International Journal of Education and Life Sciences (IJELS)
Vol. 4, No. 8 August 2026: 1379-1394

Development of a Digital Portfolio-Based Authentic Assessment Model for Assessing Students' Writing Literacy Development in Indonesian Language Learning

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A R T I C L E I N F O
Keywords: Authentic Assessment, Digital Portfolio, Writing Literacy, Bahasa Indonesia, ADDIE.

Received : 27 June
Revised : 20 July
Accepted: 18 August

A B S T R A C T
The limitations of conventional assessments in monitoring the development of writing literacy in an ongoing manner encourage the need for digital-based authentic assessments in learning Indonesian. This research aims to develop and test the feasibility and effectiveness of an authentic digital portfolio-based assessment model to assess the development of students' writing literacy. The research used the Research and Development method with the ADDIE model, involving 120 students, 4 teachers, and 3 expert validators. Data were collected through interviews, observations, questionnaires, portfolio documentation, and writing tests, then analyzed descriptively quantitatively, N-gain, and paired t-tests. The results showed the model obtained very valid categories and significantly improved writing ability. This model contributes to providing an authentic assessment that is systematic, sustainable, and adaptive to digital-based Indonesian language learning.

DOI: https://doi.org/10.59890/ijels.v4i8.82
ISSN : 3026-2429
https://journalijels.my.id/index.php/ijels

INTRODUCTION

Writing skills are one of the main competencies in language education because it reflects students' ability to develop ideas, organize information, use language appropriately, and communicate thoughts in writing. In a digital learning environment, these competencies are increasingly important because academic and communication activities often take place through text and digital media. In the Indonesian context, literacy challenges still need attention. PISA 2022 recorded a reading score of 359 Indonesian students, while the average of OECD countries reached 476. Although the indicator measures reading literacy, this data shows the broader context of literacy challenges and reinforces the urgency of learning and literacy assessments that are oriented towards sustainable language development (OECD, 2023).

In learning Bahasa Indonesia, it is not enough to assess writing skills only through the final product or test at a time because writing is a process that involves planning, drafting, giving feedback, revision, and reflection. Authentic assessments offer a more appropriate approach because they place learners' abilities in meaningful tasks and allow the learning process to be part of the assessment. A digital portfolio can support these principles by documenting student learning artifacts, work progress, feedback, and reflections over time. López-Crespo et al. (2022) show that the use of e-portfolios is related to learners' self-engagement and efficacy, while Lam (2022) emphasizes its potential in supporting self-regulation and co-regulation in the learning process.

A number of studies provide evidence on the benefits of e-portfolios in learning to write. Pourdana and Tavassoli (2022) found that e-portfolio assessments have an influence on student engagement and the improvement of genre-based writing skills. Al-Hawamdeh et al. (2023) also show that portfolio assessments provide benefits for the complexity, accuracy, and fluency of writing as well as the psychological aspects of learners. Furthermore, Fathi and Rahimi (2024) found that the group that used electronic writing portfolios showed better writing performance development than the conventional portfolio group. These findings strengthen the position of digital portfolios as a form of assessment for learning, not solely as a document of learning outcomes.

More cutting-edge research also shows the potential of electronic portfolios in providing space for feedback and monitoring of writing progress. Guo and Li (2024), through a study of 64 learners, found that learning to write based on electronic portfolios significantly improved writing performance in terms of content, organization, language use, vocabulary, and mechanics, while increasing self-efficacy in writing. Ngui et al. (2022) also show that e-portfolios can be used as an academic writing assessment tool while providing opportunities for more sustainable communication and feedback. Thus, the digital portfolio allows the assessment to move from an orientation on the final score to documentation of the development of the learner's competencies.

However, research gaps are still visible when these findings are placed in the context of learning Bahasa Indonesia. The studies that are the basis of this research are more conducted in the context of English as a foreign language and higher education, and focus on testing the impact of e-portfolio use on learners'

performance, engagement, self-efficacy, or perception (Pourdana & Tavassoli, 2022; Al-Hawamdeh et al., 2023; Fathi & Rahimi, 2024; Guo & Li, 2024). In addition, Lam (2022) emphasized the need for research on the mechanism of how e-portfolios support learning development through the interaction between reflection, feedback, self-regulation, and the learning environment. Based on these gaps, there is still a need to develop an authentic assessment model based on digital portfolios that is specifically designed, validated, and tested to monitor the development of students' writing literacy in Indonesian language learning in a systematic and sustainable manner.

Based on these problems, this study aims to develop and test the feasibility and effectiveness of an authentic digital portfolio-based assessment model to assess the development of students' writing literacy in Indonesian language learning through the Research and Development approach with the ADDIE model. The developed model is directed to integrate continuous collection of works, text preparation and revision, authentic assessment rubrics, teacher feedback, and student reflection so that the development of writing skills can be documented longitudinally. Theoretically, this research is expected to expand the study of authentic assessments and technology-based formative assessments in language education. Practically, the model is expected to help teachers obtain more comprehensive evidence of writing progress and provide more targeted feedback than assessments that are only oriented towards the final product.

LITERATURE REVIEW

Authentic Assessment in Language Learning

Authentic assessment places assessment as a process to obtain evidence of learners' abilities through meaningful, contextual, and representative assignments that represent the application of competencies, rather than just measuring knowledge through separate tests. McArthur (2023) emphasizes that the authenticity of assessments should not be limited to the similarity of the assignment to real-world situations, but also needs to consider the value, purpose, and meaning of the activity for learners. In learning Bahasa Indonesia, this principle is relevant because writing skills are not only related to mastering linguistic elements, but also the ability to produce texts that have communicative purposes, organization of ideas, language accuracy, and conformity to context. Therefore, the writing literacy assessment needs to assess both the product and the development of the text formation process.

Digital Portfolio as Authentic and Developmental Assessment

The digital portfolio is a form of assessment that allows students' work to be collected systematically in a certain period so that competency development can be observed longitudinally. Meletiadou (2021) found that the use of Padlet as an e-portfolio accompanied by feedback from lecturers and peers improved writing performance and student motivation. Meanwhile, Cheng (2022) shows that e-portfolios provide opportunities for students to review and reflect on writing, build ownership of works, see skill development, develop digital literacy, and obtain more structured learning. However, its implementation still faces technical problems, time needs, and student readiness. The findings show that the effectiveness of a digital portfolio is not determined by the platform

alone, but by the design of the assessment, criteria, revision stages, feedback, and reflections that come with it.

Writing Literacy as a Developmental Process

Writing literacy needs to be understood as a competency that develops through an iterative process starting from the development of ideas, the preparation of texts, the receipt of feedback, revisions, to editing. Peungcharoenkun and Waluyo (2023) show that the integration of process-genre approaches, technology, and various forms of feedback can improve writing performance, especially in response to tasks and the use of lexical resources. This shows the importance of recording the process of changing the text, not just giving a score to the final product. In the context of this study, the digital portfolio is therefore positioned as a space to store initial drafts, revision results, final writings, feedback, and reflections of students so that the development of writing literacy in Indonesian language learning can be assessed based on continuous evidence.

Feedback, Reflection, and Revision in Digital Writing Assessment

Feedback is an important element in writing assessments because it helps learners recognize gaps between actual performance and expected competencies. Liu et al. (2023) show that the integration of peer assessment with technology-based writing evaluation results in better writing, motivation, and critical thinking performance compared to the use of automated evaluation alone. Ajabshir and Ebadi (2023) also found that both teacher feedback and automated writing evaluations can improve writing quality, although their effects differ on syntactic complexity, accuracy, lexical diversity, and fluency. The findings suggest that the digital portfolio assessment model should ideally not replace the role of teachers with technology, but use technology to document and facilitate the cycle of writing–feedback–reflection–revision–reassessment.

More recent studies have also shown the importance of combining sources of feedback. Zhang et al. (2025) found that the combination of automated writing evaluation and human feedback can provide benefits on a number of dimensions of argumentative writing. This evidence reinforces the assumption that the development of writing literacy is more accurately assessed through repeated evidence of performance rather than a single score. In the model developed in this study, teacher feedback becomes part of the portfolio artifact so that changes between drafts, revisions, and final products can be traced and used as a basis for assessment decision-making.

Principles of Digital Assessment

Digitization of assessments should not only move conventional instruments to electronic media. Jurāne-Brēmane (2024) formulated five main principles of digital assessment, namely clarity of objectives and criteria, selection of appropriate technology, adequacy of digital competencies and devices, optimization of technological functions, and consistent use of assessment data. Lim et al. (2023) also show that digital authentic assessment design needs to provide cognitive challenges, spaces for learners to generate artifacts, as well as feedback mechanisms that allow learning progress to be reflected. Thus, the model in this study is directed not only as a digital repository, but as an

assessment system that integrates written artifacts, rubrics, feedback, revision, reflection, and records of student ability development.

Digital Portfolio, Self-Reflection, and Learner Agency

The digital portfolio also has a metacognitive function because students can compare the results of work at various stages and reflect on the changes that have been achieved. Campbell and Tran (2021) show that the systematic use of e-portfolios can support students' reflection practices when reflection activities are explicitly integrated in learning design and assessment. Thus, reflection in this study is not positioned as an additional activity, but as one of the authentic components that help students understand the strengths, weaknesses, and progress of their writing literacy. This function also changes the position of students from just receiving scores to active participants in the assessment process.

ADDIE as the Development Framework

The development of assessment models requires a systematic framework so that the resulting products are based on empirical needs and can go through the stages of validation and evaluation. The ADDIE model consists of Analysis, Design, Development, Implementation, and Evaluation, so it is suitable for research that develops digital-based learning devices or systems. Spatioti et al. (2022), through a systematic study, showed that ADDIE provides a flexible framework for integrating technology, feedback, interaction, and evaluation in a digital learning environment. In this study, the Analysis stage was used to identify the need for writing assessment; Design to design portfolio structures, rubrics, and valuation mechanisms; Development to generate and validate models; Implementation to apply it to students; while Evaluation is used to assess the feasibility and effectiveness of the model.

Conceptual Synthesis and Research Position

The study shows the conceptual relationship between authentic assessment, digital portfolio, feedback, reflection, and the development of writing literacy. While previous research has proven the benefits of technology, e-portfolios, and feedback in learning to write, most research is still conducted in the context of EFL and higher education and more often tests the effectiveness of a platform or strategy separately. This research takes a different position by developing an authentic assessment model based on a digital portfolio that is specifically designed to document and assess the development of students' writing literacy in learning Bahasa Indonesia. The novelty of the model lies in the systematic integration of authentic writing assignments, draft and revision documentation, analytical rubrics, teacher feedback, student reflections, and writing progress records in a single assessment framework developed through ADDIE.

Research Hypothesis

Since this research is Research and Development, statistical hypotheses are mainly used in the effectiveness testing stage, while the development and validation stages are more oriented towards product feasibility. Based on the synthesis of theories and previous empirical findings, the research hypothesis is formulated as follows: H_0: there is no significant difference between students' writing literacy skills before and after the application of the digital portfolio-

based authentic assessment model. H_1: there was a significant improvement in students' writing literacy skills after the implementation of the digital portfolio-based authentic assessment model. The hypothesis can be tested using a paired-samples t-test, while the magnitude of the increase can be analyzed through N-gain, as defined in the study design.

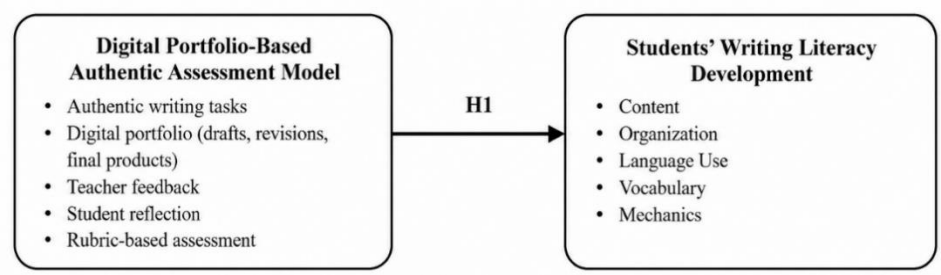

Figure 1. Framework

METHODOLOGY

Types of Research

This research uses the Research and Development (R&D) method with the ADDIE model which consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluation. This model was chosen because it allows the development and evaluation of digital assessment models to be carried out systematically (Hidayat et al., 2023). At the effectiveness testing stage, a quantitative approach was used to compare students' writing literacy skills before and after the application of the model.

Population and Sample

The research participants consisted of 120 students, 4 teachers, and 3 expert validators. Students are involved in the implementation and effectiveness testing phases, teachers play a role in identifying needs and implementing the model, while expert validators assess the feasibility of the product. The selection of participants was carried out by non-probability sampling according to the needs of development research.

Research Instruments

Data were collected using interviews, observations, questionnaires, portfolio documentation, and writing tests. The writing test assesses five aspects, namely content, organization, language use, vocabulary, and mechanics. The validity of the content of the model and instrument was obtained through the assessment of 3 expert validators, in accordance with the principle of expert judgment in the development of educational instruments (Miller-Young et al., 2021).

Data Collection Procedure

The Analysis stage is carried out through interviews and observations to identify the needs of writing assessment. The Design stage is used to design authentic assignments, digital portfolios, rubrics, feedback, and student reflections. In the Development stage, the model is developed and validated by experts. Furthermore, the Implementation stage was carried out to 120 students with the involvement of 4 teachers. The Evaluation stage is used to assess the

feasibility and effectiveness of the model based on the results of validation, portfolio, and pre- and post-implementation tests.

Data Analysis Techniques

Data were analyzed using quantitative descriptive analysis, N-gain, and paired-samples t-test. Descriptive analysis was used to determine the feasibility of the model, while N-gain was used to measure the improvement in writing ability. Paired-samples t-test was used to test differences in writing literacy skills before and after the application of the model at a significance level of $\alpha = .05$. Data were tabulated and N-gain was calculated using Microsoft Excel, while descriptive analysis and paired-samples t-test were performed using IBM SPSS Statistics Version 29.

RESEARCH RESULT

Respondent Characteristics

The study involved 127 participants, consisting of 120 students, four Indonesian language teachers, and three expert validators. The 120 students constituted the primary participants in the implementation and effectiveness testing of the digital portfolio-based authentic assessment model. The four teachers were involved in identifying assessment needs and implementing the model in Indonesian language learning, while the three expert validators assessed the content and structural feasibility of the developed model.

Table 1. Characteristics of Research Participants

Participant Group	Number (n)	Percentage (%)	Role in the Study
Students	120	94.49	Model implementation and effectiveness testing
Indonesian language teachers	4	3.15	Needs analysis and model implementation
Expert validators	3	2.36	Model and instrument validation
Total	127	100.00	

The distribution indicates that students represented the largest participant group because the primary effectiveness analysis focused on changes in students' writing literacy before and after implementation of the model. Teachers and expert validators were included according to their specific roles within the ADDIE development process.

Development and Validation of the Digital Portfolio-Based Authentic Assessment Model

The study produced a digital portfolio-based authentic assessment model designed to assess students' writing literacy development in Indonesian language learning. The model was developed through the five stages of ADDIE: *Analysis, Design, Development, Implementation,* and *Evaluation*. The final model integrated five major components: authentic writing tasks, digital documentation of drafts–revisions–final products, rubric-based assessment, teacher feedback, and student reflection. The model was subsequently evaluated by three expert validators before being implemented with 120 students and four teachers.

Expert validation indicated that the developed model achieved an overall validity score of 92.13%, placing it in the very valid category. All components achieved scores above 90%, indicating a high level of content and structural feasibility.

Table 1. Expert Validation Results

Assessment Component	Score (%)	Category
Authentic writing tasks	92.00	Very valid
Digital portfolio structure	93.30	Very valid
Documentation of drafts and revisions	91.70	Very valid
Rubric-based assessment	90.00	Very valid
Teacher feedback	93.30	Very valid
Student reflection	92.50	Very valid
Overall mean	92.13	Very valid

The validation results confirmed that the model met the required feasibility criteria for implementation in Indonesian language learning.

Students' Writing Literacy Development

Students' writing literacy was assessed in five dimensions: content, organization, language use, vocabulary, and mechanics. Descriptive analysis showed higher posttest scores across all dimensions after implementation of the digital portfolio-based authentic assessment model.

Table 2. Pretest and Posttest Writing Literacy Scores

Writing Dimension	Pretest Mean	Posttest Mean	Mean Increase
Content	65.20	83.60	18.40
Organization	63.70	82.10	18.40
Language use	62.80	80.50	17.70
Vocabulary	64.10	81.80	17.70
Mechanics	65.10	84.40	19.30
Overall	64.18	82.48	18.30

The overall mean score increased from 64.18 (SD = 7.86) on the pretest to 82.48 (SD = 6.92) on the posttest, corresponding to an increase of 18.30 points. The largest improvement was observed in *mechanics* (19.30 points), followed by *content* and *organization* (18.40 points each). Improvements were also observed in *language use* and *vocabulary*, with gains of 17.70 points each.

N-Gain Analysis

The magnitude of improvement was further examined using normalized gain (N-gain). The overall N-gain score was 0.51, indicating a moderate level of improvement in students' writing literacy.

Table 3. N-Gain Results by Writing Dimension

Writing Dimension	N-Gain	Category
Content	0.53	Moderate
Organization	0.51	Moderate
Language use	0.48	Moderate
Vocabulary	0.49	Moderate
Mechanics	0.55	Moderate
Overall	0.51	Moderate

All five dimensions were classified within the moderate improvement category. The highest N-gain was found in *mechanics* (0.55), whereas *language use* showed the lowest N-gain (0.48).

Effectiveness and Hypothesis Testing

A paired-samples t-test was conducted to determine whether the difference between students' pretest and posttest writing literacy scores was statistically significant. The analysis showed a significant increase in writing literacy scores following implementation of the model, $t(119) = 16.84$, $p < .001$.

Table 4. Paired-Samples t-Test Results

Measurement	Mean	SD	Mean Difference	t	df	p
Pretest	64.18	7.86				
Posttest	82.48	6.92	18.30	16.84	119	<,001

Because the probability value was below the significance level of $\alpha = .05$, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was supported. Thus, students demonstrated a statistically significant improvement in writing literacy after the implementation of the digital portfolio-based authentic assessment model.

Overall, the results showed that the developed model achieved a very valid expert validation rating (92.13%) and that its implementation was associated with an increase in students' writing literacy scores from 64.18 to 82.48, with an overall N-gain of 0.51 and a statistically significant pretest–posttest difference ($p < .001$).

DISCUSSION

Validity of the Digital Portfolio-Based Authentic Assessment Model

The findings demonstrate that the developed digital portfolio-based authentic assessment model achieved an overall expert validation score of 92.13%, indicating that its components were highly feasible for assessing students' writing literacy development in Indonesian language learning. The model integrates authentic writing tasks, documentation of drafts and revisions, rubric-based assessment, teacher feedback, and student reflection. This integration is important because authenticity in assessment should not be understood merely as the replication of real-life tasks, but as an assessment process that meaningfully connects task design, learning objectives, student participation, and disciplinary practices (Ajjawi et al., 2024).

The high validation score suggests that the model provides a coherent structure for shifting writing assessment from a product-oriented approach

toward a process- and development-oriented assessment system. In this model, students' drafts, revisions, feedback, and final products constitute evidence of learning progression rather than isolated assessment outcomes. This orientation is consistent with continuous assessment research showing that repeated low-stakes assessment can create learning opportunities when assessment tasks, feedback, and subsequent student action are integrated into the instructional process (Ma & Bui, 2022). Thus, the contribution of the developed model lies not simply in digitizing portfolios, but in organizing digital artefacts into a systematic mechanism for documenting writing development.

Improvement in Students' Writing Literacy

The most important empirical finding was the improvement in students' overall writing literacy score from 64.18 (SD = 7.86) before implementation to 82.48 (SD = 6.92) after implementation, representing an increase of 18.30 points. The overall N-gain of 0.51 further indicates a moderate improvement in writing literacy. The paired-samples analysis confirmed that this difference was statistically significant, $t(119) = 16.84$, $p < .001$, thereby supporting H1 and rejecting H0.

The improvement can reasonably be interpreted as resulting from the interaction of several elements rather than from the digital platform alone. In particular, students repeatedly produced drafts, received teacher feedback, revised their texts, reflected on their performance, and retained evidence of these processes within the portfolio. Research on essay revision has demonstrated that feedback becomes particularly useful when it provides learners with actionable information concerning what should be addressed next, rather than merely reporting errors or scores (Hattie et al., 2021). Similarly, technology can facilitate systematic tracking of how learners respond to feedback during draft revision, enabling writing development to be observed as a process instead of being inferred solely from final products (Cheng et al., 2023).

This finding also reinforces a broader conceptualization of feedback. Liu and Yu (2022) argue that feedback in writing should be understood across the dimensions of the written product, the writing process, and the development of the writer, rather than being reduced to textual correction. The present model operationalizes this perspective through the simultaneous inclusion of teacher feedback, revisions, portfolio documentation, and student reflection. Consequently, the significant score improvement should be understood not merely as higher posttest achievement, but as evidence that an assessment system organized around continuous writing and revision can create conditions that support observable writing development.

Differences Across Writing Literacy Dimensions

Improvement occurred across all five assessed dimensions: content, organization, language use, vocabulary, and mechanics. However, the gains were not uniform. Mechanics demonstrated the largest improvement, increasing by 19.30 points and producing the highest N-gain (0.55). In contrast, language use showed an increase of 17.70 points and the lowest N-gain (0.48). This variation indicates that different components of writing literacy may respond differently to portfolio-based formative assessment.

The stronger improvement in mechanics may be related to the relatively observable and actionable nature of mechanical errors. Errors involving spelling, punctuation, capitalization, and other conventions can be explicitly identified in teacher feedback and directly corrected during revision. Hattie et al. (2021) found that feedback providing clear directions for subsequent action was associated with stronger improvements in students' essays. Therefore, the combination of analytic rubrics and repeated revision in the present model may have made mechanical weaknesses easier for students to recognize and correct.

By comparison, the lower N-gain in language use does not indicate that the model was ineffective in this dimension; the posttest score still increased substantially from 62.80 to 80.50. Rather, the pattern suggests that language use may require more complex development than correcting surface conventions. Effective language use involves syntactic control, grammatical appropriateness, sentence relationships, and the ability to make contextual linguistic choices. Feedback research has emphasized that students vary in their ability to interpret, evaluate, and act upon feedback, and that improvements are not necessarily uniform across feedback-related competencies (Zhang et al., 2024). Therefore, language-use improvement may require longer-term exposure, repeated guided practice, and more explicit feedback than was necessary for mechanics.

The Role of Feedback, Revision, and Reflection

Teacher feedback appears to be a central element in explaining the observed improvement because the developed model does not treat the digital portfolio as a passive repository. Instead, portfolios document a sequence of writing, feedback, revision, and reflection. Research by Bozorgian et al. (2024) similarly found that writing within a Google Drive-based e-portfolio environment supported improvements in content, organization, and language when learners engaged with teacher and peer feedback; however, their study also identified affective challenges, including frustration, anxiety, and confusion associated with feedback. This suggests that digital availability alone is insufficient; the pedagogical quality and clarity of feedback remain central.

The inclusion of student reflection may further help transform feedback from information supplied by the teacher into information used by the learner. Writing feedback literacy involves students' capacity to appreciate feedback, recognize different feedback sources, make judgments, manage affect, and take action (Yu et al., 2022). The present model provides opportunities for these processes by requiring students to review earlier work, respond to feedback, document revisions, and reflect on their development. Nevertheless, because feedback literacy itself was not directly measured in the present study, its role should be regarded as a theoretically plausible mechanism rather than a demonstrated mediating variable.

Theoretical and Practical Contribution

Theoretically, this study extends research on authentic and formative assessment by positioning digital portfolio assessment as a longitudinal assessment architecture for writing literacy. The main contribution is not the digital storage function of the portfolio, but the integration of multiple forms of evidence—initial writing, revision, final writing, teacher feedback, analytic scoring, and student reflection—into a single developmental assessment model.

This perspective aligns with Ajjawi et al. (2024), who argue that authenticity should emerge through meaningful educational processes rather than simply from characteristics of an assessment task.

The study also provides a contextual contribution by applying this framework specifically to Indonesian language learning, while much contemporary research on digital writing feedback and portfolios has been concentrated on English as a second or foreign language. The findings therefore suggest that principles of digitally documented formative assessment may also be applicable to first-language writing literacy when assessment is adapted to the linguistic and instructional objectives of the target subject

Practically, the model gives teachers access to more comprehensive evidence than a single final writing score. Teachers can examine changes between drafts, identify persistent difficulties across the five writing dimensions, and use portfolio records to provide subsequent feedback. Digital feedback systems have also been shown to make the tracking of revisions more systematic, although technological implementation must remain pedagogically manageable for teachers (Cheng et al., 2023). In larger writing classes, future development could additionally investigate carefully controlled digital feedback tools to reduce teacher workload; contemporary evidence suggests that technology-supported formative feedback can assist writing development when accompanied by appropriate student training and pedagogical oversight (Mahapatra, 2024).

Limitations and Directions for Future Research

Several limitations should be considered when interpreting these findings. First, the effectiveness analysis used a single-group pretest–posttest design involving 120 students. Although the statistically significant difference establishes that students' scores improved after implementation, the absence of a comparison or control group limits strong causal conclusions. Factors such as regular instruction, repeated writing practice, familiarity with the assessment instrument, or maturation could also have contributed to the improvement. Future studies should therefore employ quasi-experimental or experimental designs that compare the developed model with conventional writing assessment.

Second, participants were selected through non-probability sampling, which limits generalization beyond the study context. Future research should involve multiple schools, different educational levels, and more heterogeneous student populations. Multi-site implementation would also help determine whether the model remains feasible when differences exist in digital infrastructure, teacher assessment literacy, student proficiency, and institutional practices.

Third, the overall N-gain of 0.51 represents moderate rather than maximal improvement. This is pedagogically meaningful, but it also indicates considerable room for further development. The relatively lower improvement in language use suggests that subsequent versions of the model could strengthen targeted feedback, guided revision activities, exemplars, and opportunities for repeated language-focused practice. Feedback interventions have been shown to affect different aspects of students' feedback literacy differently, reinforcing the

need for differentiated scaffolding rather than assuming that all students can immediately interpret and apply feedback in the same manner (Zhang et al., 2024).

Finally, the current effectiveness assessment was based on immediate pretest–posttest change. It therefore does not establish whether improvements persist after the intervention. Future research should include a delayed posttest to evaluate retention and should consider incorporating inter-rater reliability for writing scores, digital portfolio activity logs, interviews, and measures of feedback literacy. Such additional evidence would allow researchers to determine not only whether writing performance improves, but also how and why students use portfolio evidence, feedback, revision, and reflection to develop writing competence.

Overall, the results support the proposed hypothesis and demonstrate that the digital portfolio-based authentic assessment model was highly valid and that its implementation was associated with significant improvement in students' Indonesian writing literacy. More importantly, the findings position assessment as part of the writing-development process itself: authentic tasks generate writing evidence, feedback informs revision, reflection promotes learner awareness, and digital portfolios preserve these processes longitudinally. The model therefore contributes to the development of a more systematic, formative, and development-oriented approach to writing assessment in Indonesian language education.

CONCLUSIONS AND RECOMMENDATIONS

This study successfully developed a digital portfolio-based authentic assessment model for assessing students' writing literacy development in Indonesian language learning through the ADDIE framework. The model, which integrates authentic writing tasks, digital documentation of drafts and revisions, rubric-based assessment, teacher feedback, and student reflection, achieved an expert validation score of 92.13%, indicating a very valid level of feasibility. Students' writing literacy scores increased from 64.18 to 82.48, with an overall N-gain of 0.51. The paired-samples t-test also demonstrated a statistically significant improvement, $t(119) = 16.84$, $p < .001$. These findings indicate that the developed model provides a systematic and development-oriented assessment approach that enables teachers to document writing progress across content, organization, language use, vocabulary, and mechanics.

The model is recommended as an alternative assessment approach for Indonesian language teachers who seek to evaluate writing as an ongoing developmental process rather than solely through final products. Nevertheless, implementation should be accompanied by clear analytic rubrics, structured teacher feedback, guided student reflection, and adequate digital support. Particular attention should be directed to language use, which demonstrated the lowest N-gain compared with other writing dimensions. Since the present study employed a single-group design and non-probability sampling, the findings should be generalized cautiously. Future implementations should therefore strengthen language-focused feedback, provide more intensive revision opportunities, and examine the model across broader educational contexts.

ADVANCED RESEARCH

Future research should employ quasi-experimental or experimental designs with control groups, larger and multi-school samples, and delayed posttests to examine the causal effect and long-term sustainability of the model. Further studies may also investigate inter-rater reliability, students' feedback literacy, digital portfolio engagement, and the integration of AI-assisted or automated formative feedback while maintaining teacher supervision. Longitudinal research could further determine how portfolio-based authentic assessment influences writing development across different educational levels and genres of Indonesian writing.

ACKNOWLEDGMENT

The authors express their appreciation to the students, Indonesian language teachers, expert validators, and the educational institution involved in this study for their participation and valuable contributions throughout the development, validation, and implementation of the digital portfolio-based authentic assessment model.

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