



BUSAK PAUD Application: An Innovation in Monitoring Early Childhood Literacy Development

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ABSTRACT

Early childhood literacy development forms the foundation of long-term academic achievement, yet monitoring practices in Early Childhood Education (ECE) settings are often manual, fragmented, and insufficiently integrated. This study aimed to develop and evaluate the BUSAK PAUD Application as an innovative digital system for monitoring early childhood literacy development. Employing a Research and Development approach using the ADDIE model, the study integrated qualitative needs analysis with quantitative expert validation and effectiveness testing. The findings indicate that the application achieved a highly feasible rating based on expert evaluations and demonstrated strong effectiveness in improving teachers' efficiency, enabling structured and data-driven literacy monitoring, and strengthening collaborative communication between schools and parents. The study concludes that the BUSAK PAUD Application represents a technology-based managerial innovation that aligns literacy monitoring with developmental principles in early childhood education. Broader implementation, continuous user training, and further integration of comprehensive digital assessment features are recommended, while future research should examine scalability and long-term impact across diverse ECE contexts.

Keywords: *Digital Monitoring, Early Childhood Literacy, Educational Technology*

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INTRODUCTION

Building literacy from an early age constitutes a crucial investment in improving the quality of human resources, as this period represents the most rapid phase of brain development (Hasbullah et al., 2024; Neumann & Neumann, 2017; Parapat et al., 2023). Children who possess a strong literacy foundation tend to demonstrate more complex reading comprehension skills at later educational levels, which linearly affects academic success, critical thinking ability, and competitiveness in the global workforce (Loh et al., 2024; Parapat et al., 2023; Xu & Gao, 2021). Conversely, literacy gaps that are not addressed during early childhood often persist and hinder individuals' capacity to process information effectively. Strengthening literacy from the earliest stages of development is therefore a fundamental strategy for breaking the cycle of low competency levels in future generations.

The importance of early childhood literacy has been widely supported by international research. The National Early Literacy Panel in the United States reported that before children

enter elementary school, they must develop numerous linguistic and cognitive skills that enable later academic learning (Alramamneh et al., 2023). Osabel et al., (2026) further revealed that seventy-four percent of children who perform poorly in reading by third grade continue to struggle through high school, underscoring the urgency of ensuring that children enter school ready to learn. The OECD (2019), through the PISA study, emphasized that children who receive early literacy stimulation at home and at school demonstrate stronger academic performance in subsequent years. These international findings collectively highlight the necessity of providing a literacy-rich environment from early childhood.

In Indonesia, national data similarly emphasize the urgency of literacy development. Referring to the Education Report released in 2025, only 71.81 percent of elementary school students achieved minimum reading literacy competence (Nasrullah et al., 2024). In Tana Tidung Regency, the figure is even lower, with only 62.85 percent of elementary students reaching minimum literacy standards. These results pose a serious challenge to improving the quality of human resources. Consequently, literacy competence must be established at the early childhood level. This policy reinforces the importance of building literacy competence from an early age.

To further strengthen literacy, Regulation of the Minister of Primary and Secondary Education of the Republic of Indonesia Number 8 of 2025 requires that at least ten percent of the annual operational assistance budget be allocated for book procurement. Through this policy, children aged five to six in early childhood education are expected to recognize symbols and letters, understand simple meanings from stories read aloud, express ideas through oral language and drawings, and begin attempting to write the initial letters of their names. They are also expected to develop positive habits such as interest in reading storybooks, confidence in storytelling, and curiosity toward written texts in their surroundings (Anggarani et al., 2022; Khotimah & Reza, 2022). Puspitasari et al., (2023) argues that literacy in reading and writing is a process built gradually. Reading ability develops from the fantasy stage to fluent reading, while writing begins from children's scribbles and progresses toward conventional spelling.

However, in practice, Tana Tidung Regency continues to face substantial challenges. Preliminary observations indicate that reading and writing skills are often developed without attention to developmental stages and processes. Many young children are not accustomed to shared reading activities, listening to stories, or expressing ideas through drawings and simple writing. Literacy activities at home remain minimal due to limited access to children's books. A lack of understanding that reading and writing abilities develop gradually also contributes to low parental participation in literacy stimulation. Interviews with parents further illustrate this issue. Mrs. Astuti, a parent at ECE SKB Tana Tidung, expressed her expectation that her child be fluent in reading and writing, yet she admitted she did not understand the stages children undergo before achieving fluency. Similarly, Mrs. Safariah, a parent at State Kindergarten Pembina of Tana Tidung, hoped her child would read and write fluently upon graduating from early childhood education but acknowledged limited knowledge of the developmental processes involved. Both parents supported the idea of interactive monitoring and reporting by teachers and parents regarding children's reading and writing development at each stage.

This misconception is also reflected in classroom practices. Many teachers and parents continue to emphasize mechanical letter and word recognition at the early childhood level. Research by Zati, (2018) indicates that mechanical approaches risk reducing children's reading interest and neglect aspects of meaning-making, communication, and enjoyment in interacting with texts. Such practices hinder sustainable literacy development. Moreover, literacy instruction in several early childhood institutions in Tana Tidung does not consistently align with developmental standards. Some institutions still train children to write by copying letters without meaningful context. The most recent Graduate Competency Standards in Regulation Number 10 of 2025 emphasize that literacy abilities must be grounded in play-based activities, exploration, and creative expression. This discrepancy reveals a gap between policy expectations and classroom implementation. Addressing these misconceptions and strengthening early literacy requires synergy among teachers, parents, and policymakers at the regional level. Literacy must be understood as a communicative competence involving meaning-making and enjoyment, developed progressively through shared reading, discussion of illustrations, and simple writing experiences both at home and in school (Parapat et al., 2023; Rohmah & Khasanah, 2023; Wahyuni et al., 2023).

In the digital era, technology-based applications offer promising solutions for monitoring and reporting children's literacy development (Marsh et al., 2018; Purnama et al., 2022; Tatminingsih, 2022). Interactive applications enable teachers and parents to share information regarding literacy achievements, provide feedback, and support stage-appropriate stimulation (Abidin & Haq, 2023; Hirsh-Pasek et al., 2015; Kurniawan S. Djibran et al., 2024). Nevertheless, a review of prior studies reveals that most research on early childhood literacy media has focused on pedagogical instruments rather than managerial monitoring systems. Usmiyatun et al., (2023) developed audiovisual reading videos that effectively captured children's attention but did not provide measurable interaction or monitoring features. Yekple et al., (2021) transformed traditional games into literacy tools that increased engagement yet lacked automated data tracking. Rohita et al., (2024) created Magic Pocket Books validated as highly feasible, but the medium remained print-based and limited in digital transformation. Torres et al., (2021) designed systematic reading modules without digital interactivity or parental access features. Putri (2022) developed digital flashcards but did not integrate reporting dashboards. Maitra, (2024) introduced interactive digital books without cumulative academic tracking functions. Agustini et al., (2020) created an Android-based application focused on cognitive stimulation but without collaborative monitoring modules. developed interactive digital storybooks without reporting mechanisms. Mahardika et al., 2023) (2023) designed literacy board games lacking digital data collection capacity. Septiani (2021) developed a mobile application that increased motivation but did not provide comprehensive reporting systems.

These studies demonstrate significant progress in developing pedagogical literacy media; however, they reveal a critical gap in the integration of managerial monitoring systems that connect teachers, parents, school leaders, and local education authorities within a unified digital platform. The novelty of this study lies in positioning the BUSAK PAUD Application not merely as a pedagogical tool but as an integrated literacy monitoring and reporting system designed to align developmental stages, policy standards, and collaborative engagement

among stakeholders. Based on this background, this study aims to develop and implement the BUSAK PAUD Application as an innovation for monitoring early childhood literacy development, particularly in reading and writing, in order to bridge the gap between policy standards, classroom practices, and parental involvement.

RESEARCH METHODOLOGY

Research Design

This study employed a mixed-method approach using a Research and Development design with the ADDIE model, which consists of Analysis, Design, Development, Implementation, and Evaluation stages. The mixed-method approach combines qualitative and quantitative procedures by formulating results derived from analysis and interpretation according to the data collection techniques of each approach. Mixed methods as a procedure for collecting, analyzing, and integrating qualitative and quantitative methods within a single study to gain a deeper understanding of research problems. In general, mixed methods integrate qualitative and quantitative approaches within the same study to obtain optimal findings regarding a research problem.

In this research, the qualitative approach was applied during the needs analysis phase through field observations, interviews, and document analysis to identify existing literacy challenges. The quantitative approach was applied in the process of designing and validating the proposed solution based on theoretical frameworks related to literacy development and instructional design.

The ADDIE model is widely recognized as a systematic instructional design framework that provides effective guidance in product development. ADDIE as a research-based development approach emphasizing procedural analysis across interconnected components that coordinate systematically throughout the development stages. The ADDIE development procedure functions as a cyclical process in which each component is interrelated. The final product generated in this study is the BUSAK PAUD Application, developed to facilitate the monitoring and reporting of early childhood reading and writing abilities in Tana Tidung Regency.

Development Procedures

The product developed in this study was the BUSAK PAUD Application designed for monitoring and reporting early literacy development in Tana Tidung Regency. The development procedures followed the ADDIE stages as described below.

Preliminary Study

The first stage involved conducting a preliminary study as the initial step in preparing the product development. This stage included collecting information related to the development of the BUSAK PAUD application. Data were obtained through direct field observation, interviews, and literature review. Field observations were conducted to obtain a comprehensive understanding of classroom literacy practices and the contextual needs of early childhood institutions. Interviews were carried out with parents and early childhood teachers at ECE SKB Tana Tidung and State Kindergarten Pembina of Tana Tidung to

explore reading and writing activities implemented in these institutions. The problems identified during the preliminary study were analyzed based on relevant prior research and theoretical foundations concerning early literacy development. Information obtained from field studies served as the foundation for designing the application model. A literature review was conducted to identify strengths and limitations of previous studies, thereby informing the development of an improved solution.

Needs Analysis

The needs analysis stage involved identifying and evaluating essential elements derived from the preliminary study to design, construct, and implement the research product. This stage ensured that the developed application met specific user needs and was relevant, effective, and efficient in addressing identified literacy challenges.

Design

The application was developed using PHP 9 programming language and operated on the Rocky Linux operating system. Users interact with the software through a Graphical User Interface built using HTML5. The data storage server utilizes PostgreSQL 9.6, and the server operating system runs on Rocky Linux.

During the design stage, key features of the BUSAK PAUD application were formulated, including: 1) Reading and Writing Assessment Form using a checklist system for evaluating developmental stages; 2) Monitoring Dashboard presenting visual graphs and real-time data on children's reading and writing progress; 3) Personalized Recommendations based on progress data, enabling teachers to suggest appropriate books or literacy activities aligned with the child's developmental level and interests; 4) Communication Feature providing discussion space or messaging tools that enable collaboration between parents and teachers.

The system was designed for four primary user groups: 1) Early Childhood Teachers as primary users responsible for data entry, assessment, and daily communication with parents; 2) School Principals with access rights to monitor and manage teacher and student data within their institutions; 3) The Department of Education and Culture serving as administrators and policymakers with access to aggregate reports across schools in Tana Tidung Regency; 4) Parents who can monitor their children's development and interact with teachers.

Additionally, evaluation instruments were designed, including expert validation sheets for content, media, and educational technology experts; effectiveness questionnaires to measure usability among teachers and parents; and literacy monitoring instruments in the form of assessment rubrics integrated into the application system.

Development

At the development stage, the BUSAK PAUD application design was transformed into a functional system. The researcher collaborated with a software programmer in this phase. Development procedures included coding for backend database management and frontend user interface construction based on completed needs analysis and system design.

System integration ensured that all components functioned harmoniously according to the designed data structure. The application was then installed and configured on the server according to operational requirements established during the design phase. Before implementation, feasibility testing was conducted by content experts, media or application experts, and educational technology experts to ensure system validity and appropriateness.

Implementation

During the implementation stage, the BUSAK PAUD application was applied at State Kindergarten Pembina of Tana Tidung and ECE SKB Tana Tidung. Training sessions were conducted for all teachers regarding system usage, including navigation of menus and available features. The purpose of this stage was to ensure optimal utilization of the application in daily literacy monitoring activities.

Evaluation

The evaluation stage involved trial testing to ensure the feasibility and effectiveness of the system. User feedback was collected to assess the extent to which the BUSAK PAUD application met identified needs. Evaluation results were used to refine and improve the system to ensure sustainability and practical effectiveness in monitoring early literacy development..

RESULTS AND DISCUSSION

Results

Model Development Results

The development and research were conducted at State Kindergarten Pembina of Tana Tidung and ECE SKB Tana Tidung. This study aimed to produce a technology-based application for monitoring early childhood reading and writing development. The application was developed as a software system designed to support early literacy growth in young children. This study employed a Research and Development method using the ADDIE development model. The stages conducted are described as follows.

Analysis Stage

Needs Analysis

At this stage, the need for developing the BUSAK PAUD Application was identified based on the problems found in the field, namely the nssity for synergy between parents and teachers in stimulating children's reading and writing abilities according to developmental stages, supported by data-based reporting and monitoring of literacy progress. The collected data are also expected to serve as a reference for the Department of Education in formulating regional education policies.

Product Analysis

Based on the needs analysis, BUSAK PAUD Application was developed with features specifically designed to fulfill reporting and monitoring requirements for early childhood reading and writing development in Tana Tidung.

Design Stage

At the Design stage, BUSAK PAUD Application was structured to provide a solution aligned with the identified needs. The system design includes a user-friendly interface, efficient data structure, and system architecture that enables optimal technological integration. The application was built using web-based technology to allow accessibility and flexibility in its use.

Information Architecture

The features developed in the BUSAK PAUD Application are as follows; 1) User Management Module (a. Dashboard: Main display presenting a summary of important data according to user roles, such as number of children and report status; b. User Profile: Page for managing personal data and user roles); 2) Student Data Module (a. Child Data: Teachers can input basic information for each child, including name, age, date of birth, and parent contact information; b. Class or Learning Group: Feature for grouping children into classes managed by teachers; 3) Literacy Assessment Module. This is the core feature of the application where teachers record children's literacy progress. The assessed aspects focus on: (a. Reading Ability: Measuring children's reading stages consisting of fantasy stage, self-concept formation, picture reading, recognition of printed text, and fluent reading; b. Writing Ability: Measuring writing stages consisting of free scribbling, directed scribbling, writing initial letters, writing names, and copying or writing simple words; c. Record Book: Teachers can add descriptive notes for each child, including observation results and activity recommendations); 4) Reporting and Analysis Module (a. Individual Reports: Teachers and parents can view detailed development reports for each child presented in graphical and narrative formats. b. Collective Reports: School principals and the Department of Education can access aggregated reports per class or school to identify trends and intervention needs); 4) Communication Module A simple chat feature that enables private communication among teachers, parents, and Bunda ECE regarding children's development.

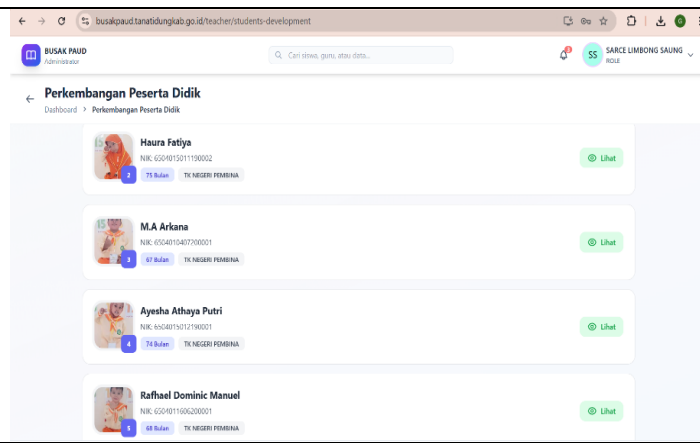
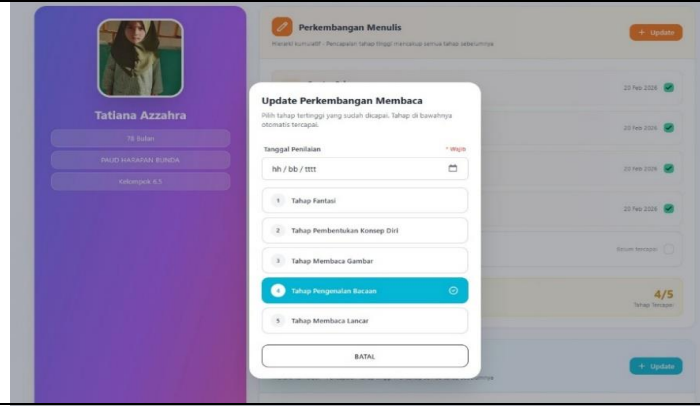
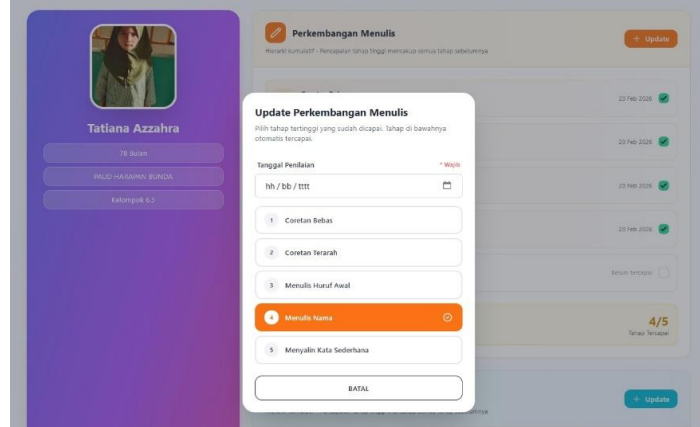
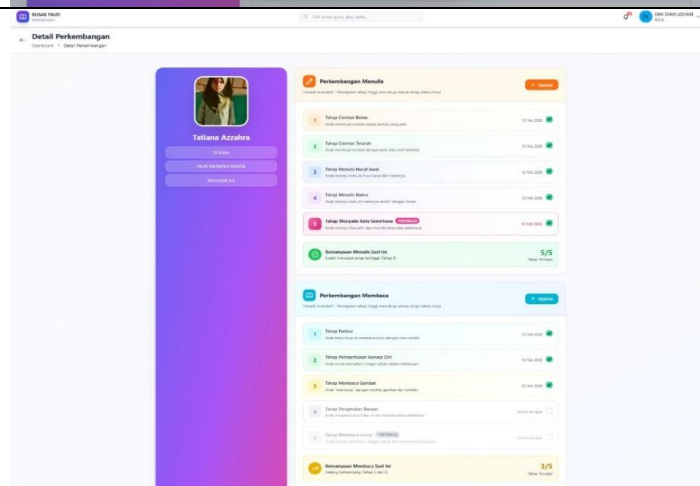
Development Stage

At the Development stage, the BUSAK PAUD Application system design was implemented into a functional application. The coding process was conducted by a computer programmer. This stage involved system creation and testing to ensure that the data structure and system features aligned with the prepared design.

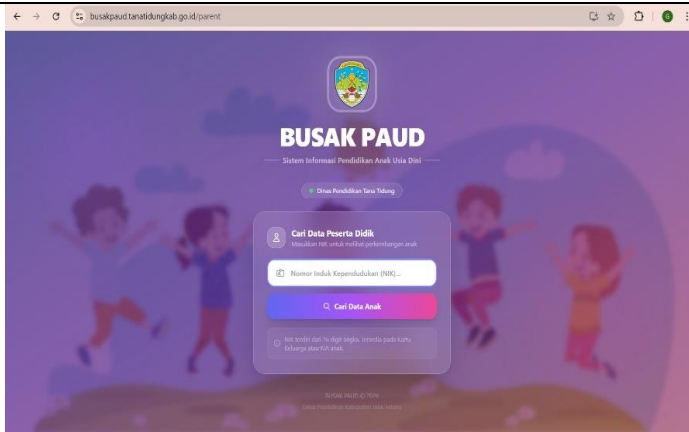
This stage also integrated teacher data input features with monitoring graph features accessible to parents. The following are screen displays of the BUSAK PAUD Application developed according to the design stage.

Table 1. Screenshots of BUSAK PAUD Application Features

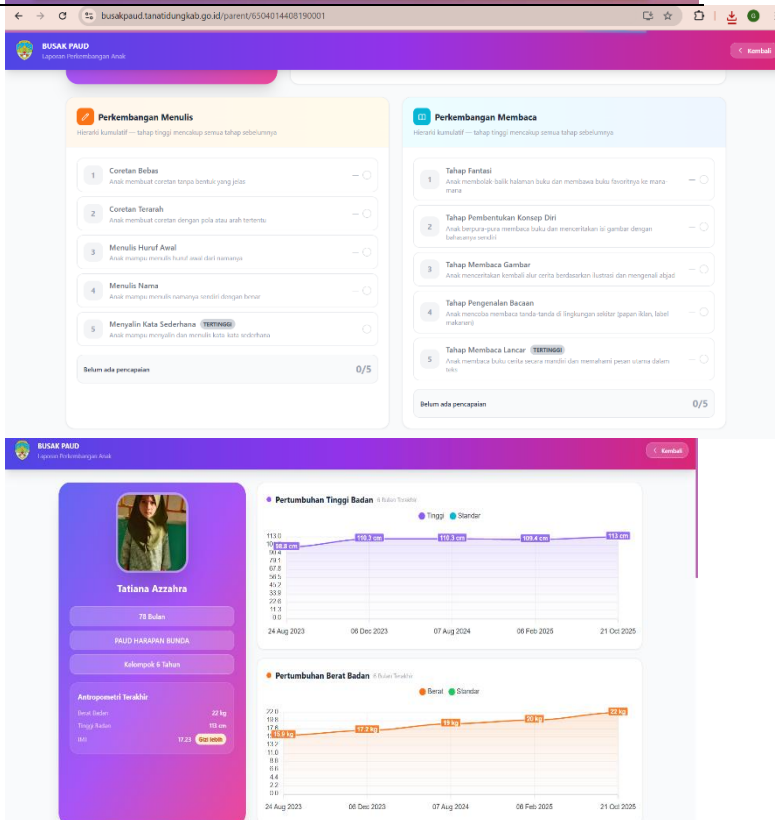
No	Module	Feature	Screenshot
1	User Management	Login Page	
2	User Management	User Profile	
3	User Management	Teacher Data	
4	Student Data	Child Data	

<p>5 Student Data</p>	<p>Class or Learning Group</p>	
<p>6 Literacy Assessment</p>	<p>Reading Ability</p>	
<p>7 Literacy Assessment</p>	<p>Writing Ability</p>	
<p>8 Reporting and Analysis</p>	<p>Individual Report – Teacher Role</p>	

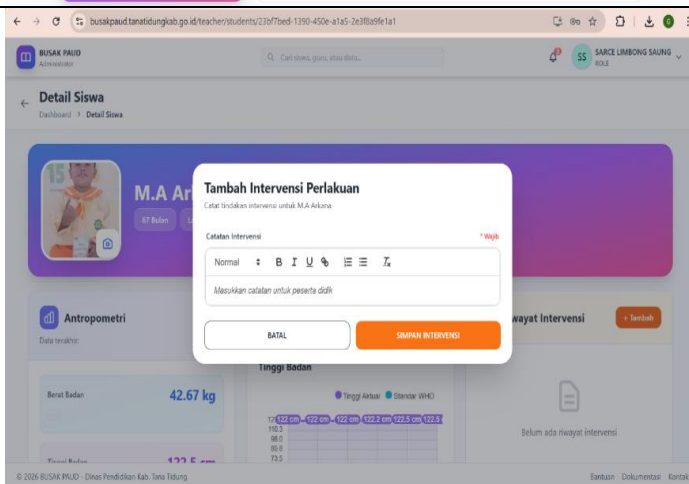
9 Reporting and Analysis Parent Login



10 Reporting and Analysis Child Development Report



11 Communication Module Communication on Feature



BUSAK PAUD Application was implemented at State Kindergarten Pembina of Tana Tidung and ECE SKB Tana Tidung. This implementation ensured that the system functioned properly and could be effectively used by end users. At this stage, training sessions were conducted for teachers and parents to ensure optimal utilization of the system.

Model Feasibility

The feasibility of the BUSAK PAUD Application model was assessed through expert validation involving a literacy content expert, a media or application expert, and an educational technology expert.

Content Expert Validation

The content validation focused on the substance of early childhood reading and writing literacy embedded in the application. The expert assessed pedagogical relevance, accuracy of monitoring instruments, and language and communication aspects. Based on the evaluation results, the content expert provided a feasibility score of 84 percent, placing BUSAK PAUD Application in the Feasible category. Although the content met functional standards, minor revisions were suggested regarding operationalization to make it more applicable for teachers. Strengthening the theoretical foundation of literacy indicators was also recommended to ensure alignment with early childhood developmental stages.

Media or Application Expert Validation

The visual design and user interface were evaluated by a media expert, resulting in a feasibility score of 95 percent categorized as Highly Feasible. The assessment covered software engineering, visual design, navigation, and interaction aspects. The expert stated that the application's aesthetics and layout were well designed but suggested enhancements to improve user experience. Recommendations included adding two-way communication features such as live chat or ticketing systems, providing educational features specifically for parents, and incorporating interactive game ideas to stimulate children's literacy engagement.

Educational Technology Expert Validation

The educational technology expert evaluated instructional design, visual communication, and technological efficiency. The application rived a feasibility score of 96 percent, categorized as Highly Feasible. From an instructional technology perspective, the application demonstrates strong potential in supporting digital transformation in early childhood education. Recommendations included integrating a systematic digital assessment system based on developmental indicators, strengthening teacher dashboards, adding an evaluation instrument bank, and enhancing data-driven reporting features.

Table 2. Model Feasibility Assessment

No	Validator	Percentage of Feasibility	Category	Notes and Recommendations
1	Content Expert	84%	Feasible	Minor revision in content operationalization and strengthening theoretical foundation of literacy

				indicators.
2	Media Expert	95%	Highly Feasible	UX improvement, addition of live chat or ticketing features, parent education features, and interactive game ideas.
3	Educational Technology Expert	96%	Highly Feasible	Integration of digital assessment system, teacher dashboard enhancement, instrument bank, and data-driven reporting.
Combined Average		91.60%	Highly Feasible	

Based on the expert judgment results above, the BUSAK PAUD Application demonstrates a strong foundation both technically and substantively. The evaluation from the three experts indicates that the application is highly ready to be implemented by teachers and parents in Tana Tidung. Revisions based on expert recommendations, particularly in strengthening theoretical foundations and adding interactive features, were conducted prior to its implementation for users.

Discussion

Early childhood education represents the most fundamental phase in the human life cycle because cognitive, linguistic, and social development occurs most rapidly during this period. This phase is frequently referred to as the golden age, in which appropriate stimulation becomes a crucial investment in improving the quality of human resources. The development of early literacy during this stage forms the foundation for later academic achievement and long-term learning outcomes (Diprossimo & Cain, 2025; Himawati et al., 2025; Kelley & Kinney, 2016; Klop et al., 2018). Children who develop strong early literacy competencies tend to demonstrate better reading comprehension and academic performance at subsequent levels of education (Bus et al., 2026). Conversely, literacy gaps that are not addressed in early childhood may persist and negatively affect children's future academic trajectories.

The literacy condition in Tana Tidung Regency reflects a discrepancy between national policy expectations and classroom realities. The 2025 Education Report indicates that only 62.85 percent of elementary students achieved minimum literacy competence, which is below the national average of 71.81 percent. This finding confirms that literacy strengthening must begin at the early childhood level. Research in Indonesia has shown that early literacy practices in preschool settings are often influenced by teachers' perceptions and limited pedagogical understanding (Rohita et al., 2024; Yekple et al., 2021). Similar findings indicate that literacy instruction frequently emphasizes mechanical decoding rather than meaningful engagement with text (Schaughency et al., 2017; Suggate et al., 2011). Such practices contradict contemporary early literacy theory, which views literacy as a gradual developmental continuum rather than a drill-based outcome (Miles & Ehri, 2017).

The field findings in Tana Tidung revealed that many parents expect children to master reading and writing skills before entering elementary school without understanding

developmental stages. This phenomenon aligns with previous research highlighting misconceptions among parents regarding early literacy expectations (Amri et al., 2021). Studies also confirm that parental involvement plays a critical role in early literacy development, yet effective collaboration requires shared understanding between home and school (Wachidah & Putikadyanto, 2024). Without structured communication systems, literacy stimulation at home may not align with school-based activities, thereby reducing the effectiveness of intervention efforts.

The literacy assessment model embedded in BUSAK PAUD is grounded in developmental literacy theory. The reading stages integrated in the system correspond to established frameworks, including emergent literacy theory, stage-based reading development, and dual-route processing models of reading (Whitehurst & Lonigan, 1998). The inclusion of fantasy reading, picture reading, and recognition stages reflects the pre-phonological and emergent phases. Writing stages incorporated into the system are consistent with early writing development models emphasizing scribbling, symbolic representation, and conventional writing progression (Amri et al., 2021; Okur, 2020).

The feasibility analysis demonstrated strong validation outcomes across expert categories, with a combined feasibility score of 91.60 percent. The content validation score of 84 percent confirms that the literacy indicators are pedagogically appropriate. This aligns with the theoretical construct of the Simple View of Reading, which conceptualizes reading as the product of decoding and linguistic comprehension (Aslan et al., 2025). The structured indicators embedded in the application reduce ambiguity in teacher assessment practices and support authentic literacy evaluation, addressing challenges previously identified in manual assessment systems.

From a media and user interface perspective, the application rived a 95 percent feasibility score, categorized as highly feasible. This result supports research indicating that well-designed digital interfaces significantly enhance user engagement and technology acceptance (Shandilia et al., 2024). The integration of potential interactive literacy features corresponds with findings that multimodal digital tools can enhance children's literacy motivation (Arnott & Yelland, 2020; Lestariyana & Widodo, 2018). The recommendation to incorporate interactive elements also reflects the multimodality principle in literacy learning, emphasizing diverse symbolic modes of communication. The educational technology validation yielded the highest score of 96 percent, demonstrating the system's readiness for digital transformation in early childhood education. This finding is consistent with national data showing increasing ICT infrastructure availability in schools. The emphasis on data-driven reporting aligns with the broader movement toward evidence-based educational management, where aggregated literacy data can inform policy decisions at the regional level.

The effectiveness analysis using the USE Questionnaire framework indicated a 91 percent effectiveness score. In terms of usefulness, teachers reported increased productivity in literacy documentation. This supports the argument that digital systems enhance administrative efficiency and instructional focus (Dina et al., 2025; Habiddin et al., 2022). From a pedagogical perspective, the system supports scaffolding processes as conceptualized in Vygotsky's Zone of Proximal Development theory (Vygotsky, 1978), allowing teachers to tailor interventions based on developmental data. The high ease-of-use and ease-of-learning

scores demonstrate that the interface design successfully minimized cognitive load for users. Research confirms that simplicity and intuitive navigation significantly influence digital adoption in educational contexts (Sabariah et al., 2024). Teachers were able to master the system following brief training sessions, indicating alignment between system architecture and user characteristics.

User satisfaction results further confirm the application's practical relevance. Teachers reported improved professional communication with parents, as objective graphical reports reduced misunderstanding regarding children's literacy stages. This finding reinforces research highlighting the importance of structured home-school collaboration in early literacy development (Novalia & Setyowahyudi, 2025; Wachidah & Putikadyanto, 2024). Transparent reporting mechanisms promote shared responsibility for literacy growth, transforming assessment from a purely administrative requirement into a developmental support system.

Compared with previous digital literacy applications, BUSAK PAUD demonstrates added value by integrating managerial monitoring functions rather than functioning solely as a pedagogical medium. While prior studies emphasize instructional media effectiveness, the present model contributes a systemic digital reporting structure that aligns policy standards, classroom practices, and parental engagement.

Overall, BUSAK PAUD not only addresses early literacy instructional challenges but also strengthens digital governance in early childhood education. By integrating developmental literacy theory, instructional design principles, and collaborative communication systems, the application provides a sustainable framework for literacy monitoring in Tana Tidung. Its feasibility and effectiveness outcomes suggest that technology-based managerial innovation can serve as a strategic response to literacy challenges in regional education contexts.

CONCLUSION

This research and development study produced the BUSAK PAUD application as a digital system for monitoring and reporting early childhood reading and writing development in Tana Tidung Regency. The needs analysis revealed that previous monitoring practices were manual and fragmented, lacking integrated collaboration between teachers and parents. Through the ADDIE model, a web-based application was developed that integrates structured stages of literacy development into digital assessment instruments, graphical dashboards, and interactive communication features. Feasibility testing confirmed that the application meets pedagogical, technical, and media design standards, while effectiveness testing demonstrated that the system improves teachers' efficiency in managing literacy data, enhances parents' access to transparent developmental information, and strengthens collaborative support for children's early literacy growth. Thus, BUSAK PAUD Application achieves its development objective as a technology-based managerial innovation that supports developmentally appropriate literacy practices. It is recommended that the application be implemented more broadly across early childhood institutions with sustained training for teachers and parents. Further development should focus on integrating more comprehensive developmental assessment indicators and strengthening interactive features to increase user engagement and long-term sustainability.

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