreign Language Integrative Teaching at the Initial Stage of Interpreter Training. *International Journal of Environmental and Science Education*, 11(8), 1975–1988.
- Wang, Q. (2015). Study on the New Model of College English Teaching Under the Setting of Multimodality. *Universal Journal of Education Research*, 3(8), 473–477.
- Wedman, J., & Tessmer, M. (1993). Instructional Designers Decisions and Priorities: A Survey of Design Practice. *Performance Improvement Quarterly*, 6(2), 43–57.
- Wright, S. J., Gray, E., Rogers, G., Donten, A., & Payne, K. (2024). A Structured Process for the Validation of a Decision-Analytic Model: Application to a Cost-Effectiveness Model for Risk-Stratified National Breast Screening. *Applied Health Economics and Health Policy*, 22(4), 527–542.
- Wylie, E. C., & Lyon, C. J. (2019). The Role of Technology-Enhanced Self-and Peer Assessment in Formative Assessment. In *Classroom Assessment and Educational Measurement* (pp. 170–191). Routledge.
- Yerimadesi, Y., Kiram, Y., Lufri, L., Festiyed, F., & Guspatni, G. (2019). Validity and Practicality of Guided Discovery Learning Models for Chemistry Learning in Senior High School. *Journal of Physics: Conference Series*, 1317(1), 1–7.