



Development Of Sidangke Mobile Learning To Improve Stunting Literacy In Enrekang Regency

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Abstract: This study reports the development and evaluation of SIDANGKE (Sistem Informasi Stunting Kabupaten Enrekang), a mobile learning application designed to improve public literacy on stunting prevention in Enrekang Regency, South Sulawesi, Indonesia. The research adopted an applied Research and Development (R&D) approach using the ADDIE model, comprising analysis, design, development, implementation, and evaluation stages. The application was developed based on community needs, local health data, and instructional design principles to ensure contextual relevance and usability. Data were collected through interviews, observations, expert validation instruments, and pre-test and post-test assessments involving parents of toddlers, community health cadres, and health practitioners. The data were analysed using descriptive statistics and inferential analysis, including expert validation scores and the N-Gain test to measure effectiveness. The results indicate that the SIDANGKE application achieved a content and media validity score of 91.8%, classified as very high, and a practicality score of 89.6%, indicating strong usability and user acceptance. Furthermore, the effectiveness analysis produced an N-Gain value of 0.67, reflecting a moderate-to-high improvement in users' knowledge and understanding of stunting causes, prevention strategies, and early intervention practices. These findings demonstrate that mobile learning can serve as an effective medium for community-based health education, particularly in rural areas with limited access to conventional learning resources. The study supports mobile learning theory, multimedia learning principles, and health literacy frameworks, while also aligning with regional stunting reduction policies and national digital transformation initiatives. Overall, SIDANGKE represents a valid, practical, and effective digital innovation that can be scaled and replicated to strengthen community health literacy and support sustainable stunting prevention programmes in Indonesia.

Keywords: Stunting Literacy, Mobile Learning, ADDIE Model, Health Education, Digital Innovation

INTRODUCTION

The transformation of business law in Indonesia during the digital era marks a new phase in the relationship between law, technology, and the economy. Over the past two decades, globalization and digitalization have fundamentally reshaped the structure of business law—from a conventional system based on physical transactions to an adaptive, electronic, and cross-border framework. Business law today is not merely a normative instrument that regulates private



relations among economic actors, but a strategic mechanism that ensures legal certainty, justice, and protection within technology-based economic activities.

According to Subekti (2008), business law is “a set of rules governing the implementation of legal relations between parties in economic activities aimed at gaining profit.” Likewise, Sutarno (2010) asserts that business law evolves from social and economic dynamics, demanding legal instruments that are responsive to technological and market developments. These perspectives highlight the inherently dynamic nature of business law—it evolves alongside shifts in economic structures and technological innovation.

On a global level, Stiglitz (2019) argues that modern economic law cannot be separated from the rise of digital capitalism, which integrates market mechanisms with information technology. Castells (2010), in his *network society theory*, similarly explains that digitalization has created a “networked economy,” where value creation no longer relies solely on tangible goods but on the exchange and manipulation of information. Consequently, modern business law must guarantee that data-based transactions possess equal legal legitimacy as conventional ones.

The modernization of Indonesia’s business law gained momentum with the enactment of Law No. 11 of 2020 on Job Creation (the “Omnibus Law”), which restructured licensing, investment, and labor systems. Through the Online Single Submission – Risk-Based Approach (OSS-RBA), the government has digitalized company registration, business licensing, and reporting processes into a unified, electronic framework. This reform represents a concrete shift toward *digital governance* characterized by transparency, efficiency, and accountability (BKPM, 2023). Yet, as Barkatullah (2019) notes, such modernization also generates new challenges, particularly concerning legal certainty and consumer protection in online transactions that remain only partially regulated.

Technological advances, especially in *financial technology (fintech)*, *blockchain*, and *e-commerce*, have significantly expanded the scope of business law. Prasetyo (2022) refers to the emergence of *electronic securities* and *digital financial instruments* as a hallmark of legal evolution that demands a paradigm shift—from a document-based to a data-driven financial system. In this context, law functions not merely as a regulatory tool but also as a facilitator of



innovation, ensuring that economic modernization operates within a just and transparent framework.

The Financial Services Authority (OJK, 2023) reinforces this orientation through its regulations on digital financial innovation, such as POJK No. 13/POJK.02/2018, emphasizing consumer protection, data integrity, and systemic risk mitigation. This indicates that Indonesia's business law transformation runs parallel to global economic shifts that are increasingly digitized, borderless, and algorithm-driven.

However, behind these developments lies a structural problem rooted in the gap between technological advancement and regulatory adaptation. Kusumaatmadja (2002), through his concept of *law as a tool of social engineering*, argues that law must actively shape societal transformation rather than merely respond to it. When law lags behind technology, society experiences what Roscoe Pound (1954) calls the “lag of law”—a condition in which legal systems fail to keep pace with socio-economic innovation. This lag is evident in Indonesia's business law landscape, where digital business practices evolve faster than the regulatory mechanisms designed to govern them.

One of the most critical issues in this transformation is the legality of electronic contracts. Under Law No. 11 of 2008 on Electronic Information and Transactions (the ITE Law), any electronic contract fulfilling the four essential elements of an agreement—as stipulated in Article 1320 of the Indonesian Civil Code (KUHPperdata)—is legally binding. Article 11 of the ITE Law further recognizes the validity of electronic signatures, provided that they maintain authenticity, integrity, and verifiability. This principle is reinforced by Government Regulation No. 71 of 2019 on Electronic System and Transaction Operation (PSTE), which grants electronic documents equal evidentiary power as written documents in court.

Nonetheless, Fuady (2014) identifies three core challenges in implementing electronic contracts: (1) proving the parties' intent in virtual environments, (2) determining jurisdiction across different national laws, and (3) safeguarding personal data as part of individual civil rights. The emergence of *smart contracts*—automated agreements executed through blockchain—intensifies these challenges. In *smart contracts*, the fulfillment of contractual obligations occurs automatically through coded algorithms, raising profound legal questions about accountability: to



what extent can human parties be held responsible when machines perform the contractual execution autonomously?

This dilemma echoes Lawrence Lessig's (2006) argument in *Code and Other Laws of Cyberspace* that "code is law." In the digital world, algorithms themselves act as regulators of behavior. Therefore, contemporary business law must evolve to govern not only human actors but also algorithmic systems, digital intermediaries, and autonomous technological agents.

Globally, business law has also been influenced by international institutions and agreements such as the World Trade Organization (WTO), the United Nations Commission on International Trade Law (UNCITRAL), and the International Chamber of Commerce (ICC). These organizations establish global trade standards and arbitration mechanisms for cross-border commercial disputes. Furthermore, treaties like the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) and *Bilateral Investment Treaties (BITs)* reinforce the principles of openness, efficiency, and investor protection (OECD, 2023). Consequently, Indonesia must harmonize its national business law framework with international norms emphasizing transparency, accountability, and sustainability.

Domestically, the evolution of corporate law under Law No. 40 of 2007 on Limited Liability Companies (the Company Law) institutionalizes the principles of Good Corporate Governance (GCG)—transparency, accountability, responsibility, independence, and fairness. Article 74 of this law mandates that corporations undertake Corporate Social Responsibility (CSR) programs as part of their legal and ethical duties. As Porter and Kramer (2011) argue in their *shared value theory*, CSR has transcended moral obligation; it has become a strategic legal-economic mechanism to ensure sustainable growth and legitimacy. Thus, CSR represents a convergence between profit-making and public welfare, embodying the moral dimension of modern business law.

Parallel to regulatory reform, Indonesia's judicial system has undergone digital transformation through Supreme Court Regulation (Perma) No. 3 of 2018 on electronic case administration. The implementation of e-court and e-litigation enables online filing, payment, and evidence submission, accelerating dispute resolution and reducing administrative corruption. As Suryani (2022) observes, digital justice systems strengthen public trust in the judiciary and



embody the principle of procedural efficiency. Yet, they also demand institutional readiness—qualified personnel, secure infrastructure, and reliable cybersecurity—to ensure procedural justice in digital environments.

Another major dimension of modern business law involves personal data protection. The proliferation of digital transactions heightens the risk of data breaches, identity theft, and cyber manipulation. The enactment of Law No. 27 of 2022 on Personal Data Protection (PDP Law) marks a milestone in Indonesia’s digital legal regime. Rahardjo (2023) asserts that data protection represents an extension of human rights in the digital economy, as personal data now constitutes a valuable economic asset. Hence, the PDP Law complements the ITE Law and the Company Law in forming a coherent legal framework for digital business governance.

From the standpoint of legal development theory, Satjipto Rahardjo (2009) emphasizes that law must be “living law,” evolving dynamically alongside societal needs. Business law, therefore, should not be interpreted rigidly through positivist doctrines alone but must remain responsive to the socio-economic realities of digital civilization. Similarly, Friedman (1975) explains that an effective legal system rests upon three interrelated components: *legal structure*, *legal substance*, and *legal culture*. Without harmony among these elements, reform efforts risk becoming merely formalistic without genuine societal impact. Thus, the modernization of Indonesia’s business law must integrate not only new legal texts but also the digital literacy and ethical orientation of its users.

Following Gustav Radbruch’s legal triad—*certainty*, *utility*, and *justice*—the purpose of business law reform should be to ensure clarity of regulation, practical benefits for economic actors, and equitable treatment across all stakeholders. Legal certainty provides predictability; utility promotes efficiency and innovation; and justice ensures fairness and moral accountability in digital transactions. Achieving balance among these three values is the hallmark of a mature and humane legal system.

Nevertheless, structural and socio-legal challenges persist. A significant proportion of micro, small, and medium enterprises (MSMEs) still lack sufficient digital legal literacy, leaving them vulnerable to fraud or breach of contract in online transactions. The enforcement of digital contract law also suffers from technical constraints, including the scarcity of digital forensic experts and



inter-agency coordination weaknesses. This asymmetry creates what may be called *digital inequality of justice*, in which large corporations enjoy stronger legal protection than small entrepreneurs. To overcome this gap, the integration of law, education, and technology must be institutionalized as part of Indonesia's long-term legal reform.

In light of these realities, the urgency of research on modern business law in the digital era becomes evident. Academic inquiry is needed to evaluate to what extent Indonesia's legal framework has adapted to digital economic realities; how effective current laws are in protecting consumers and businesses; and whether classical principles—such as freedom of contract and good faith—remain relevant when contracts are executed by algorithms. Such research can bridge the gap between normative legal doctrines and empirical technological developments.

Ultimately, the transformation of business law in the digital era represents both an inevitability and a multidimensional challenge. Legal reform must reconcile economic efficiency with social justice, institutionalize ethical responsibility, and sustain national competitiveness amid technological globalization. As Satjipto Rahardjo (2010) aptly stated, “a good law is not one that is rigid, but one that moves along with the heartbeat of society.” Hence, Indonesia's modern business law must remain empirically grounded, systematically structured, logically coherent, and normatively relevant to the realities of the digital age—serving not as a barrier to innovation but as the foundation of an equitable, transparent, and sustainable economic order.

METHOD

Research Type and Approach

This study adopts an Applied Research design employing a Research and Development (R&D) approach. The aim is to develop a mobile learning application named *SIDANGKE* (*Sistem Informasi Stunting Kabupaten Enrekang*) as an innovative educational tool to improve public literacy regarding stunting prevention. The R&D approach was chosen because it integrates theoretical development with practical implementation, allowing the researcher to design, test, and validate an educational product that directly addresses real community needs. Following Sugiyono (2014), applied research emphasizes solving specific societal problems through the adaptation of



scientific methods. Therefore, this study not only produces an academic framework but also delivers a tangible product that supports the regional health education agenda.

Development Model

The development process followed the ADDIE model, which consists of five interconnected stages: Analysis, Design, Development, Implementation, and Evaluation. This model was selected because it provides a structured and iterative procedure for instructional product development that ensures both pedagogical and technical quality. During the *Analysis* stage, user needs, target audience characteristics, and local health data were examined, revealing a stunting prevalence rate of 19.45% in Enrekang (2022). The *Design* stage focused on determining learning objectives, organizing content into structured modules, and creating user interface storyboards. In the *Development* phase, a functional prototype of the mobile application was created, integrating multimedia features such as text, graphics, and video to improve user engagement. The *Implementation* phase involved small- and large-scale trials with parents, cadres, and health officers to assess usability, clarity, and effectiveness. Finally, the *Evaluation* phase incorporated both formative and summative assessments to validate the accuracy, practicality, and impact of the product on users' literacy and behavioral awareness.

Data Sources

The study utilized both primary and secondary data to ensure comprehensive and reliable results. Primary data were collected directly from the field through interviews, observations, and user testing involving parents, community health cadres, and practitioners who actively participated in the stunting prevention program in Enrekang Regency. These data provided firsthand insights into community behaviors, technological readiness, and literacy challenges. Secondary data were drawn from various official reports and academic studies, including the *Survei Status Gizi Indonesia (SSGI) 2021*, the *Enrekang Health Office Annual Report (2022)*, and relevant research on mobile learning and health literacy. The integration of both data types allowed for a balanced combination of empirical validation and theoretical grounding.

Data Collection Techniques

Data were collected through several interrelated qualitative and quantitative procedures to capture the full scope of the study. Interviews were conducted with local health officials, cadres,



and parents to identify specific learning needs, gaps in nutrition education, and potential user preferences for the application's content and design. Observations were carried out in community health centers (*posyandu*) to document real conditions of stunting education practices and community engagement. Additionally, expert validation was performed using questionnaires distributed to content and media specialists, employing a five-point Likert scale to measure relevance, clarity, and feasibility. To evaluate knowledge improvement, pretest and posttest assessments were administered to participants before and after using the *SIDANGKE* application. All instruments were previously validated and tested for reliability to ensure consistency and accuracy of the data collected.

Data Analysis Techniques

The data obtained from this research were analyzed through quantitative descriptive and inferential techniques to determine the validity, practicality, and effectiveness of the developed mobile learning application. Descriptive analysis was used to summarize expert validation results and user feedback from field trials. Inferential analysis was applied to measure learning outcomes using the N-Gain formula, which compares participants' pretest and posttest scores to assess the level of improvement in stunting literacy. According to Hake (1998), the effectiveness level is categorized as high ($g \geq 0.70$), moderate ($0.30 \leq g < 0.70$), or low ($g < 0.30$). Based on this criterion, the *SIDANGKE* application achieved an N-Gain score of 0.67, which falls into the *moderate-to-high* category, indicating a significant enhancement in users' literacy and awareness related to stunting prevention.

Research Subjects and Setting

The research was carried out in Enrekang Regency, South Sulawesi, an area selected purposively because of its relatively high stunting prevalence and the government's ongoing nutrition intervention programs. The participants consisted of three main groups: parents of toddlers as the primary users of the *SIDANGKE* application, health cadres and practitioners as validators and facilitators, and members of the broader community involved in the field trials. The diverse participant composition ensured that the findings reflected multiple perspectives, covering both expert evaluations and real user experiences. This setting also provided a representative



environment for testing the effectiveness of mobile-based educational media in rural contexts where access to conventional learning resources remains limited.

Validation Criteria

The evaluation process for the *SIDANGKE* application was guided by three primary criteria: validity, practicality, and effectiveness. The validity assessment was conducted by subject matter experts and media designers, focusing on the accuracy of content, the appropriateness of learning objectives, and the quality of interface design. Practicality was evaluated through field implementation involving parents and health cadres, emphasizing aspects of ease of use, accessibility, and user satisfaction. Effectiveness was measured through quantitative analysis of learning outcomes, reflected in the improvement of knowledge and literacy levels after application usage. The overall validation results showed that the *SIDANGKE* mobile learning application met the established standards across all three dimensions, confirming that it is a valid, practical, and effective educational innovation for enhancing stunting literacy in the community.

RESULT AND DISCUSSION

Needs Analysis for Developing the *SIDANGKE* Mobile Learning

The results of the needs analysis indicate that the Enrekang Regency community still experiences a considerable gap in understanding the causes, effects, and prevention of stunting. Based on data from the Enrekang Health Office (2022), the stunting prevalence rate reached 19.45%, confirming the urgency of developing educational interventions to improve literacy. Interviews with health cadres and parents revealed that most parents were unaware of nutritional indicators, the importance of exclusive breastfeeding, or the role of sanitation in stunting prevention. Furthermore, observations in *posyandu* showed that health promotion activities were limited to conventional counseling methods using posters and oral explanations, which were often less engaging and difficult to understand.

This analysis affirmed the community's need for a mobile-based learning medium that presents comprehensive, accessible, and interactive information about stunting. The findings formed the foundation for the instructional design of *SIDANGKE*, emphasizing visual communication, local context, and user-friendly features.



Design and Development of the SIDANGKE Application

The design process was guided by the ADDIE model, particularly during the *Design* and *Development* phases. The instructional content was structured into several modules, including (1) understanding stunting, (2) identifying symptoms and causes, (3) nutrition and growth tracking, and (4) prevention and early intervention. Each module combined text explanations, illustrations, video tutorials, and self-assessment quizzes to enhance user interaction. Technically, the *SIDANGKE* application was developed using a simple Android-based programming framework to ensure accessibility on low-spec devices. The visual identity incorporated local symbols such as the *Enrekang* logo and Bahasa Indonesia as the main language to promote regional ownership. The layout design prioritized minimalism and intuitive navigation. User testing in early prototypes confirmed that users could operate the application easily without prior technical knowledge.

Validity Test Results

The validation process involved three types of experts: content experts, media experts, and practitioners. Content validation assessed the accuracy and comprehensiveness of the learning materials. Media validation focused on interface design, functionality, and navigation. Practitioner validation evaluated the contextual relevance and usability in community health education. Based on expert assessments, the mean validity score reached 91.8%, which falls under the “very valid” category. The material experts emphasized that the app successfully simplified complex nutritional concepts into accessible formats for non-academic audiences. Meanwhile, media experts noted that the use of color contrast, icon consistency, and readability enhanced engagement and reduced cognitive load. The practitioners acknowledged that *SIDANGKE* could be integrated into *posyandu* activities and community counseling sessions effectively.

Practicality Test Results

The practicality assessment was conducted in two stages: a small-group trial and a large-group trial. In the small-group stage involving 15 users (parents and cadres), observations indicated that users found the application intuitive and informative. The average practicality score was 90.4%, categorized as *very practical*. In the large-group test involving 50 users across three sub-districts, similar results were obtained, with an average practicality score of 88.9%. Participants



reported that *SIDANGKE* helped them understand stunting more effectively compared to traditional leaflets or verbal counseling. Users particularly appreciated the growth tracking feature and reminder notifications for immunization schedules. These findings validated the assumption that mobile learning can improve engagement and retention of health information among low-literacy users.

Effectiveness Test Results

The effectiveness test employed a pretest–posttest design to measure users’ improvement in stunting literacy after using the *SIDANGKE* application. The statistical analysis using the N-Gain formula showed an average gain score of 0.67, which falls within the *moderate-to-high* category based on Hake’s (1998) classification. This result demonstrates a significant increase in participants’ knowledge and awareness about stunting. Before using the app, only 38% of users could correctly identify the causes and prevention methods. After using *SIDANGKE*, this percentage increased to 81%. The findings confirm that the app effectively enhances health literacy and can serve as an alternative educational medium in community health interventions.

Discussion

The results of this study substantiate both the theoretical and empirical assumptions underlying the development of *SIDANGKE* as an innovative mobile learning medium designed to enhance public literacy on stunting prevention. The empirical findings — which demonstrate high levels of validity, practicality, and moderate-to-high effectiveness — confirm that the integration of mobile learning technology into public health education is a feasible and impactful strategy, particularly for rural communities with limited access to conventional learning resources.

This study supports the essence of mobile learning theory, as introduced by Quinn (2000), which conceptualizes learning as a portable, flexible, and continuous process supported by digital devices. In this context, *SIDANGKE* functions not merely as a supplementary educational tool but as a transformative learning ecosystem. It allows users — mainly parents and health cadres — to access structured, interactive, and contextually relevant information about stunting anytime and anywhere. Through multimedia integration (text, video, quizzes, and interactive charts), the application translates complex nutritional and health information into practical, actionable



knowledge. The results confirm Quinn's assertion that the ubiquity and immediacy of mobile learning bridge the gap between formal instruction and informal community education.

From a health literacy perspective, this research reinforces the conceptual framework proposed by the World Health Organization (WHO, 2017), which defines health literacy as the cognitive and social ability to access, comprehend, and utilize information to maintain and improve health. The improvement of users' posttest scores after using SIDANGKE reflects this transition from passive awareness to active understanding. The participants, many of whom had previously relied on oral information or printed leaflets, were able to interact with digital content that presented stunting-related knowledge in an engaging and comprehensible form. This transformation illustrates how technology-based education can bridge the literacy gap among communities with low educational attainment — a finding consistent with the results of Nutbeam (2008), who emphasized that effective health literacy requires both comprehension and empowerment.

The study also provides evidence that mobile learning can facilitate participatory education, where learners become active agents in constructing their own understanding. In the context of Enrekang, where cultural communication is often collective and community-based, SIDANGKE encouraged family discussions about child nutrition and health practices. Parents reported that after using the application, they were able to discuss stunting indicators and feeding practices more confidently with health cadres during posyandu visits. This aligns with Vygotsky's social constructivist theory (1978), which highlights that learning occurs through interaction, collaboration, and the co-construction of meaning. SIDANGKE thus exemplifies how digital tools can extend social learning processes into a mobile environment, reinforcing both individual and communal learning.

From the usability and practicality standpoint, the high scores obtained in both expert validation and user testing indicate that SIDANGKE met the essential criteria of usability proposed by Nielsen (1993) — namely, learnability, efficiency, memorability, error tolerance, and satisfaction. Users expressed that the interface was easy to navigate, the materials were understandable, and the features (such as notifications and growth tracking) supported their daily health routines. These findings are consistent with the research of Sarrab, Elgamel, & Aldabbas



(2012), who demonstrated that usability and perceived usefulness are primary determinants of mobile learning acceptance in developing countries. Similarly, Miftah (2010) emphasized that the portability and flexibility of mobile learning encourage spontaneous and repeated exposure to learning content, leading to deeper understanding and behavioral change.

Moreover, the practicality dimension of this study extends beyond usability to contextual adaptability. The use of the Indonesian language and culturally relevant visual cues made the application accessible to users with low digital literacy. This design approach resonates with Cultural Interface Theory (Nakata, 2007), which argues that educational technologies are most effective when they integrate local cultural symbols, languages, and practices. The integration of Enrekang's local identity and health norms ensured that users perceived the app not as an external intervention but as part of their community's educational ecosystem. This contextual adaptation likely contributed to the app's high acceptance and engagement rates among participants.

In terms of effectiveness, the improvement of literacy scores ($N\text{-Gain} = 0.67$) confirms that mobile learning interventions can produce significant cognitive gains. The finding aligns with the research of Dijkers, Martin, & Coulter (2011), who found that interactive, multimedia-based instruction leads to better retention and comprehension than static learning materials. It also resonates with Junita (2022), whose study on mobile health applications in Indonesia demonstrated that mobile-based interventions could increase health knowledge by 30–40% compared to conventional methods. The structured modules, combined with formative quizzes in SIDANGKE, allowed users to engage in repetitive and self-paced learning — an essential factor in adult learning theory as discussed by Knowles (1980). This self-directed learning approach fosters autonomy and motivation, enabling users to take ownership of their health literacy development.

Furthermore, the effectiveness of SIDANGKE cannot be separated from the principles of multimedia learning formulated by Mayer (2009). According to this theory, learners gain a deeper understanding when information is presented in multiple formats — text, visuals, and audio — rather than through text alone. The combination of explanatory videos, pictorial growth charts, and simple animations in SIDANGKE helped users visualize the consequences of stunting, thereby strengthening both cognitive and emotional engagement. This multimodal approach is particularly



beneficial for users with low reading comprehension levels, as it allows meaning to be constructed visually and interactively.

Beyond the measurable cognitive outcomes, this research also identifies the social and behavioral implications of using SIDANGKE. Interviews conducted during the post-implementation phase revealed that parents began to adopt new practices related to nutrition and hygiene after engaging with the application. Several users reported modifying their children's meal plans and paying more attention to sanitation routines, such as ensuring clean water and handwashing before feeding. This behavioral shift reflects the transformation from awareness to practice — a key indicator of applied health literacy. The findings align with Bandura's social learning theory (1986), which posits that observation and reinforcement through visual models can influence individual behavior. The digital modules, especially those containing video examples and testimonials, likely functioned as virtual models that reinforced healthy habits.

From a policy integration perspective, the development and implementation of SIDANGKE correspond directly with local and national government strategies on stunting reduction. The application supports the objectives of Peraturan Daerah Enrekang No. 44 Tahun 2021 and Surat Keputusan Bupati No. 141/KEP/III/2022, both of which prioritize preventive, community-based, and technology-assisted interventions. Moreover, the project aligns with Indonesia's broader Digital Transformation Roadmap 2021–2024, which promotes the utilization of digital innovations in public service delivery, including health and education. By functioning as an accessible, data-driven literacy tool, SIDANGKE complements existing government programs such as Gerakan 1.000 HPK (First 1,000 Days of Life Movement) and Program Keluarga Harapan (PKH), strengthening community participation in achieving the national target to reduce stunting to below 14% by 2024.

The discussion also highlights SIDANGKE as a model of digital inclusion. In many rural settings, disparities in access to digital technology and education limit communities' ability to benefit from innovation. However, the success of SIDANGKE in Enrekang demonstrates that well-designed mobile applications can overcome these barriers when they prioritize user context and simplicity. This finding supports the notion of inclusive digital design promoted by UNESCO (2022), which advocates for technology development that accommodates socio-economic



diversity, language barriers, and varying levels of literacy. The implication is that SIDANGKE could serve as a prototype for similar health literacy applications targeting other rural populations across Indonesia, particularly in regions facing similar socio-demographic challenges.

From an educational technology standpoint, the findings contribute to the growing body of research emphasizing that digital learning innovations must balance technological sophistication with pedagogical clarity. As noted by Branch (2009), the ADDIE model's iterative nature ensures that product development remains responsive to user feedback and contextual relevance. In this study, the continuous validation, refinement, and testing cycles exemplify how user-centered design enhances both the quality and sustainability of educational technologies. The validation results, showing very high expert agreement (above 90%), indicate that this model was effectively implemented to ensure alignment between instructional goals, content design, and user experience.

Another key aspect of the discussion is the transformative potential of mobile learning for health empowerment. The success of SIDANGKE demonstrates that learning is no longer confined to formal educational institutions but can occur dynamically within households and communities. This transformation reflects the lifelong learning paradigm advocated by the OECD (2020), which views education as a continuous process supporting personal and societal development. In the case of Enrekang, SIDANGKE empowered parents — especially mothers — to become active participants in monitoring their children's growth and nutrition. This empowerment fosters sustainability, as literacy improvement translates into behavioral change and community-driven health promotion.

This study's findings reaffirm the importance of localizing educational innovation within socio-cultural frameworks. The cultural relevance of the SIDANGKE application — including the use of regional imagery, language, and examples — aligns with contextual learning theory (Johnson, 2002), which emphasizes that knowledge becomes meaningful when connected to learners' daily lives. This contextualization not only increases engagement but also ensures that health messages are internalized rather than memorized. By blending modern digital tools with local cultural wisdom, SIDANGKE demonstrates a hybrid model of education that respects tradition while embracing innovation.



CONCLUSION

This study concludes that the *SIDANGKE* mobile learning application (*Sistem Informasi Stunting Kabupaten Enrekang*) is a valid, practical, and effective innovation for enhancing public literacy on stunting prevention. Developed through the Research and Development (R&D) approach using the ADDIE model, the research produced a digital learning product that combines scientific accuracy, pedagogical structure, and local cultural context. The validity test results confirmed that the application met expert standards in both content and media, achieving a validity level of 91.8% (very valid). The practicality results, based on user feedback from small and large group trials, also indicated a high level of usability and user satisfaction, with an average practicality score of 89.6% (very practical). Furthermore, the effectiveness analysis, measured through the N-Gain formula, yielded a score of 0.67, classified as *moderate-to-high effectiveness*. This result demonstrates that *SIDANGKE* significantly improved users' understanding, awareness, and application of stunting prevention practices. Theoretically, this research reinforces mobile learning theory (Quinn, 2000), multimedia learning (Mayer, 2009), and health literacy frameworks (WHO, 2017; Nutbeam, 2008). Empirically, it supports previous findings by Sarrab et al. (2012) and Miftah (2010), which confirm that mobile technology can serve as an inclusive educational platform for low-literacy populations. Contextually, the study aligns with regional policies such as Perda Enrekang No. 44/2021 and national efforts to reduce stunting rates through community-based and technology-supported interventions. Overall, *SIDANGKE* not only functions as a learning medium but also as a tool for digital empowerment, enabling families and communities to access reliable information and apply preventive health behaviors. Its success demonstrates that integrating technological innovation with participatory education and local culture can create sustainable solutions for public health literacy in Indonesia.

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