Jurnal Cakrawala Pendas
Vol. 12 No. 3, July 2026
DOI: http://dx.doi.org/10.31949/jcp.v12i3.18603

p-ISSN: 2442-7470
e-ISSN: 2579-4442

DESIGN AND DEVELOPMENT OF A WORDWALL-BASED ASSESSMENT GUIDED BY THE FIVES LEARNING MODEL TO FOSTER STUDENTS' CRITICAL THINKING SKILLS

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Abstract

The limited development of critical thinking skills among elementary school learners indicates the necessity of assessment innovations that extend beyond measuring academic achievement and actively promote higher-order thinking processes. This study was conducted to design a Wordwall-based digital assessment grounded in the FIVES instructional framework and to evaluate its validity, practicality, and effectiveness in enhancing the critical thinking performance of fifth-grade students at SD Dharma Karya UT. The investigation adopted a Research and Development approach employing the ADDIE framework, encompassing the phases of analysis, design, development, implementation, and evaluation. The participants consisted of 48 students assigned to experimental and control groups. Data were obtained through expert appraisal, questionnaires, classroom observations, interviews, documentation, and critical thinking assessments. The results revealed that the developed assessment attained a very high level of validity based on expert judgments and demonstrated excellent practicality from the perspectives of teachers and students. In terms of effectiveness, the average score of the experimental group rose from 55 before treatment to 84 after treatment, producing an N-Gain value of 0.64, whereas the control group achieved an N-Gain value of 0.53. Statistical analysis using a paired-samples t-test yielded a significance level of 0.000 ($p < 0.05$), confirming a significant improvement in students' critical thinking abilities following the implementation of the developed assessment. Overall, the findings demonstrate that the developed assessment met the criteria of validity, practicality, and effectiveness, supporting its use as a digital assessment tool for enhancing fifth-grade students' critical thinking skills.

Keywords: *wordwall-assisted assessment; FIVES learning model; critical thinking skills; elementary school.*

Abstrak

Keterbatasan perkembangan keterampilan berpikir kritis di kalangan siswa sekolah dasar menunjukkan perlunya inovasi penilaian yang melampaui pengukuran prestasi akademik dan secara aktif mendorong proses berpikir tingkat tinggi. Studi ini dilakukan untuk merancang penilaian digital berbasis Wordwall yang berlandaskan kerangka pembelajaran FIVES dan untuk mengevaluasi validitas, kepraktisan, dan efektivitasnya dalam meningkatkan kinerja berpikir kritis siswa kelas lima di SD Dharma Karya UT. Investigasi ini mengadopsi pendekatan Penelitian dan Pengembangan dengan menggunakan kerangka ADDIE, yang mencakup fase analisis, desain, pengembangan, implementasi, dan evaluasi. Partisipan terdiri dari 48 siswa yang dibagi menjadi kelompok eksperimen dan kontrol. Data diperoleh melalui penilaian ahli, kuesioner, observasi kelas, wawancara, dokumentasi, dan penilaian berpikir kritis. Hasil penelitian menunjukkan bahwa penilaian yang dikembangkan mencapai tingkat validitas yang sangat tinggi berdasarkan penilaian ahli dan menunjukkan kepraktisan yang sangat baik dari perspektif guru dan siswa. Dari segi efektivitas, skor rata-rata kelompok eksperimen meningkat dari 55 sebelum perlakuan menjadi 84 setelah perlakuan, menghasilkan nilai N-Gain sebesar 0,64, sedangkan kelompok kontrol mencapai nilai N-Gain sebesar 0,53. Analisis statistik menggunakan uji t sampel berpasangan menghasilkan tingkat signifikansi 0,000 ($p < 0,05$), yang mengkonfirmasi peningkatan signifikan dalam kemampuan berpikir kritis siswa setelah implementasi penilaian yang dikembangkan. Secara keseluruhan, temuan menunjukkan bahwa penilaian yang dikembangkan memenuhi kriteria validitas, kepraktisan, dan efektivitas, mendukung penggunaannya sebagai alat penilaian digital untuk meningkatkan keterampilan berpikir kritis siswa kelas lima.

Keywords: penilaian berbantuan wordwall; model pembelajaran FIVES; keterampilan berpikir kritis; sekolah dasar

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Received	: 2026-05-31	Approved	: 2026-07-20
Reviesed	: 2026-07-17	Published	: 2026-07-31

Introduction

The role of Social Studies education in primary schools extends beyond the transmission of knowledge. It also encompasses the development of social skills, the internalization of values, and the cultivation of students' character, enabling them to become responsible members of society and informed citizens who are aware of their rights, duties, and social responsibilities (Nur et al., 2025; Siregar et al., 2025). Social Studies education extends beyond the acquisition of factual knowledge; it also aims to develop students' ability to understand and critically analyze social, economic, geographical, and historical phenomena occurring within their immediate environment as well as in broader local, national, and global contexts (Aopmonaim et al., 2025; Khoir, 2024). Through Social Studies (IPS) education, students are expected to develop and optimize their critical reasoning skills, systematically solve complex problems, make informed decisions based on rational considerations, and demonstrate awareness and responsibility toward the social, cultural, and environmental diversity within their communities.

Several studies have reported that social studies learning in elementary schools is still predominantly characterized by rote memorization and one-way information transmission (Arifah & Asror, 2026; Rachmadyanti et al., 2025; Sasmita et al., 2023; Wahyuni et al., 2025; Wulandari et al., 2025). Students tend to memorize factual information, such as Indonesia's geographical location, natural resources, historical kingdoms, and economic activities, without developing a deeper understanding of the interrelationships among these concepts and their relevance to real-world contexts (Faizah & Kamal, 2024; N. M. S. Putri & Rachmadyanti, 2024). This condition leads to students' limited ability to analyze social issues, understand environmental changes, and establish connections between historical events and contemporary societal conditions.

Social Studies (IPS) possesses inherently complex characteristics, as it integrates knowledge and perspectives from multiple disciplines, including history, geography, economics, sociology, and other social sciences (Mariati et al., 2021; Maulinda, 2022). In the geography dimension, students explore Indonesia's spatial characteristics through topics such as geographical location, biodiversity, natural resources, regional spatial transformation, environmental physical features, and the relationship between geographical conditions and human activities (Attaulloh & Kusumawardani, 2025; Ermayanti, 2024). In the sociology dimension, students examine social values and norms, human interactions, social dynamics, cultural diversity, and the implications of globalization for society (Putra, 2025; E. S. W. Utama et al., 2025). In the economics dimension, students investigate economic issues, economic activities, international trade, maritime and plantation-based economies, as well as strategies for achieving sustainable economic development (Yolanda & Marzaman, 2024). Meanwhile, in the history dimension, students study the development of Indonesia's diverse cultural heritage, the spread of Buddhism, Hinduism, and Islam, the struggle for independence, and the contributions of national and local figures to nation-building processes (Lisnawati et al., 2022; Susilo et al., 2025).

The complexity of social studies content requires instructional approaches that facilitate knowledge construction through higher-order thinking activities (T. Saputra et al., 2025; Shalikhah & Nugroho, 2023). Students are expected not only to acquire factual knowledge but also to develop the ability to analyze the relationships between geographical conditions and economic activities, examine the impacts of globalization on socio-cultural transformations, and critically interpret historical events as part of national identity formation (Rokhman et al., 2025; Siska et al., 2021). Accordingly, social studies instruction should be designed to be contextual, integrative, and student-centered.

In elementary school contexts, these challenges are further compounded by the developmental characteristics of young learners, who require assessment activities that are concrete, interactive, and cognitively appropriate. Although critical thinking has become an important learning objective, assessment practices in elementary social studies continue to emphasize factual recall and low-level cognitive outcomes rather than Higher-Order Thinking Skills (HOTS). Consequently, many existing assessment instruments are not yet capable of systematically capturing students' abilities to analyze information, evaluate evidence, formulate arguments, and draw logical conclusions during the learning process.

Nevertheless, evidence from previous studies indicates that efforts to foster critical thinking skills in social studies education have not yet been fully optimized due to persistent pedagogical and assessment-related challenges, as teachers continue to rely predominantly on lecture-based instruction and content-oriented assignments that emphasize knowledge acquisition and subject-matter mastery rather than critical inquiry, analytical reasoning, and higher-order thinking skills (Aashamara et al., 2024; Atilah et al., 2024; Putri et al., 2025; Ridwan et al., 2025). Consequently, students have limited opportunities to engage in analytical reasoning, discussion, argumentation, and problem-solving activities related to social phenomena in their surrounding environments (Kurniawan & Zabeta, 2025; Resti et al., 2024). Furthermore, the integration of instructional media and educational technologies capable of enhancing student engagement and active participation remains insufficient (Putera et al., 2024; Sirait et al., 2025).

These challenges highlight the need for a paradigm shift toward instructional practices that are more responsive to the demands of twenty-first-century education. Learning processes should extend beyond the acquisition of knowledge and actively promote higher-order thinking skills, including critical thinking, creativity, communication, and collaboration. In this regard, social studies instruction should be developed through meaningful learning experiences that integrate social, economic, cultural, and historical dimensions. Such an approach enables students to develop a comprehensive understanding of social issues, recognize causal relationships among events, and interpret real-world phenomena in a more logical, reflective, and in-depth manner.

Assessment plays a fundamental role not only in measuring learning outcomes but also in stimulating higher-order cognitive processes. Assessment designed according to HOTS principles encourages learners to identify relevant information, analyze relationships among concepts, evaluate alternative perspectives, and construct evidence-based conclusions. Therefore, assessment should function as an integral component of learning that promotes critical thinking rather than merely verifying students' mastery of factual knowledge (Sofie et al., 2023; Liu et al., 2024).

One instructional framework that aligns closely with the development of critical thinking is the FIVES model, consisting of Facts, Inference, Vocabulary, Experiences, and Summary. The model guides students through a structured sequence of cognitive activities,

beginning with identifying factual information (Facts), interpreting evidence to generate logical inferences (Inference), understanding essential concepts and terminology (Vocabulary), connecting new information with prior knowledge and authentic experiences (Experiences), and finally synthesizing ideas into coherent conclusions (Summary). Through these sequential stages, learners engage in progressively deeper cognitive processing that supports the development of higher-order thinking skills.

Several studies have reported that problem-based learning, cooperative learning, differentiated instruction, and digital learning media contribute positively to the development of students critical thinking skills (Indriyani & Aprima, 2025; Jihanifa et al., 2025; Lestari et al., 2024; Saputra et al., 2024; Utama et al., 2024). However, these studies have primarily focused on instructional interventions rather than on the development of assessment systems specifically designed to foster and measure critical thinking skills.

Although previous studies have reported the effectiveness of various instructional models, digital media, and technology-enhanced learning environments in promoting students' critical thinking skills, most of these studies have primarily focused on instructional strategies rather than on the development of assessment systems specifically designed to foster higher-order thinking (Barid et al., 2025; Dori & Lavi, 2023; Novela et al., 2025). Furthermore, existing research on Wordwall has largely emphasized its role as an interactive learning medium, while its potential as a structured digital assessment platform for measuring and developing critical thinking skills remains underexplored (Agustin et al., 2024; Ayustyaningtias et al., 2025; Nurhaidah et al., 2025). In addition, studies integrating digital assessment with the FIVES instructional framework (Facts, Inference, Vocabulary, Experiences, and Summary) are still scarce, particularly in elementary social studies education.

Despite the growing body of research on digital learning media, several important limitations remain. First, previous studies have predominantly evaluated instructional models rather than developing assessment instruments specifically intended to foster higher-order thinking skills. Second, most Wordwall-based studies have positioned the platform as a learning medium instead of a structured assessment system capable of measuring critical thinking processes. Third, limited studies have integrated an instructional framework such as FIVES into a digital assessment environment, particularly within elementary social studies education. Consequently, there remains a need for an assessment model that simultaneously measures, facilitates, and develops elementary students' critical thinking skills through a structured digital assessment process.

To address this gap, the present study develops and validates a Wordwall-assisted digital assessment guided by the FIVES instructional model for elementary school students. The novelty of this study lies in the integration of the FIVES framework into a digital assessment environment using the Wordwall platform, enabling assessment activities to simultaneously measure and promote critical thinking skills. In addition, this study provides empirical evidence regarding the validity, practicality, and effectiveness of the developed assessment through a systematic ADDIE-based development process. Therefore, this study aims to develop a Wordwall-assisted digital assessment based on the FIVES instructional model and to examine its validity, practicality, and effectiveness in enhancing elementary school students' critical thinking skills.

Research Methods

This study employed a Research and Development (R&D) approach aimed at designing, developing, and empirically evaluating an educational product. The R&D approach was selected because it enables the systematic creation of instructional innovations grounded in identified educational needs while ensuring their quality through iterative validation and evaluation processes. This study consisted of two sequential stages. The first stage involved the development of the Wordwall-assisted assessment using the Research and Development (R&D) approach with the ADDIE model, including analysis, design, development, implementation, and evaluation. The second stage focused on evaluating the effectiveness of the developed product using a quasi-experimental nonequivalent control group design involving an experimental class and a control class.

The product developed in this study was a Wordwall-assisted digital assessment designed based on the FIVES learning model (Facts, Inference, Vocabulary, Experiences, and Summary) to facilitate and assess elementary school students' critical thinking skills. The development process followed the ADDIE instructional design model, which consists of five sequential phases: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model was adopted due to its systematic and iterative structure, providing a comprehensive framework for product development from needs assessment to final refinement.

The ADDIE model was selected because it provides a flexible and iterative framework that is particularly suitable for developing digital assessment instruments. Unlike linear development models, ADDIE allows continuous revision based on expert validation, user feedback, and field trial results, ensuring that the developed assessment progressively meets the criteria of validity, practicality, and effectiveness before classroom implementation. This flexibility makes the model appropriate for educational product development that requires repeated refinement throughout the design and implementation processes.

Each phase of the ADDIE model was implemented in an integrated and systematic manner. The Analysis phase focused on identifying learner characteristics, existing assessment practices, instructional needs, and the requirements for fostering critical thinking skills. During the Design phase, product specifications were established, including assessment blueprints, critical thinking indicators, and the integration of FIVES components into the Wordwall platform. The Development phase involved constructing the assessment product, developing research instruments, and conducting expert validation to evaluate content quality and design appropriateness. Following revisions based on expert feedback, the product was implemented in a classroom setting to examine its practicality and effectiveness in supporting learning activities. Finally, the Evaluation phase was conducted continuously throughout the development process to assess product quality, identify areas for improvement, and ensure alignment with the intended learning objectives. Through these stages, the developed assessment was expected to meet the criteria of validity, practicality, and effectiveness as a digital learning instrument for enhancing students' critical thinking skills. The activities and outputs associated with each development phase are presented in Table 1.

Table 1. ADDIE Model Activities and Outputs

ADDIE Phase	Activities	Output
Analysis	Conducting classroom observations, interviews, and needs assessment	Identification of critical thinking assessment needs and evaluation-related learning challenges
Design	Developing assessment specifications, critical thinking indicators, and Wordwall-based assessment design	Assessment blueprint, test specifications, and Wordwall assessment prototype
Development	Constructing assessment items, expert validation, and product revision	Validated and revised Wordwall-assisted assessment instrument
Implementation	Conducting small-group and large-group trials, including pretest–posttest administration	Implementation data, user feedback, and students' critical thinking performance outcomes
Evaluation	Analyzing implementation results and conducting final revisions	Finalized Wordwall-assisted assessment instrument ready for classroom application

The study utilized both primary and secondary data sources. Primary data were collected throughout the development process of the Wordwall-assisted digital assessment integrated with the FIVES instructional model, beginning from the needs analysis stage through product implementation and evaluation. These data included expert validation results obtained from subject-matter, assessment, language, and media experts to determine the validity and feasibility of the developed product. Practicality data were gathered through teacher and student response questionnaires as well as classroom observations during product implementation. Effectiveness data were obtained from pretest and posttest scores to examine improvements in students' critical thinking skills following the intervention. In addition, teachers, school administrators, and fifth-grade students of SD Dharma Karya UT provided essential information regarding instructional needs, classroom conditions, and feedback on the developed assessment during both the preliminary and implementation phases.

Secondary data were obtained from curriculum and institutional documents, including Learning Outcomes (CP), Learning Objective Sequences (ATP), instructional materials, the Education Report Card, textbooks, assessment records, relevant previous studies, and scholarly publications that supported the theoretical and conceptual foundations of the study.

The population of this study consisted of all fifth-grade students of SD Dharma Karya UT, comprising 48 students distributed into two parallel classes. Because the number of fifth-grade classes was limited, all available students were included in the study using purposive sampling. One class was assigned as the experimental group, while the other served as the control group based on the school's existing classroom organization to avoid disrupting the regular instructional schedule.

The study population comprised all fifth-grade students of SD Dharma Karya UT. The sample was selected using purposive sampling and consisted of two classes, each containing 24 students. The collected data included both quantitative and qualitative information. Quantitative data consisted of expert validation scores, questionnaire responses, and pretest–posttest results used to evaluate product validity, practicality, and effectiveness. Qualitative data included suggestions, comments, critiques, and recommendations provided by experts, teachers, and students to support product revision and refinement.

The assignment of the experimental and control groups was based on the existing classroom structure established by the school. Random assignment was not feasible because the

study employed a quasi-experimental design in a natural classroom setting. Prior to treatment, both groups completed a pretest to examine the equivalence of their initial critical thinking abilities.

Research instruments were employed to collect information necessary to address the research objectives. The primary instrument was a critical thinking skills test developed based on Ennis's critical thinking framework, encompassing four dimensions: elementary clarification, basic support, inference, and advanced clarification. The test consisted of reasoned multiple-choice items and essay questions aligned with the stages of the FIVES instructional model, enabling the measurement of students' critical thinking skills before and after the implementation of the Wordwall-assisted assessment.

To complement the primary data, additional instruments included questionnaires, interview protocols, observation sheets, and documentation records. Questionnaires were used to evaluate product quality and user responses, while interviews explored participants' experiences, perceived benefits, encountered challenges, and recommendations for product improvement. Observations were conducted to monitor instructional activities and student engagement during implementation. Documentation served to collect supporting evidence, including assessment results, instructional materials, implementation records, and expert validation documents.

Prior to data collection, all instruments underwent expert review to ensure content validity, construct appropriateness, linguistic clarity, and media suitability. This validation process ensured that the instruments met established quality standards and were capable of generating accurate, relevant, and scientifically credible data.

Table 2. Blueprint of the Critical Thinking Skills Instrument

Critical Thinking Dimension (Ennis)	Operational Indicator	Item Type	Cognitive Level
Elementary Clarification	Identifying key concepts and main ideas within a text	Multiple-choice, Essay	C4
Basic Support	Answering questions based on information provided in a text	Multiple-choice	C4
Inference	Formulating summaries and drawing conclusions from available information	Multiple-choice, Essay	C5
Advanced Clarification	Providing logical reasoning, arguments, and explanations for a given issue	Essay	C5–C6

Data collection was conducted in alignment with the five phases of the ADDIE development model: Analysis, Design, Development, Implementation, and Evaluation. The procedures were designed to obtain information concerning instructional needs, product quality, usability, and the effectiveness of the Wordwall-assisted digital assessment integrated with the FIVES instructional model in enhancing students' critical thinking skills.

During the analysis phase, data were collected through classroom observations, semi-structured interviews, and document analysis to identify existing instructional practices, assessment approaches, and challenges encountered by teachers and students in fostering critical thinking skills. Findings from this stage served as the foundation for product design and development.

The developed product subsequently underwent expert validation involving subject-matter, assessment, language, and media experts to evaluate content appropriateness, assessment quality, linguistic accuracy, and media design prior to implementation.

The implementation phase focused on examining product usability and user acceptance. Data were collected through teacher and student response questionnaires, classroom observations, and field notes. To evaluate the effectiveness of the developed assessment, students' critical thinking skills were measured through pretest and posttest administration. Additional evidence was gathered through observations and documentation during classroom implementation.

All collected data were systematically analyzed to guide product revision, refine assessment components, and determine the final quality of the developed product. The analysis was conducted to ensure that the assessment met the criteria of validity, practicality, and effectiveness for use in elementary school learning contexts.

Table 3. Data Collection Procedures

Research Phase	Data Collection Technique	Purpose
Analysis	Observation, interviews, documentation	Identifying instructional needs and learning problems
Development	Expert validation sheets	Evaluating product feasibility and validity
Implementation (Limited Trial)	Teacher questionnaire, student questionnaire, observation	Assessing product practicality
Implementation (Field Trial)	Pretest, posttest, observation, documentation	Assessing product effectiveness
Evaluation	Comprehensive data analysis	Refining and finalizing the product

This study adopted the ADDIE instructional development model, consisting of five phases: Analysis, Design, Development, Implementation, and Evaluation. The analysis phase focused on identifying instructional needs through observations, interviews, and document analysis to understand classroom conditions, student characteristics, challenges in assessment practices, and the need for assessment instruments capable of fostering critical thinking skills.

Findings from the analysis stage informed the development of a Wordwall-assisted digital assessment integrated with the FIVES instructional model (Facts, Inference, Vocabulary, Experiences, and Summary). During the design phase, a comprehensive product blueprint was developed, including assessment specifications, critical thinking indicators, item formats, media navigation procedures, and interface designs within the Wordwall platform.

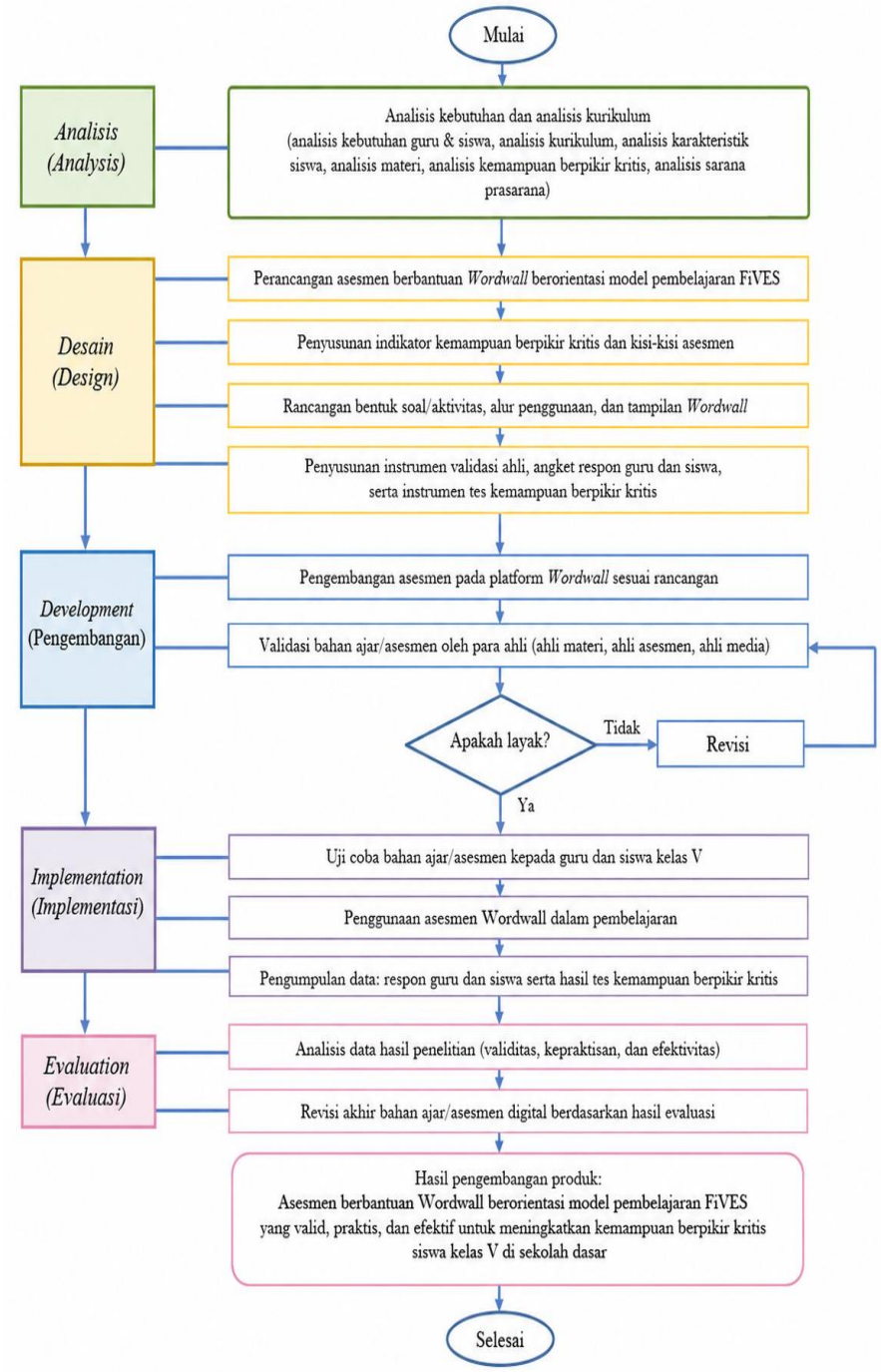

Figure 1. Development Procedure

During the development phase, the assessment framework that had been designed was integrated into the Wordwall platform, resulting in a functional prototype that could be implemented within the learning environment. Prior to its administration to students, the instrument underwent a comprehensive quality assurance process to ensure its appropriateness and measurement accuracy. This process included analyses of validity, reliability, item difficulty index, and discrimination index to verify that each item accurately represented the construct of critical thinking skills. Subsequently, the developed product was subjected to expert validation involving content experts, assessment experts, language experts, and media experts. The review process focused on the appropriateness of content, the quality of instrument construction,

linguistic clarity, and the visual as well as functional aspects of the digital platform. Feedback, critiques, and recommendations provided by the validators were used as the basis for revising and refining the product before conducting a preliminary trial with fifth-grade students at SD Dharma Karya UT. This trial aimed to obtain information regarding readability, usability, and user acceptance of the developed assessment.

The implementation phase involved the application of the revised Wordwall-based assessment within classroom learning activities. The effectiveness of the product was evaluated using a quasi-experimental approach employing a nonequivalent control group design. In this design, the experimental group utilized the Wordwall-assisted assessment developed in accordance with the stages of the FIVES instructional model, whereas the control group continued to use the conventional assessment instruments routinely employed by the classroom teacher. Prior to the intervention, both groups completed a pretest to identify students' initial critical thinking skills and to establish baseline equivalence between the groups. Following the completion of the instructional intervention, a posttest was administered to determine changes in students' critical thinking skills attributable to the implementation of the developed assessment.

Research data were collected through pretest and posttest results, classroom observations of student learning activities, and interviews with both teachers and students. These data were utilized to evaluate the effectiveness of the assessment in fostering improvements in critical thinking skills, as well as to examine its practicality based on user perceptions and the extent to which the learning activities were successfully implemented. Findings obtained during the implementation phase subsequently informed the evaluation and refinement process, leading to the development of a Wordwall-assisted assessment that met the criteria of validity, practicality, and effectiveness for use in elementary school learning contexts.

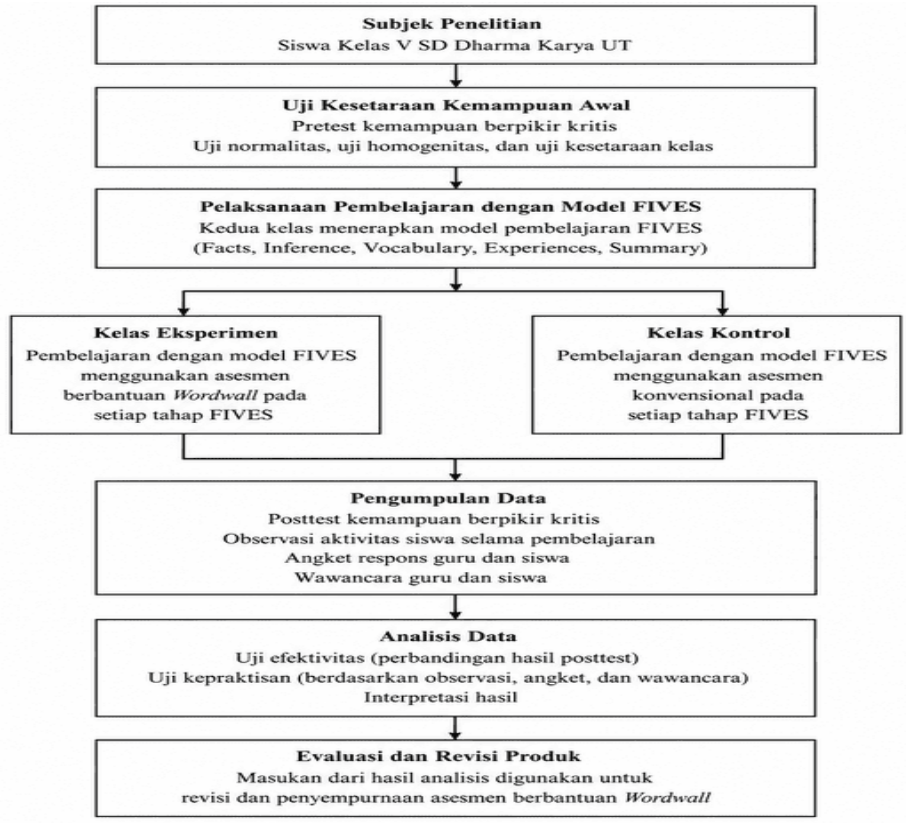

Figure 2. Implementation Phase

Assessment data were analyzed to determine the extent to which students' critical thinking skills improved following the implementation of the Wordwall-assisted digital assessment. The analysis focused on students' achievement across the critical thinking indicators embedded within the FIVES instructional model, including the ability to identify factual information (Facts), generate inferences (Inference), comprehend and apply vocabulary contextually (Vocabulary), connect information to prior knowledge and personal experiences (Experiences), and formulate logical conclusions (Summary). In addition, the practicality of the developed product was evaluated through classroom implementation observations, teacher response questionnaires, and student response questionnaires. These measures were intended to examine the usability, acceptability, and perceived usefulness of the assessment within the learning process. Findings obtained from these multiple data sources were subsequently used to refine and improve the product. As a result, the study produced a Wordwall-assisted assessment that satisfied the criteria of validity, practicality, and effectiveness, indicating its suitability for implementation as an assessment instrument in elementary school education.

Results and Discussion

The findings of this study are presented according to the stages of the ADDIE development model, namely Analysis, Design, Development, Implementation, and Evaluation. The results focus on the development of a Wordwall-assisted digital assessment aligned with the FIVES instructional model, followed by an evaluation of its validity, practicality, and effectiveness in improving the critical thinking skills of fifth-grade students at SD Dharma Karya UT. Data were collected through classroom observations, semi-structured interviews, expert validation, teacher and student questionnaires, and pretest–posttest assessments. The collected data were analyzed systematically to address the research objectives and research questions.

Development Process of the Wordwall-Assisted Assessment Based on the FIVES Model

The development process followed the five stages of the ADDIE framework. During the analysis stage, observations and interviews revealed that assessment practices were predominantly paper-based and insufficiently engaging for students. Students experienced difficulties in identifying key information from texts, drawing inferences, understanding contextual vocabulary, and constructing coherent summaries. Teachers also reported challenges related to the time-consuming process of scoring and managing assessment results manually. These findings highlighted the need for a digital assessment tool capable of supporting both assessment efficiency and the development of critical thinking skills.

At the design stage, learning objectives, assessment specifications, critical thinking indicators, scoring rubrics, and Wordwall-based assessment activities were developed. The assessment content focused on explanatory texts and was structured according to the five components of the FIVES model: Facts, Inference, Vocabulary, Experiences, and Summary.

During the development stage, the prototype was created and evaluated by experts in subject matter, educational assessment, language, and instructional media. Revisions were conducted based on expert recommendations, particularly regarding interface design, instructional clarity, and language simplicity. The implementation stage involved small-group and field trials to evaluate usability and functionality in authentic classroom settings. Finally, the evaluation stage confirmed that the assessment could be effectively implemented as a learning evaluation tool while increasing student engagement during learning activities.

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Table 4. Development Stages of the Wordwall-Assisted Assessment Using the ADDIE Model

Stage	Main Activities	Outputs
Analysis	Observation, interviews, needs analysis	Identification of the need for a digital assessment to enhance engagement and critical thinking
Design	Development of learning objectives, assessment blueprint, FIVES indicators, and assessment instruments	Initial assessment design completed
Development	Product creation and expert validation	Product revised according to expert feedback
Implementation	Small-group and field trials	Product implemented in classroom learning
Evaluation	Final evaluation and revision	Product declared feasible for use

The development process produced a Wordwall-assisted assessment integrated with the FIVES instructional model. Expert validation indicated that the product fulfilled the required quality criteria, and the implementation stage demonstrated positive responses from teachers and students.

Validity of the Wordwall-Assisted Assessment Based on the FIVES Model

The validity of the developed assessment was evaluated through item analysis and expert validation. The instrument initially consisted of 35 items, including 25 multiple-choice questions and 10 essay questions, administered to 24 students during the pilot test. The item analysis indicated that 15 multiple-choice items and 8 essay items met the required psychometric criteria and were therefore retained for implementation.

Reliability analysis demonstrated satisfactory internal consistency, with a coefficient of 0.76 for multiple-choice items and 0.90 for essay items, indicating good and excellent reliability, respectively. Furthermore, item difficulty indices were predominantly within the low-to-moderate range, while discrimination indices showed that most items adequately differentiated students according to their ability levels. Expert validation results are presented in Table 5.

Table 5. Expert Validation Results

Validator	Percentage (%)	Category
Subject Matter Expert	84 %	Very Valid
Assessment Expert	94,5 %	Very Valid
Media Expert	90 %	Very Valid
Language Expert	98 %	Very Valid
Average	91,7 %	Very Valid

The average expert validation score was 91.7%, with subject matter validation of 84%, assessment validation of 94.5%, media validation of 90%, and language validation of 98%. The interpretation of the validation scores followed the feasibility criteria proposed by Akbar (2017), in which scores of 85.01–100% are categorized as Very Valid, 70.01–85.00% as Valid, 50.01–70.00% as Fairly Valid, and below 50% as Invalid.

Practicality of the Wordwall-Assisted Assessment Based on the FIVES Model

The practicality of the assessment was evaluated through classroom observations and student response questionnaires. Observation results yielded a practicality score of 92%, indicating that the assessment was highly practical. The highest ratings were obtained for ease of use and clarity of instructions, while efficiency of implementation received comparatively lower, yet still highly positive, ratings.

Student responses further supported these findings. Based on questionnaires completed by 24 students, the assessment achieved a practicality score of 89%, categorized as highly practical. Students reported that the assessment was easy to use, visually engaging, and supportive of their understanding of learning materials. Moreover, the digital format increased motivation and participation during classroom activities.

Table 6. Practicality Test Results

Data Source	Percentage (%)	Kategori
Teacher Observation	92%	Highly Practical
Student Responses	89%	Highly Practical
Average	90,5%	Highly Practical

Effectiveness of the Wordwall-Assisted Assessment Based on the FIVES Model

The effectiveness of the assessment was examined by comparing students' critical thinking performance before and after implementation. Both the experimental and control groups demonstrated improvements; however, the experimental group achieved greater gains.

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Variabel	Kelas	Statistic	df	Sig.	Statistic	df	Sig.
Kemampuan Berpikir Kritis	Pretest Eksperimen	.118	24	.200	.956	24	.328
	Posttest Eksperimen	.097	24	.200	.968	24	.284
	Pretest Kontrol	.121	24	.186	.952	24	.110
	Posttest Kontrol	.104	24	.200	.949	24	.096

a. Lilliefors Significance Correction

Figure 3. Normality Test

Based on the results of the homogeneity test using Levene's Test, the significance values for the pretest and posttest data were 0.386 and 0.410, respectively, with degrees of freedom of $df_1 = 1$ and $df_2 = 46$. Since the significance values for both datasets exceeded the threshold of 0.05, it can be concluded that the variances of the critical thinking scores between the control and experimental groups were homogeneous. Therefore, the assumption of homogeneity of variance was satisfied, indicating that the data were suitable for subsequent parametric statistical analyses.

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Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Pretest	.764	1	46	.386
Posttest	.691	1	46	.410

Figure 4. Homogeneity Test

The experimental group's mean score increased from 55 to 84, resulting in an N-gain score of 0.64, whereas the control group improved from 53 to 78 with an N-gain score of 0.53. Both values fall within the moderate improvement category, although the experimental group achieved a higher level of improvement.

Prior to hypothesis testing, the data satisfied the assumptions of normality and homogeneity, with significance values exceeding 0.05. The paired-samples t-test revealed a significance value of 0.000 ($p < 0.05$), indicating a statistically significant difference between pretest and posttest scores in the experimental group.

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pretest Eksperimen - Posttest Eksperimen	-29.00	6.52	1.33	-31.75	-26.25	-21.80	23	.000
Pair 2	Pretest Kontrol - Posttest Kontrol	-25.00	6.08	1.24	-27.56	-22.44	-20.16	23	.000

Figure 5. Paired-Samples t-Test Results

The effectiveness of the Wordwall-assisted assessment integrated with the FIVES instructional model was confirmed through paired-samples t-test and N-gain analyses. The paired-samples t-test revealed statistically significant differences between pretest and posttest scores in both groups ($p < 0.001$). In the experimental group, the mean critical thinking score increased from 55 to 84, representing a gain of 29 points, whereas the control group improved from 53 to 78, representing a gain of 25 points. Although both groups demonstrated significant improvement, the experimental group achieved a higher posttest mean score and a greater learning gain (N-gain = 0.64) than the control group (N-gain = 0.53).

Table 7. Effectiveness Test Results

Group	Pretest	Posttest	Gain	N-Gain	Category
Control	53	78	25	0,53	Moderate
Experimental	55	84	29	0,64	Moderate

ANCOVA results showed that, after controlling for students' pretest scores, the posttest scores differed significantly between the experimental and control groups ($p < 0.05$), indicating that the treatment had a significant effect on students' critical thinking skills.

The results indicate that the Wordwall-assisted assessment integrated with the FIVES model effectively enhanced students' critical thinking skills. The higher N-gain achieved by the experimental group, together with the statistically significant improvement observed after implementation, suggests that the developed assessment provides meaningful support for critical thinking development in elementary school learning.

Research Findings

The findings of this study indicate that the Wordwall-assisted assessment integrated with the FIVES instructional model was successfully developed and demonstrated a high level of validity. The successful development process can be attributed to the systematic implementation of the ADDIE model, which facilitated the alignment of learning objectives, critical thinking indicators, and assessment activities. The high validity score obtained from expert evaluations suggests that the assessment fulfilled the required standards in terms of content, assessment design, language, and media quality. This finding is consistent with Barid et al., 2025, who emphasized that assessment instruments intended to measure critical thinking skills should be designed based on clearly defined cognitive indicators and undergo rigorous validation procedures. Furthermore, the integration of the Facts, Inference, Vocabulary, Experiences, and Summary (FIVES) components enabled the assessment to address multiple dimensions of critical thinking through structured and meaningful learning tasks.

The practicality results revealed that both teachers and students perceived the developed assessment as highly practical and easy to use. The positive responses may be attributed to the interactive features provided by the Wordwall platform, which increased student engagement and simplified the assessment process. These findings are in line with previous studies conducted by Agustin et al., 2024, which reported that Wordwall-based learning environments enhance student participation, motivation, and learning engagement. In addition, the digital format allowed teachers to manage assessment activities more efficiently while providing students with a more attractive and interactive assessment experience compared with conventional paper-based assessments.

The effectiveness analysis demonstrated that the experimental group achieved greater improvements in critical thinking skills than the control group, as reflected by higher posttest scores and N-Gain values. These findings indicate that the integration of Wordwall and the FIVES instructional model effectively supported the development of students' higher-order thinking skills. The results corroborate previous studies by Sasmita et al., 2023, which found that technology-supported learning and assessment activities can enhance critical thinking when students are actively engaged in analyzing information, making inferences, and constructing conclusions. Through the sequential stages of the FIVES model, students were encouraged to move beyond memorization and engage in deeper cognitive processes, thereby contributing to the observed improvement in critical thinking performance.

This study has several limitations. First, the implementation involved only one elementary school with a relatively small sample size, limiting the generalizability of the findings. Second, the intervention was conducted over a relatively short period, preventing the investigation of long-term retention of students' critical thinking skills. Third, the effectiveness analysis focused primarily on students' learning outcomes and did not examine other potential variables such as digital literacy, learning motivation, or teacher competence. Future studies are encouraged to involve larger and more diverse samples, longer implementation periods, and more comprehensive statistical analyses to strengthen the evidence regarding the effectiveness of the developed assessment.

Conclusion

This study successfully developed a Wordwall-assisted digital assessment integrated with the FIVES instructional model through a systematic ADDIE-based development process, encompassing analysis, design, development, implementation, and evaluation stages. The resulting assessment was specifically designed to facilitate the measurement and enhancement of students' critical thinking skills through the integration of the Facts, Inference, Vocabulary, Experiences, and Summary components. The findings demonstrated that the developed assessment achieved a high level of validity, as confirmed by expert evaluations in the areas of content, assessment, language, and media design. Furthermore, the product exhibited high practicality, evidenced by positive responses from both teachers and students regarding its usability, engagement, and support for classroom assessment activities. In terms of effectiveness, the implementation of the assessment contributed to a significant improvement in students' critical thinking skills, as indicated by the higher learning gains achieved by the experimental group. Overall, the Wordwall-assisted assessment based on the FIVES model represents a valid, practical, and effective assessment tool for elementary education. Beyond its function as an evaluation instrument, the assessment provides meaningful support for the development of critical thinking skills and promotes more interactive and learner-centered assessment practices. These findings suggest that integrating digital assessment platforms with structured instructional frameworks can serve as a promising approach to enhancing higher-order thinking skills in primary education. Future studies are encouraged to validate the developed assessment in broader educational contexts involving diverse school settings, larger samples, and different learning subjects to strengthen its generalizability and practical applicability.

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