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Development of Interactive Digital Teaching Materials to Support the Integration of Literacy and Numeracy in Learning for Writing Procedure Texts

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ABSTRACT
Improving the quality of basic education requires learning that is able to integrate literacy and numeracy meaningfully. Indonesian language learning has the opportunity to develop both competencies through the activity of writing procedural texts that contain numerical information in the context of daily life. The reality in the field shows that students still have difficulty in compiling procedural texts sequentially, while teachers need more interactive learning media to support the learning process. This research aims to develop interactive digital teaching materials to support the integration of literacy and numeracy in learning to write procedural texts in elementary schools. The research uses the Design and Development Research approach with the ADDIE model which includes the stages of analysis, design, development, implementation, and evaluation. The research subjects consisted of 66 grade V students from three elementary schools and three grade V teachers. Data was collected through needs questionnaires, validation sheets, observations, and user response questionnaires. The results of the needs analysis show a high need for interactive learning media with a percentage of 93.52%. The product developed obtained a validity level of 86.67% with a very feasible category. The results of the practicality test showed a percentage of 81.25% in teachers with the practical category and 93.44% in students with the very practical category. These findings show that the interactive digital teaching materials developed are feasible and practical to support the integration of literacy and numeracy in Indonesian language learning in elementary schools.

Keywords: interactive digital teaching, literacy, numeracy, writing procedural texts

INTRODUCTION

Basic education plays a crucial role in establishing the foundation of competencies required for learners to navigate the challenges of the 21st century. Efforts to enhance educational quality focus not only on expanding access to learning but also on strengthening competencies that enable learners to think critically, solve problems, communicate effectively, and adapt to advancements in science and technology. This direction aligns with the fourth Sustainable Development Goal (SDG 4), which emphasizes the importance of providing inclusive, high-quality, and sustainable education for all learners (United Nations, 2024). UNESCO (2024) asserts that quality education must equip learners with relevant competencies, enabling them to participate actively in an ever-changing social, economic, and cultural landscape. Literacy and numeracy are two fundamental competencies that receive significant attention in both global and national education policies. The OECD (2023) explains that literacy extends beyond the mere ability to read and write; it encompasses the capacity to understand, evaluate, and effectively utilize information across various life contexts. Numeracy is understood as the ability to apply mathematical concepts, procedures, facts, and tools

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to interpret information and make sound decisions in real-world situations (Bolstad, 2023). Mastering these competencies is essential, as they are directly linked to a learner's ability to learn, reason, and resolve problems encountered in daily life. Research indicates that strengthening literacy and numeracy is most effective when fostered through contextual and meaningful learning experiences. Utilizing instructional media that bridges reading, writing, information comprehension, and the application of numerical concepts in real-world scenarios offers learners greater opportunities to build a comprehensive understanding. For instance, the use of illustrated storybooks rooted in local wisdom has been shown to enhance literacy and numeracy skills through activities that resonate with children's own experiences (Fitri, 2024). Similar findings also indicate that various learning innovations based on numeracy literacy can help students develop reading, writing, and arithmetic skills in a more integrated manner (Nur Muhammad et al., 2022).

Evolving educational paradigms indicate that literacy and numeracy are no longer viewed as isolated competencies. Instead, there is an increasing emphasis on developing them in an integrated manner across various subjects, enabling students to simultaneously employ language and reasoning skills to complete authentic tasks. Instruction that links language, information, data, and problem-solving allows students to gain a more comprehensive understanding of the interconnections between different areas of knowledge. UNESCO (2024) identifies the interdisciplinary approach as a crucial strategy for preparing students to navigate the complexities of future life.

National education policy in Indonesia highlights the strengthening of literacy and numeracy as a primary focus of the Independent Curriculum implementation. This policy promotes learning that is flexible, contextual, and student-centered. Literacy and numeracy are no longer the sole responsibility of specific subjects; rather, they must be integrated into all learning activities (Ashri & Pujiastuti, 2021). Research by Ummah and Nadlir indicates that the Kurikulum Merdeka ffers teachers ample scope to develop digital-based learning media as a means to foster literacy, numeracy, and creativity, while facilitating differentiated instruction tailored to students' needs.

Indonesian language instruction holds a strategic position in supporting the development of both competencies. Language-related activities involve not only the ability to comprehend and produce texts but also the capacity to process information, interpret data, and articulate ideas logically. Dassa et al. (2023) explain that numeracy can be integrated into various non-mathematics subjects through activities that require students to utilize quantitative information within meaningful contexts. This perspective underscores the significant potential of Indonesian language instruction to serve as a platform for the simultaneous development of literacy and numeracy skills.

Procedural texts exemplify this type of material. Such content requires students to understand objectives, identify sequential steps, utilize information systematically, and convey instructions clearly and logically. The activity of drafting procedural texts often involves the use of measurements, quantities, timeframes, and various other numerical data. These characteristics make procedural texts suitable material for integrating language and numeracy skills into a single learning activity. Such integration offers students the opportunity to apply multiple competencies simultaneously in situations that closely mirror real-life contexts. Furthermore, the use of interactively designed teaching materials enhances the potential for creating contextual and meaningful learning experiences (Dewi, 2025).

Field observations indicate that teaching students to write procedural texts still faces various challenges. A needs analysis conducted for this study reveals that students experience a moderate level of difficulty—57.05 percent—when writing procedural texts. These difficulties stem from challenges in organizing ideas, sequencing steps logically, and systematically developing the content. This situation suggests that many students require instructional support that helps them grasp the structure of procedural texts in a more concrete

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and accessible manner. These findings align with research (Maladerita et al., 2023; Sariadi et al., 2025) indicating that writing instruction for elementary school students requires more contextual learning experiences to enable a better understanding of text structures and purposes.

The needs analysis also reveals that student interest in numeracy activities falls into the high category, with a figure of 70.57 percent. This result indicates that learners are prepared to engage in learning activities that combine language use with numerical information. This potential serves as a crucial asset for designing instruction that focuses not only on writing skills but also on developing reasoning abilities through integrated activities.

The need for interactive learning media emerged as the most significant finding in this study, with a demand rate of 93.52 percent. This figure indicates that both teachers and students desire instructional innovations capable of delivering learning experiences that are more engaging, responsive, and aligned with the characteristics of the digital generation. Similar trends have been observed in various studies on learning media development. The use of visual literacy-based interactive e-books has been shown to enhance student comprehension of material while fostering greater engagement during the learning process (Dewi, 2025). Android-based animation media has also been reported to strengthen conceptual understanding through more engaging and interactive visual presentations (Kurniawati & Setyaningtyas, 2022). Other research findings demonstrate that interactive multimedia developed using Canva can boost learner engagement and thinking skills by facilitating more active learning experiences (Suryani et al., 2024).

Advancements in educational technology offer numerous opportunities to enhance the quality of learning. UNESCO (2023) emphasizes that the use of technology in education should be directed toward improving learning quality, learner engagement, and equitable access to education, ensuring that technology serves not merely as an aid but as a vehicle for transforming learning. Mayer (2021) explains that multimedia learning enables students to process information through verbal and visual channels simultaneously, thereby improving their understanding of the subject matter. The use of digital technology allows for the presentation of material in ways that are more flexible, interactive, and adaptive to user characteristics. These advantages position digital media as a promising alternative for supporting Indonesian language instruction that integrates literacy and numeracy. Numerous studies have demonstrated the positive contribution of digital media to the quality of learning. Hidayat et al. (2024) found that interactive activity-based digital media can enhance student engagement in the learning process. Nangimah and Dharin (2023) reported that interactive multimedia contributes to the development of digital literacy among elementary school students. Susanta et al. (2023) showed that interactive learning yields better results in mathematical literacy development compared to conventional instruction. Various other studies also indicate that the use of interactive e-books, augmented reality-based media, contextual learning videos, and multiliteracy-based teaching materials can boost learning motivation, conceptual understanding, and student learning outcomes across various educational levels (Saifuddin et al., 2025; Wahyuni & Agustika, 2021; Dewi, 2025; Hasanah et al., 2026).

A review of prior research indicates that digital learning media have been developed in various forms, such as interactive e-books, Android-based animations, interactive multimedia, contextual cartoons, instructional videos, and multiliteracy-based teaching materials. Some studies focus on strengthening literacy, others emphasize numeracy, while some are directed primarily at the development of the digital media itself. Research integrating literacy, numeracy, modeling strategies, and procedural text writing instruction into a single interactive digital product remains relatively limited. This situation highlights the need for learning innovations that not only combine various competencies within a single learning activity but also leverage digital technology to enhance students' learning experiences.

This study aims to address this gap by developing interactive digital teaching materials that integrate literacy, numeracy, modeling strategies, and digital technology into procedural text writing instruction in elementary schools. The developed product incorporates learning content, video tutorials, animations, a 2D shape calculator, interactive exercises, digital assessments, and visual feedback designed to help students build understanding incrementally. These features are expected to create a learning experience that is engaging, contextual, and aligned with the characteristics of students in the digital age.

Based on this background, the study aims to develop interactive digital teaching materials to support the integration of literacy and numeracy in procedural text writing instruction in elementary schools, as well as to assess the validity and practicality of the resulting product. The product development is expected to provide an alternative learning resource relevant to student needs, support the implementation of the Independent Curriculum, and contribute to efforts to improve the quality of education as mandated by SDG 4.

METHOD

This study employs a Design and Development Research (DDR) approach, which focuses on developing educational products to address learning needs identified in the field. This approach was selected because it enables a systematic development process, ranging from needs identification, product design, validation, and implementation to evaluation. Richey & Klein (2021), Razak et al. (2020), explain that DDR focuses not only on producing a product but also on generating knowledge regarding the development process, which can be used to refine educational practices.

The research focuses on developing interactive digital learning materials that support the integration of literacy and numeracy into procedural text writing lessons for elementary school students. Product development takes into account user needs, learner characteristics, the requirements of the Independent Curriculum, and the evolution of educational technologies that are increasingly integrated into teaching and learning activities.

Product development utilized the ADDIE model, which comprises five stages: analysis, design, development, implementation, and evaluation. This model was selected due to its systematic yet flexible procedures, allowing for refinements at every stage of development. Branch et al. (2009), Razak (2017), explain that the ADDIE model is a widely used instructional development model because it enables the creation of products that meet user needs through a continuous evaluation process.

The analysis stage focused on identifying the needs of teachers and students, the learning context, and the challenges encountered in teaching procedural text writing. The design stage involved drafting the product, structuring the content, designing the interface, and creating research instruments. The development stage resulted in an interactive digital teaching material, which was subsequently validated by experts. The implementation stage involved field-testing the product with teachers and students. The evaluation stage was conducted formatively to gather feedback for product refinement.

The research was conducted during the even semester of the 2025/2026 academic year in Cluster V, Campaka District, Cianjur Regency. The research sites included SDN Budi Asih, SDN Margawaluya, and SDN Sindanghayu. These locations were selected based on a preliminary study indicating a need for teaching materials that support the integration of literacy and numeracy into Indonesian language instruction.

The research subjects consisted of students, teachers, and expert validators. A total of 66 fifth-grade students participated in the product trial, while the assessment of teacher-related practicality involved three fifth-grade teachers—one from each participating school. They are divided intothree school e. i 19 students of SDN Budi Asih , 25 students of SDN Margawaluya, and 22 students of SDN Sindanghayu. Product validation was carried out by three validators: a subject matter expert, a media expert, and a language expert.

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The analysis phase was conducted through observations, interviews, the distribution of needs-assessment questionnaires, and an analysis of instructional documents. These activities aimed to gain insight into students' difficulties in writing procedural texts, their interest in numeracy activities, the requirements for learning media, and the characteristics of classroom instruction at the schools.

The results of the needs analysis served as the foundation for the product design. During this stage, the content structure, navigation flow, user interface, and learning activities—integrating both literacy and numeracy—were designed. The product utilized a modeling strategy involving the presentation of examples, video tutorials, guided practice, and independent practice.

The development phase resulted in an HTML-based interactive digital learning resource featuring various components, such as instructional content, video tutorials, digital student worksheets, a 2D shape calculator, interactive exercises, digital assessments, and learning reflections. Once developed, the product underwent validation by subject matter experts, media specialists, and linguists to gather feedback prior to implementation with end-users.

Product trials were conducted with fifth-grade students and teachers across the three research sites. Teachers utilized the interactive digital learning resource to teach procedural text writing, while students participated in all the learning activities included in the product. These activities aimed to assess the product's practicality within actual classroom settings.

Evaluation was carried out continuously throughout the development process. Expert validation results, classroom observations, and user feedback served as the basis for refining the product, ensuring the final interactive digital learning resource met user needs.

Research data were collected using several instruments tailored to the research objectives. These instruments included a needs-analysis questionnaire, expert validation sheets, classroom observation sheets, and questionnaires to gauge teacher and student responses.

Data collection was conducted through observation, interviews, documentation, and questionnaires. Observation was used to gather information regarding the learning conditions at the school. Interviews were conducted with teachers to explore the needs and challenges associated with teaching procedural text writing. Documentation was used to supplement the data obtained during the research. Questionnaires were used to collect data on user needs, product validity, and the practicality of using the interactive digital teaching materials.

The data were analyzed using quantitative descriptive techniques. Scores obtained from validation results and user responses were converted into percentages to determine the product's level of validity and practicality.

Criteria for Interpreting validity and practicality:

1) 81–100 : highly suitable/practical
2) 61–80 : suitable/practical
3) 41–60 : adequate
4) 21–40 : poor
5) 0–20 : very poor

A product is deemed suitable if it receives a "suitable" or "highly suitable" rating based on expert validation results. A product is deemed practical if it receives a "practical" or "highly practical" rating based on teacher and student feedback. Through this procedure, the quality of the interactive digital teaching materials can be systematically evaluated before they are recommended for use in Indonesian language instruction at the elementary school level.

RESULT

1. Needs Analysis Results

The needs analysis phase was conducted to gain insight into the current state of procedural text writing instruction, student interest in numeracy, and user requirements regarding the teaching materials to be developed. Data were obtained by ad-

ministering questionnaires to fifth-grade students and teachers at the three elementary schools serving as research sites.

The analysis results indicate a high level of user demand for the development of interactive digital teaching materials. This trend is evidenced by the high demand among teachers for interactive learning media, which reached 93.52 percent. These findings suggest that the media currently in use have not fully succeeded in facilitating learning that is engaging, interactive, and aligned with the characteristics of elementary school students.

Table 1
Results of the Product Development Needs Analysis

No.	Aspect	Respondent	Mean	Percentage	Category
1	Difficulty in Writing Procedural Texts	Students	2.85	57.05	Moderate
2	Challenges in Teaching Procedural Texts and Numeracy	Teachers	1.70	42.50	Low
3	Interest in Numeracy	Students	3.53	70.57	High
4	Need for Interactive Learning Media	Teachers	3.74	93.52	Very High
5	Preference for Learning Media	Students	3.66	73.18	High
6	Need for Visual Feedback	Students	3.66	73.18	High

The data in Table 4 indicate that students still experience difficulties in structuring procedural texts in a coherent and systematic manner. These difficulties primarily relate to organizing ideas, sequencing steps, and developing the content of the writing. On the other hand, student interest in numeracy activities falls into the high category, presenting an opportunity to integrate numeracy elements into Indonesian language instruction.

The aspect receiving the highest score is the need for interactive learning media. This result suggests that both teachers and students require instructional innovations capable of providing a learning experience that is more engaging, responsive, and aligned with technological advancements. The need for visual feedback and the preference for digital media—both of which also fall into the high category—further underscore the importance of developing teaching materials that utilize interactive technology.

2. Needs Analysis Results

The general overview of the needs analysis results reveals an alignment between user needs and the direction of product development. Students require learning experiences that are more visual and interactive and provide immediate feedback, while teachers need media that can assist in integrating literacy and numeracy into the teaching of procedural text writing. These findings serve as the foundation for designing the interactive digital teaching materials developed in this study.

3. Characteristics of the Developed Product

The resulting product consists of interactive digital teaching materials designed to support the integration of literacy and numeracy into the teaching of procedural text writing. Product development was guided by the needs analysis results and utilized a modeling strategy as the primary instructional approach (component and description):

1) Product Type : Interactive digital learning material
2) Subject Matter : Writing procedural texts

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3) Numeracy Integration : Area and perimeter of 2D shapes
4) Learning Strategy : Modeling strategy
5) Platform : Interactive HTML
6) Users : Grade 5 elementary school teachers and students

The product is designed for use either independently or with teacher guidance. The material is structured in a step-by-step manner, progressing from concept introduction and examples to guided practice and learning evaluation. To visually represent the developed product design, a storyboard was created to outline the learning flow, content layout, and the integration of interactive components within the digital learning material. The product storyboard is shown in the following figure.

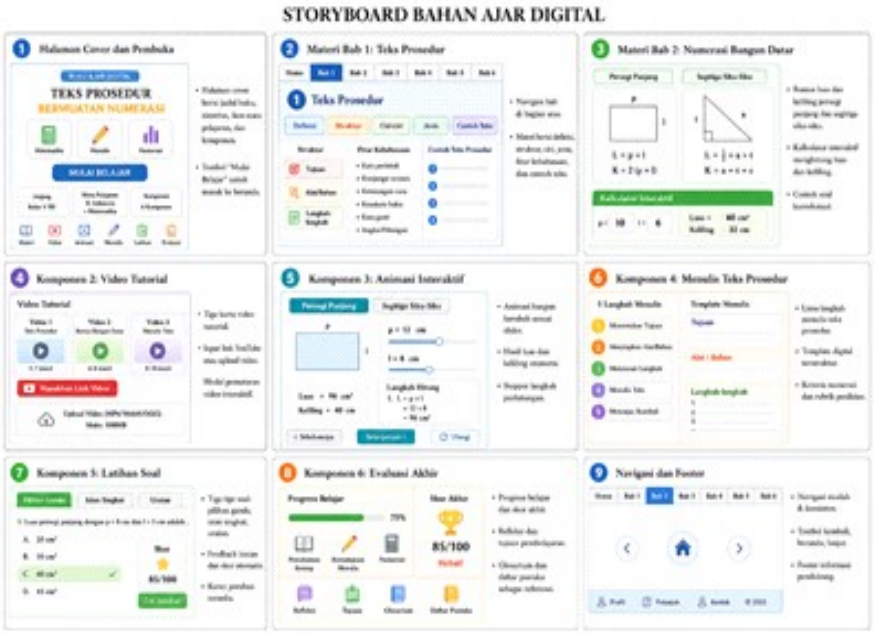

Figure 1
Storyboard of the Numeracy-Infused Procedural Text Digital Textbook

The product's primary characteristic lies in the integration of literacy and numeracy, presented through interactive digital media. Instruction is not merely directed at mastering the structure of procedural texts but also provides students with opportunities to utilize numerical information within contextual learning activities.

The video tutorials included in the product serve as a modeling tool, helping students understand the learning steps before performing tasks independently. The inclusion of digital student worksheets, a 2D shape calculator, interactive exercises, and digital assessments offers a more active learning experience compared to conventional teaching materials.

Product Characteristics

The developed product functions not only as a digital learning resource but also as a means of integrating literacy and numeracy, supported by modeling strategies and various interactive features. This combination distinguishes the product from conventional teaching materials, which typically focus on delivering content primarily through text.

Product Validation Results

Validation was conducted to assess the product's suitability for use in instruction. The assessment involved subject matter experts, media experts, and language experts.

Table 2
Product Validation Results

Validator	Maximum Score	Score Obtained	Percentage (%)	Category
Subject Matter Expert	120	102	83.67	Highly Suitable
Media Expert	105	93	88.57	Highly Suitable
Language Expert	120	98	81.66	Highly Suitable
Average	345	293	86.67	Highly Suitable

The validation results indicate that all aspects achieved the "Highly Suitable" category. The highest rating was awarded to the media aspect, demonstrating that the product's visual design, navigation, and interactivity align with instructional media development principles. The subject matter and language aspects also received excellent ratings, confirming that the product meets the standards of suitability for use in instruction.

Table 3
Summary of Validator Suggestions and Follow-up Actions

Validator	Suggestion for Improvement	Follow-up Action
Subject Matter Expert	Refinement of text examples	Revision of examples and illustrations
Media Expert	Layout adjustments for several pages	Revision of visual design
Language Expert	Refinement of spelling and word choice	Revision of linguistic aspects

Feedback provided by the validators served as the basis for refining the product prior to the implementation stage. Revisions were made regarding content, visual presentation, and language use to enhance the product's quality.

Synthesis of Validation Results

Validator assessments indicate that the interactive digital learning material met the criteria for content, media design, and language. These results demonstrate that the product possesses sufficient quality for use in instruction following the revision and refinement process.

4. Product Practicality Results

Practicality testing was conducted to determine the product's ease of use based on the experiences of teachers and students during instructional implementation.

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Table 4
Teacher Practicality Results

Assessment Aspect	Percentage	Category
Ease of Implementation	90.67	highly practical
Time Allocation	88.87	highly practical
Student Motivation	90.00	highly practical
Learning Benefits	86.67	highly practical
Average	89.05	highly practical

Teacher assessments indicate that all aspects fall into the "highly practical" category. The systematic structure of the material, clear navigation, and user-friendly learning features assisted teachers in conducting lessons more effectively. The product was also deemed capable of increasing student engagement during the learning process.

Table 5
Student Practicality Results

Assessment Aspect	Percentage	Category
Visual Appeal	93.40	highly practical
Clarity of Instructions	93.45	highly practical
Ease of Material	93.36	highly practical
Modeling Strategy	93.33	highly practical
Numeracy Integration	93.46	highly practical
Interest and Motivation	93.51	highly practical
Satisfaction and Benefits	93.56	highly practical
Average	93.44	highly practical

Student responses demonstrate a very high level of acceptance regarding the developed product. All aspects fell into the "highly practical" category, with a relatively uniform range of scores. This uniformity indicates that students consistently perceived the product's benefits across the various components evaluated—including its visual design, ease of use, and the resulting learning experience.

Synthesis of Product Practicality

Assessments by both teachers and students demonstrate that the interactive digital learning materials are easy to use in real-world instructional settings. The product effectively supports learning activities, boosts student engagement, and provides a more compelling, contextual learning experience.

5. Synthesis of Product Development Results

Overall, the research findings indicate that the development of the interactive digital learning materials successfully addressed the user needs identified during the analysis phase. The developed product effectively integrates literacy, numeracy, modeling strategies, and digital technology into a cohesive, unified learning experience.

The integration of these various educational elements creates a mutually reinforcing learning system focused on achieving student competencies. A visualization of the interrelationships between these components is presented in the product development diagram shown in the following figure.

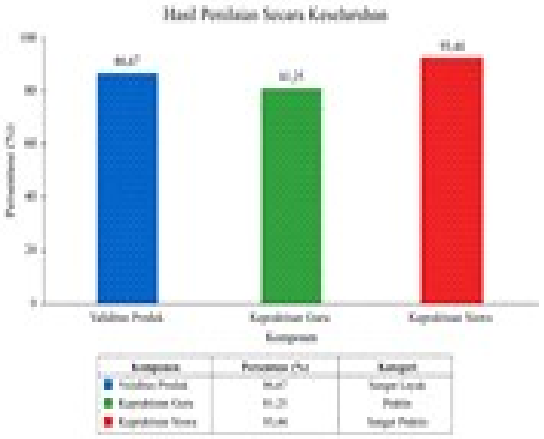

Figure 1
Comparison of Product Validity and Practicality

The validity results indicate that the product meets quality standards regarding content, media, and language. High levels of practicality—from the perspectives of both teachers and students—demonstrate that the product is ef-

fective for use in instruction. These findings suggest that the developed interactive digital teaching material is of high quality and suitable for supporting the integration of literacy and numeracy into procedural text writing lessons in elementary schools.

DISCUSSION

Integration of Literacy, Numeracy, and Modeling Strategies in Procedural Text Writing Instruction

Strengthening literacy and numeracy is no longer viewed solely as the responsibility of specific subjects; rather, it is seen as a fundamental competency that must be developed holistically through various learning activities. Research findings show that teaching students to write procedural texts offers ample opportunity to link language skills with the use of numerical information within meaningful contexts. This is evidenced by students' high interest in numeracy activities and their positive response to the numeracy integration incorporated into the interactive digital teaching material.

The nature of procedural texts—which require the sequential arrangement of steps and the use of measurements, quantities, timeframes, and other quantitative data—allows learners to employ literacy and numeracy skills simultaneously. Such activities help students realize that the use of numbers and quantitative information is not limited to mathematics lessons but is also integral to language-based activities relevant to everyday life. Hidayat et al. (2024) explain that numeracy concepts are more easily grasped when situated in authentic contexts connected to learners' real-life experiences.

Research data indicate that students readily embraced the integration of numeracy into Indonesian language instruction. This suggests that the boundaries between language learning and numeracy instruction are not rigid; indeed, learning experiences that link these two competencies offer students greater opportunities to build a more comprehensive understanding. These findings align with research by Mardi et al. (2025), which demonstrates that strengthening literacy and numeracy can be achieved through contextual learning media, thereby enabling students to more easily grasp the connections between the concepts being studied and their own lives. Similar results were reported by Nur Muhammad et al. (2022), who explained that learning activities integrating reading, writing, and arithmetic can more comprehensively strengthen students' mastery of basic competencies.

The successful integration of literacy and numeracy in this study is attributable to the application of a modeling strategy, which served as the foundation for designing the learning activities. Primary school students generally require concrete examples before they can produce work independently. The provision of sample texts, video tutorials, illustrated procedural steps, and guided practice helped students understand the step-by-step process of composing procedural texts. This demonstrates that the learning process is more effective when students have a clear picture of the expected outcomes.

Joyce et al. (2018) explain that the modeling strategy offers learners the opportunity to learn by observing, imitating, and modifying the examples presented. This approach helps alleviate the difficulties often encountered when students are asked to produce writing without adequate examples. Student responses regarding the modeling strategy—which fell into the "highly practical" category—demonstrate that the use of learning models contributes significantly to their understanding of the structure and content of procedural texts. A similar trend is observed in various studies on the development of learning media that utilize storyboards, visualizations, and demonstrations as part of the learning process. Presenting clear models helps learners grasp the procedural steps before undertaking tasks independently. Research by Dewi (2025) and Jusniani & Monariska (2025) indicates that media presenting examples and visualizations systematically can enhance student understanding and engagement during lessons.

These findings demonstrate that the integration of literacy, numeracy, and modeling strategies

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creates a mutually supportive relationship. Literacy provides a space for developing language skills, numeracy enriches thinking and problem-solving activities, and modeling strategies help learners understand the learning process in a more structured manner. The combination of these three components makes the instruction of procedural text writing more contextual, accessible, and relevant to the needs of elementary school students.

Contribution of Interactive Digital Media to Learning Quality

Advancements in digital technology have created numerous opportunities to enrich students' learning experiences. Interactive digital media enables a learning process that combines text, images, audio, video, animations, and interactive activities that complement one another. This creates a learning experience distinct from that provided by conventional teaching materials, which are typically dominated by text-based content.

Research results indicate that the developed interactive digital teaching materials achieved high levels of validity and practicality. Expert evaluations confirm that the product meets the necessary standards regarding content, media design, and language use to effectively support the learning process. This achievement demonstrates that integrating various learning components into a single digital medium can yield a product that meets user needs.

The media aspect made the most significant contribution to the product's suitability. High ratings in this area indicate that the visual design, layout, navigation, and interactivity effectively supported the learning process. Mayer (2021) explains that multimedia learning is more effective when information is presented simultaneously through visual and verbal channels. A structured presentation helps learners process information more easily, leading to a better understanding of the material.

The learning experience gained by students while using the product demonstrates that interactive digital media serves not only as a means of delivering content but also as a learning environment that fosters active learner engagement. Positive student responses regarding visual appeal, learning interest, and the benefits of using the product indicate that students felt comfortable using the developed media. This suggests that the media design significantly influences the quality of the learning experience perceived by the students.

Similar trends have been observed in various previous studies. The use of visual literacy-based interactive e-books has been shown to improve students' understanding of the material (Dewi, 2025). Android-based animation media has been reported to strengthen conceptual understanding through engaging and interactive visual presentations (Kurniawati & Setyaningtyas, 2022). Other research indicates that Canva-assisted interactive multimedia can enhance learner engagement while strengthening critical thinking skills during instruction (Suryani et al., 2024). Augmented reality-based storybooks have also been proven to positively impact learning outcomes by combining visual elements and interactivity in a more engaging manner (Pahlevi et al., 2024).

Teacher assessments placing the product in the "highly practical" category demonstrate that it can be used without complex adjustments. The systematic content structure, easily accessible features, and simple navigation help teachers manage instruction more effectively. These findings align with research by Maladerita et al. (2023), which shows that digital teaching materials designed to meet user needs are generally easier to implement and provide greater benefits to the learning process. Nevertheless, the use of digital media in education is inseparable from various challenges that schools continue to face. Factors such as device availability, access to technology, and teachers' digital competence remain critical to the successful implementation of technology-based learning media. Prinanda (2025) explains that the use of digital media in elementary schools is often constrained by limited infrastructure and varying levels of teacher readiness in managing educational technology.

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These conditions demonstrate that the success of learning media depends not only on the quality of the product itself but also on a learning environment that supports its use. School support, teacher competence, and the availability of learning resources are essential factors that must be addressed to ensure the benefits of digital media are fully realized.

Implications for the Kurikulum Merdeka and SDG 4

The research findings indicate that the development of interactive digital learning materials offers a viable alternative for supporting the implementation of the Independent Curriculum in primary schools. The product's characteristics—integrating literacy, numeracy, modeling strategies, and digital technology—align with educational policy directions that emphasize contextual learning, differentiation, and the strengthening of 21st-century competencies.

A study by Ummah & Nadlir (2023) explains that the Kurikulum Merdeka provides ample scope for teachers to develop digital-based learning media to enhance students' literacy, numeracy, creativity, and thinking skills. The product developed in this study demonstrates how the integration of these various competencies can be realized within a cohesive learning experience.

The research also contributes to the objectives of SDG 4, which emphasizes the importance of quality, inclusive, and sustainable education. Strengthening literacy and numeracy through interactive digital media offers students learning experiences that are more relevant to contemporary needs. Learning shifts its focus from mere content mastery to the development of thinking skills, problem-solving abilities, communication, and the productive use of technology.

The introduction of interactive digital learning materials in Indonesian language instruction demonstrates that educational transformation can begin with innovations closely aligned with the needs of teachers and students. Learning experiences that are more visual, interactive, and contextual provide greater opportunities for students to engage actively in the learning process. These findings reinforce the view that the use of appropriately designed educational technology can serve as a strategy to improve the quality of learning while simultaneously supporting the achievement of sustainable educational development goals.

CONCLUSION

This study produced interactive digital teaching materials designed to support the integration of literacy and numeracy into procedural text writing lessons in elementary schools. The product's development was driven by the need—expressed by both students and teachers—for learning media that are interactive, contextual, and capable of facilitating the integrated development of various competencies. A needs analysis revealed that students struggled to compose procedural texts systematically, while the demand for interactive learning media was extremely high. These findings served as the basis for designing teaching materials that integrate procedural text writing content, numeracy activities, modeling strategies, and digital technology into a unified learning experience. Developed using the ADDIE model, the product incorporates various learning features such as video tutorials, digital student worksheets, a 2D shape calculator, interactive exercises, digital assessments, and visual feedback. Validation by subject matter, media, and language experts rated the product as "highly feasible," with an average score of 86.67%. This assessment indicates that the product meets the necessary standards regarding content, media design, and language to support elementary school instruction.

Implementation demonstrated that the interactive digital teaching materials could be effectively utilized in real-world classroom settings. Teacher feedback indicated a very high level of practicality (89.05%), while student feedback reached 93.44%, placing it in the "highly practical" category. These results suggest that the product is user-friendly, capable of capturing student attention, and effective in fostering active engagement during the learning process.

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The research findings demonstrate that literacy and numeracy can be effectively integrated into procedural text writing lessons when supported by modeling strategies and interactive digital media tailored to the students' characteristics. The developed teaching materials serve not only as a learning resource but also as a means to strengthen thinking, communication, and problem-solving skills within the context of Indonesian language instruction. Thus, the resulting product is suitable and practical for use as an alternative learning resource to support the implementation of more innovative instruction in elementary schools.

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