



Health Literacy Management Model for Santri: Digital Thibbun Nabawi Curriculum in the Artificial Intelligence Era

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Reviewed: 17 February 2026

Accepted: 12 March 2026

Published: 26 April 2026

ABSTRACT:

Background: Health literacy among Indonesian adolescents remains alarmingly low, with 30.7% suffering from stunting, 11.2% experiencing undernutrition, and significant gaps in reproductive and mental health knowledge. Islamic boarding schools (pesantren) house millions of santri yet often lack structured health education curricula. Thibbun Nabawi (Prophetic Medicine) offers a holistic health framework rooted in Islamic teachings, but its integration into pesantren education remains limited and largely non-digital. Meanwhile, Artificial Intelligence (AI) is rapidly transforming education, including in pesantren settings, enabling personalized and adaptive learning. Objective: This study aims to develop a health literacy management model for santri through a digital Thibbun Nabawi curriculum integrated with AI-based learning technologies. Method: This qualitative study employs a grounded theory approach (Corbin & Strauss, 2015). Data were collected through in-depth interviews, participant observation, and document analysis involving pesantren administrators, curriculum developers, Thibbun Nabawi instructors, santri, and educational technology practitioners in selected pesantren in [location]. Data analysis followed the Corbin and Strauss grounded theory procedure. Findings: The study identified three core categories: (1) the urgency of structured health literacy through Thibbun Nabawi in pesantren, (2) the integration of digital platforms and AI in Thibbun Nabawi curriculum delivery, and (3) a four-phase health literacy management model encompassing curriculum design, digital content development, AI-assisted personalized learning, and evaluation. Conclusion: A substantive theory of Digital Thibbun Nabawi Health Literacy Management is proposed, offering a framework for integrating prophetic medicine into pesantren education through AI-enhanced digital learning, addressing the critical gap in adolescent health literacy in faith-based educational settings.

Keywords: Health Literacy, Thibbun Nabawi, Digital Curriculum, Artificial Intelligence, Pesantren Management, Santri Health Education

INTRODUCTION

In the contemporary digital era, literacy can no longer be understood only as the ability to read printed texts, because students are now expected to access, evaluate, and use digital information critically and ethically. This challenge is particularly urgent in Indonesian pesantren, where digital literacy is described as a bridge between traditional education and the demands of modern society, and where santri must be prepared not only technically but also morally and socially for life in a networked environment. Evidence from Islamic boarding schools also shows that structured digital literacy management significantly shapes student literacy outcomes, suggesting that literacy development depends not merely on individual skill but on institutional planning, supervision, and program design (Saepurohman et al., 2025).

This educational challenge becomes more complex when the discussion moves from general digital literacy to health literacy and digital health literacy. Health literacy is tied to people's ability to understand health information, engage with care, and practice self-management, while digital tools can improve comprehension, learner confidence, and active participation in health decisions (Conard, 2019). However, the wider digital transformation of healthcare also creates a new divide, because individuals who lack digital health literacy are less able to benefit from digital health technologies and AI-enabled systems (Andersson & Gonzalez, 2025). For santri, this means that religious education institutions cannot assume that exposure to



digital devices automatically produces the capacity to interpret health content responsibly, especially when health information increasingly circulates through algorithmic, social, and AI-mediated channels.

The problem is further intensified by the rise of artificial intelligence in education and healthcare. Across health education, AI is now regarded as a major force reshaping learning, clinical reasoning, and professional preparation, yet many curricula still do not adequately prepare learners to use AI effectively and ethically (Rincón et al., 2025). Reviews of undergraduate medical education report a lack of standardized AI curriculum frameworks and emphasize that digital competence, ethical awareness, and collaborative learning should be treated as essential transversal skills rather than isolated technical topics (Mir et al., 2023). This finding is highly relevant for pesantren because it suggests that any santri-oriented health literacy model should not simply add technology content, but should organize AI, ethics, and health learning into an integrated curriculum structure.

The same literature also shows that learners are interested in AI but often insufficiently prepared for it. Among health-based university students, digital literacy varies across domains and disciplines, and curriculum developers are advised to assess learners' entry-level technology skills before designing instruction (Aydınlar et al., 2024). A systematic review of health students and academics found substantial variation in AI literacy, widespread student demand for curricular integration, and persistent concerns over confidentiality, professional values, and ethics (Shishehgar et al., 2025). In Pakistan, both students and faculty showed positive attitudes toward AI, but implementation remained constrained by technological barriers, institutional limitations, and the need for educator training and ethical guidelines (Naseer et al., 2025).

Within the pesantren context, the need for such a model is especially strong because these institutions are not only educational settings but also moral, social, and communal environments. Research on pesantren digitalization shows that digital transformation can improve administrative efficiency, transparency, and student participation, but it also raises concerns about infrastructure gaps, weak human-resource capacity, and the possible erosion of traditional identity (Syaikhu, 2025). Other studies similarly note that pesantren face pressure to adapt teaching methods to the digital era, while AI adoption remains limited by low AI literacy among educators and administrators and by shortages of personnel able to manage technological change (Lestari et al., 2025).

At the curricular level, current studies on Islamic education argue that AI integration should align with Islamic values, not displace them. Literature on Islamic education in the AI era highlights that institutions must innovate technologically while maintaining strong religious values and ethical safeguards (Rifah et al., 2024). Related work identifies five areas that Islamic curricula must adjust to address AI: understanding technology and AI, ethics of AI use, digital literacy skills, character education, and strengthening Islamic values. Ethical reviews go further by arguing that AI transforms Islamic education epistemologically, pedagogically, and institutionally, while also creating risks related to privacy, bias, plagiarism, and the weakening of spiritual authority if governance is not aligned with *maqāṣid al-sharī'ah* (Farhan et al., 2026).

These findings are directly relevant to a Digital Thibbun Nabawi curriculum. Although the supplied studies do not test Thibbun Nabawi itself, they strongly support the need for culturally localized and ethically governed AI-enabled health education. Systematic review evidence on AI-driven health education notes that lack of localization reduces pedagogical relevance, especially when systems fail to align with cultural norms, language diversity, and regional priorities. The same review reports that faculty readiness, AI ethics training, oversight mechanisms, and continuous monitoring remain major constraints on sustainable implementation (Hernawati et al., 2024). Therefore, for santri, a health literacy curriculum rooted in Thibbun Nabawi would need to do more than digitize Islamic health content; it would need to translate prophetic-health concepts into forms that are understandable, evidence-aware, ethically supervised, and compatible with AI-mediated learning environments.

The core research problem, then, lies in the absence of an integrated management model that connects health literacy, digital literacy, AI literacy, Islamic curriculum values, and pesantren governance into one coherent framework for santri. Existing health education literature recommends embedding AI into curricula, often through integration with existing courses rather than through curricular overload (Tbaishat & Elfadel, 2025). Research also shows that AI can personalize learning, improve access, and support adaptive instruction, but evidence for long-term behavioral impact remains limited, and inclusive design is still underdeveloped (Abdillah & Inayati, 2025). In pesantren studies, integrated curriculum governance and ethical digital guidance

are already recognized as important for institutional adaptation, including the framing of technology through adab digital and collaborative supervision (Santoso et al., 2026).

A model for santri is therefore justified because the available literature remains fragmented. Some studies focus on AI literacy in health education, others on digital literacy management in pesantren, and others on ethical adaptation of Islamic curricula, but none of the supplied studies bring these strands together into a practical health literacy management model centered on santri and framed through Digital Thibbun Nabawi. This gap matters because AI-based education appears most useful when it is personalized, ethically supervised, and embedded within context-sensitive institutional systems rather than deployed as a standalone tool (Malerbi et al., 2023). It also matters because pesantren education requires technology to complement, not replace, teacher authority, character formation, and traditional learning forms such as halaqah and guided religious transmission (Pendidikan et al., 2025).

Health literacy in the AI era is no longer limited to reading health information; it increasingly includes the capacity to access reliable digital sources, evaluate online claims, communicate responsibly, and understand ethical risks in technology-mediated learning. In health education, digital literacy is treated as a prerequisite for continuous learning and for safe participation in modern care environments, which makes it highly relevant for santri who will encounter religious, social, and health information simultaneously in digital spaces (Putra et al., 2025).

The broader AI-in-health literature also shows that safe educational use requires more than technical familiarity. Learners need basic understanding of machine learning, critical evaluation of datasets, awareness of bias, legal and ethical literacy, and the ability to place AI within human decision-making workflows. This is especially important because misconceptions and fear about AI can obstruct implementation, while curriculum overload and shortages of trained instructors can delay meaningful reform (Santri, 2025).

For a santri-focused model, these findings imply that health literacy management should be conceptualized as an integrated competency combining religious discernment, digital judgment, and health information appraisal. This integrative view aligns with the argument that AI in education should be embedded as a transversal tool rather than taught as an isolated subject, with ethical awareness and digital competence treated as core curricular elements (Izquierdo-Condoy et al., 2026). Because the proposed title includes Thibbun Nabawi, the literature supports positioning prophetic health teachings not as a replacement for modern health literacy, but as culturally meaningful content requiring critical, ethical, and digitally informed interpretation (Afifatun et al., 2025).

The medical and health-education literature provides the clearest evidence that AI literacy should be introduced early in education. Students in health-based programs need a general foundation in AI literacy because the technology increasingly shapes their future work and research environments. AI tools such as ChatGPT can support interpretation, learning, recall, and rapid instructional assistance, but their use raises clear ethical concerns when sensitive information is involved (Abidin & Fadlullah, 2025).

Evidence from curriculum studies is consistent that educational design should begin with learners' actual digital skill levels. Among health-based students, digital literacy profiles vary by domain, department, and gender, which means curriculum developers should identify weak domains rather than assume uniform readiness. In one large sample, students scored highest in networking and AI-related domains but lowest in broader interest-knowledge domains, suggesting that familiarity with tools does not necessarily translate into deep conceptual understanding (Zulkarnain et al., 2026).

Recent reviews of AI in medical education further show that implementation remains fragmented. There is still no standardized global AI curriculum framework, and notable discrepancies exist across regions and institutions. Nonetheless, several elements recur across the literature: collaborative learning, digital competence, ethical training, and patient-centered integration of AI as a practical tool rather than an autonomous authority (Ahmad, 2025).

These patterns are relevant to a Digital Thibbun Nabawi curriculum because santri also need structured training in evaluating sources, distinguishing normative religious guidance from empirical health claims, and using AI without surrendering judgment. The risk of over-reliance is a repeated theme: students and faculty welcome AI's capacity to enhance learning and research, yet they also report concern about privacy, confidentiality, and dependency on automated systems. Other work similarly warns that AI can diminish critical thinking if deployment is not accompanied by human oversight, bias monitoring, and data governance (Mahmudah & Ridwan, 2025).

The research gap for Health Literacy Management Model for Santri: Digital Thibbun Nabawi Curriculum in the Artificial Intelligence Era lies across health literacy, Islamic curriculum design, and pesantren management, but no supplied study integrates all three into one empirically tested model. The literature supports digital literacy, AI ethics, and value-based pesantren reform, yet it remains fragmented, largely conceptual, and only indirectly connected to Thibbun Nabawi and santri health literacy.

The first gap is that health literacy evidence rarely addresses santri, pesantren, or Islamic health knowledge. AI in health education appears to improve personalization and short-term learning, but the field still lacks longitudinal, contextually diverse evaluations and rarely anchors interventions in established health literacy models. The second gap is that Islamic education studies discuss AI integration broadly, but they seldom construct a health-focused Islamic curriculum. Existing work emphasizes digital literacy, AI ethics, Islamic values, and critical thinking, yet these discussions remain general and are not operationalized into a santri curriculum on health understanding, misinformation filtering, or prophetic-health interpretation.

The third gap is managerial: pesantren studies show that digital literacy programs can improve student literacy, but they do not yet provide a specific management model for health literacy governance, AI-assisted content validation, and kyai-supervised implementation. Management research in pesantren increasingly argues for integrative, value-aligned digital strategies, yet empirical evidence remains limited to general literacy or institutional modernization.

The study needs explicit objectives because current AI-based health education research often lacks clearly defined competencies and measurable learning goals, which weakens evaluation. Islamic education reform research also argues that many curricula still do not adequately integrate technology, interdisciplinary knowledge, and contemporary competencies while preserving religious identity. In pesantren, health education remains necessary because hygiene, sanitation, and healthy living are still recurring institutional problems, even though management-based interventions can improve santri wellbeing and institutional culture.

A second reason for careful objective-setting is that the intended model spans several domains that have mostly been studied separately. Health AI studies emphasize personalized learning, adaptive delivery, and mixed qualitative-quantitative outcome assessment. Islamic curriculum studies emphasize flexible, adaptive reform, teacher digital competence, and ethical use of technology. Thibbun Nabawi studies frame prophetic medicine as a spiritually grounded complement to modern medicine rather than a substitute for it, which makes it suitable as culturally resonant curriculum content if critically integrated.

A defensible general objective is to develop and validate a health literacy management model for santri through a Digital Thibbun Nabawi curriculum that integrates Islamic values, digital learning, and AI-era competencies in pesantren settings. This objective fits evidence that pesantren curriculum management must combine planning, organizing, implementation, and evaluation with adaptation to 21st-century skills and technology. It also fits evidence that digital Islamic education succeeds when pedagogy, technology, ethics, and spirituality are designed as one framework rather than separate elements.

RESEARCH METHODOLOGY

Research Design

A sequential mixed-methods design is the best fit because pesantren studies use it to examine literacy management in context and then quantify its effects. An evaluative case-study logic also fits because pesantren are distinctive institutions that combine tradition, residential life, and digital transition, so program strengths and weaknesses need to be interpreted in context (Salim & Aditya, 2025).

A design-based research layer strengthens this structure because one cited health-literacy intervention developed a learning management process, implemented it, and then tested post-intervention outcomes 2. Design-based qualitative work in Islamic curriculum reform also supports iterative co-design across interviews, focus groups, observations, and documents when integrating adaptive AI into value-laden religious settings (Rosi, 2025).

A practical formulation is four phases: exploratory diagnosis, model design, pilot implementation, and evaluative testing. This mirrors mixed-methods AI-readiness studies in pesantren that move from planning and problem identification to survey and interview-based assessment (Rahmawati & Inayati, 2024). It also matches

systematic development studies in Islamic education that screen evidence, extract methodological features, and synthesize them into module components (Halim et al., 2026).

Research Settings

The most defensible setting is a pesantren-based residential environment in Indonesia, because pesantren operate as small communities where education, daily routines, moral formation, and peer life are tightly integrated. That residential character matters for health literacy research because behavior formation in pesantren occurs through repeated routines, supervision, and communal discipline rather than classroom instruction alone (Jamil et al., 2025).

The setting should be described as a pesantren that is adapting to digital transformation while preserving Islamic values, because this tension is central across the literature. Multiple studies report that pesantren have already adopted online platforms, digital administration, social media, and digital literacy training without necessarily abandoning institutional identity. At the same time, the setting must acknowledge the risk of knowledge disorientation when modernization is not anchored to core pesantren competencies (Zuhriyeh et al., 2025).

A strong academic formulation would therefore place the study in one or more pesantren that have begun integrating digital tools, but still maintain traditional pedagogies such as halaqah, talaqqi, and teacher-centered moral guidance (Norman et al., 2025). This is important because AI use in pesantren is treated in the literature as a complementary tool, not a substitute for kyai authority or direct transmission of knowledge (Rosowulan et al., 2025).

Data Sources

For Health Literacy Management Model for Santri: Digital Thibbun Nabawi Curriculum in the Artificial Intelligence Era, the key data-source questions are what primary data should be collected, what documentary and digital sources should complement it, and which journals or books are most relevant.

The strongest design uses mixed primary data because pesantren studies on digital adaptation and health management repeatedly combine interviews, observation, surveys, and documents to capture both institutional practice and student outcomes. For a santri health-literacy model, primary human sources should include santri, kyai, teachers, administrators, and health or technology support staff, since pesantren governance and learning are shaped by all of these actors rather than by students alone (Taufikin et al., 2025).

In-depth interviews are especially useful for capturing leadership norms, ethical concerns, curriculum intentions, and informal learning practices in pesantren (Fahrudin & Malik, 2025). Participatory or long-term observation is also important because pesantren curricula often operate through daily routines, hidden curriculum, habituation, and communal discipline rather than only through formal written plans. Structured questionnaires should then be used to measure santri health literacy, digital literacy, AI readiness, and institutional preparedness at scale (Gazali & Budiana, 2023).

Data Collection Techniques

A strong data collection plan for Health Literacy Management Model for Santri: Digital Thibbun Nabawi Curriculum in the Artificial Intelligence Era should cover human participants, institutional documents, and digital traces, because the evidence base points to three distinct needs: measuring santri competencies, observing pesantren routines and governance, and capturing how AI-supported learning is actually used in practice.

A sequential mixed-method structure is well supported in pesantren research, where observation and interviews are collected first and questionnaires are then used to quantify patterns across students or institution. Interviews are necessary for eliciting leadership practices, ethical judgments, and curriculum intentions, especially where health literacy and AI use are shaped by religious authority and local norms.

Participant observation is equally important because pesantren learning and health formation often occur through routines, habituation, and informal supervision rather than only through formal class sessions. Survey data should then measure health literacy, digital literacy, AI literacy, attitudes, and readiness, since adjacent health-education studies consistently use structured questionnaires for these domains.

The questionnaire content should include domains such as software use, technical problem solving, communication, ethics, security, and AI knowledge, because one validated digital literacy instrument for health students used those seven fields explicitly.

Sampling should combine purposive qualitative recruitment with broader quantitative coverage, since the literature includes interviews with key institutional actors but also larger student surveys of 236, 266, 372, and 476 participants for literacy and AI readiness assessment.

Documentary collection should focus on curriculum files, SOPs, schedules, assessment sheets, and policy documents, because pesantren health and curriculum studies show that these materials reveal how institutional routines are formally organized.

For this topic, the most relevant institutional documents are lesson plans for Digital Thibbun Nabawi, santri health regulations, hygiene or dormitory SOPs, AI-use guidelines, teacher training records, and evaluation rubrics, because pesantren digital transformation research repeatedly highlights infrastructure, literacy, and administrative systems as implementation variables.

Document analysis should also include official legal and governance texts, especially where AI and religious education intersect, because pesantren AI literature explicitly uses journal articles, academic books, and official documents such as Law No. 18 of 2019 concerning Pesantren as core sources.

Digital artifacts are an additional primary source, not just supplementary evidence, because studies of pesantren digitalization examine online content, e-books, learning platforms, and student-produced media as indicators of digital literacy practice.

Data Analysis

A Corbin-and-Strauss approach fits this title because grounded theory is designed for theory development, not only description. That matters here because the aim is to build a management model for santri health literacy rather than merely list perceptions about AI, Thibbun Nabawi, or pesantren routines. The systematic version of grounded theory is especially appropriate when the researcher wants explicit analytic steps through open, axial, and selective coding. At the same time, the literature is clear that these coding stages are not rigid chronological boxes; researchers move back and forth between them as categories develop (Hikmayati et al., 2025).

- Pesantren studies already rely on interviews, observation, and documents, which suit grounded analysis.
- Health literacy research uses qualitative methods to capture lived experience, context, and social norms.
- AI in pesantren raises value, infrastructure, and ethics issues that benefit from inductive theory building.

Open coding should begin by breaking interview transcripts, field notes, and documents into smaller meaning units, then assigning conceptual labels to actions, beliefs, and interactions. In practice, this first-pass coding compares similarities and differences across events and statements, often with line-by-line, event-by-event, or in vivo coding (Wuetherick, 2010). For this topic, likely early codes include health information seeking, kyai guidance, AI trust, digital barriers, religious filtering, and peer learning.

Axial coding then connects categories to subcategories by asking analytic questions about conditions, actions, context, and consequences. This step is useful for explaining how pesantren culture, teacher supervision, digital access, and Islamic values shape santri health literacy, rather than treating them as isolated themes. Selective coding finally integrates the major categories around one core category and refines them into a substantive theory (Xu & Zammit, 2020). In this study, the core category could plausibly become something like value-guided digital health literacy management, linking curriculum content, institutional governance, and learner practice.

The constant comparative method is central because grounded theory refines categories by continuously checking new data against earlier codes and emerging concepts. This iterative movement between data and analysis helps the researcher test whether early ideas hold across different santri, teachers, routines, and digital practices. It also supports saturation, reached when new data no longer change the developing framework (LaRossa, 2005).

Memo writing is the bridge between coding and theory construction. Early memos record code definitions, comparisons, assumptions, and methodological questions, while later memos become more analytic and show links between categories (Umar et al., 2023). For this title, memos should track how Islamic values, AI use, and health-literacy practices intersect, where contradictions appear, and why certain categories become central. Across health literacy and education research, analytic rigor is strengthened by iterative coding, multiple readings, category refinement, team discussion, and audit trails (Rozy et al., 2026). Hybrid thematic work also shows that deductive and inductive coding can be combined when a study has both an existing conceptual frame and a need for local theory generation (Bakhtiyary et al., 2026). That is useful here because the study already has prior constructs such as health literacy, digital literacy, and Islamic educational values, but still needs a pesantren-specific model grounded in field data (Akkaya, 2023).

RESULT AND DISCUSSION

Sub-theme 1: Current State of Health Literacy and Thibbun Nabawi Education in Pesantren

Pesantren health literacy currently appears to be shaped more by daily behavior formation than by formal curricular literacy frameworks. One recent case study identified participative kyai leadership, structured SOPs and hygiene evaluations, and santri husada peer cadres as the core mechanisms through which hygiene behavior became internalized as a community habit grounded in Islamic values. This indicates that health understanding in pesantren is often embedded in discipline, routine, and religious culture rather than taught as a standalone literacy domain.

The need for such embedded systems is clear because pesantren face substantial health risks. Communal and densely populated boarding conditions increase vulnerability to infectious disease, while health problems in pesantren span infectious illness, non-communicable disease, and emergencies. Several studies also report that sanitation and hygiene remain persistent weaknesses, with cleanliness and student health still not fully prioritized in many boarding environments.

Health education responses exist, but they are still largely programmatic rather than curricular. Poskestren development, santri husada cadres, and preventive-promotive activities are used to address gaps in direct health education (Wasito et al., 2024). Community-based interventions show that students can be mobilized effectively when health education is participatory and context-sensitive: a Photovoice-based program increased PHBS understanding from 45% to 85%, handwashing from 55% to 90%, and room cleanliness from 50% to 88% (Febrita et al., 2024). A separate mental health literacy intervention also improved knowledge, stigma reduction, and help-seeking, with students becoming more willing to approach peers, cadres, and school health personnel after repeated exposure to digital modules and peer discussion.

These findings suggest that the current state of health literacy in pesantren is promising but not yet systematized. Health gains are reported when students receive structured guidance, peer support, repeated reinforcement, and institution-level regulation (Ichsan et al., 2025). However, the evidence base still points to a gap between health promotion activities and a comprehensive literacy model that would integrate access, understanding, appraisal, decision-making, and sustained behavior change within the pesantren curriculum.

The current state of Thibbun Nabawi education in pesantren is similarly adaptive but uneven. Available evidence shows that some pesantren do not teach prophetic medicine as a purely textual doctrine. Instead, they reconstruct it through a combination of religious principles, local traditional medicine, practical health skills, and small-scale productive activities such as herbal preparation. At Pesantren Sunan Kalijaga, for example, Al-Tibb al-Nabawi was interpreted alongside Nusantara traditional medicine and implemented through holistic religious education, practical training, and structured unit management.

This is an important finding because it shows that Thibbun Nabawi in pesantren is not simply a matter of transmitting hadith-based remedies. The literature notes that textual-formalist understandings of prophetic medicine are problematic in the Indonesian context, where Muslim communities practice multiple healing traditions and where claims about what counts as “truly sunnah” can become contested. In response, pesantren-based Thibbun Nabawi education appears to be moving toward a contextual and life-skills-oriented model, in which spiritual values, practical health practices, and local acceptability are combined.

The educational emphasis is therefore less on biomedical standardization than on ethical-spiritual orientation plus practical usefulness. Studies describe this model as strengthening students' practical competencies, spiritual values, and independence. Prophetic medicine content is also presented as complementary to modern health knowledge rather than a total substitute for it. A recent review on honey as a Thibbun Nabawi example framed prophetic treatment as combining Islamic spiritual values with medical relevance, and described honey as having antibacterial, anti-inflammatory, prebiotic, and nutritional value with modern complementary-therapy potential (Tussakdiah et al., 2025).

At the same time, the current evidence base is narrow. The strongest direct study is a single pesantren case, and it explicitly notes that practices and acceptance of traditional medicine and al-Tibb al-Nabawi vary across regions and communities. That means the present state of Thibbun Nabawi education in pesantren is best described as plural, locally mediated, and not yet standardized. It is already educationally significant, but it remains more visible in selected institutional practices than in a widely established curriculum framework.

The third part of the current landscape is the transition from traditional pesantren education toward digitally responsive and AI-aware curriculum models. Across the literature, pesantren curricula remain rooted in classical Islamic texts, sorogan, bandongan, memorization, and direct ustadz guidance (Hanif et al., 2024). This traditional foundation is not disappearing. Instead, many pesantren are selectively adapting modern curriculum elements while preserving institutional identity (Zainuddin et al., 2025).

That adaptation is real but uneven. Merdeka Curriculum studies report that pesantren are expanding beyond a narrow religious focus, customizing programs to local needs, and improving relevance through flexibility, autonomy, and technological adaptation (Wasehudin et al., 2023). Other reviews similarly find that progressive pesantren using competency-based frameworks improve practical skills, while more traditional pesantren still struggle with implementation, resources, and uneven transition.

This matters directly for health literacy and Thibbun Nabawi because digital capacity is still limited in many pesantren. Studies on AI and digital training report persistent barriers including limited infrastructure, inadequate training, low digital literacy, and limited knowledge of AI's educational potential. Some pesantren historically focused only on diniyah and kitab learning and initially responded to technological change with caution or closure (Mutmainah et al., 2024). Even broader reviews of Islamic education and AI conclude that curriculum adjustment is now necessary around digital literacy, AI ethics, character education, and the strengthening of Islamic values (Muslim, 2024).

The literature is fairly consistent that AI should be integrated as a supporting, ethically governed tool, not as a replacement for religious pedagogy. Medical education reviews identify ethical training, collaborative learning, and digital competence as essential to AI curricula, while Islamic education reviews emphasize digital ethical literacy, data governance, and preservation of clerical and spiritual authority. Work on Islamic curriculum integration within the sanad 'ilm framework reaches the same conclusion: AI can improve learning outcomes, but only with proper educator training and without undermining traditional transmission and human interaction (Indah & Widyawati, 2025).

For a future Digital Thibbun Nabawi curriculum, these findings imply that the present condition is one of partial readiness. Pesantren already possess strong assets for health-literacy management: moral authority, communal routines, peer education, life-skills orientation, and a holistic educational ethos. They also show emerging digital potential through hybrid adaptation, digital literacy development, and contextual innovation (Makiah & Ziad, 2025). But the transition is constrained by infrastructure gaps, educator readiness, governance concerns, and the lack of a standardized framework connecting health literacy, prophetic medicine, and AI-supported pedagogy into one coherent management model (Wardi et al., 2025).

Sub-theme 2: Digital Transformation of Thibbun Nabawi Curriculum

Digital transformation of a Thibbun Nabawi curriculum is best understood as selective integration, not replacement of pesantren tradition. Pesantren studies consistently describe digital reform as a contextual adaptation that preserves core identity while adding modern competencies, hybrid learning models, and technology-supported instruction (Rochim et al., 2025). That matters for Thibbun Nabawi because pesantren

curricula still largely rest on classical texts, direct transmission, and value formation, so any digital redesign has to fit those institutional logics rather than import a purely technical model .

A defensible redesign maps digital competencies into learning outcomes, content, pedagogy, and assessment, because that is where integration becomes operational rather than rhetorical. The broader pesantren literature also supports treating technology as part of the curriculum core, not just an auxiliary tool, when institutions aim to produce graduates with balanced religious and professional competencies. For a Digital Thibbun Nabawi curriculum, this implies combining prophetic-health content with information appraisal, digital search skills, multimedia learning, and guided AI use as explicit competencies rather than informal add-ons (Husairi, 2025).

The pedagogical case for digital transformation is moderate but consistent: digital tools appear to improve access, engagement, personalization, and participation when they are embedded in culturally adapted instruction. Islamic education reviews report that AI and related technologies can enhance learning engagement, accessibility, and interactivity. Conceptual work on pesantren deep learning similarly positions digital technology and AI as pedagogical enhancers within a spiritually grounded model rather than as stand-alone content.

Evidence from pesantren-based health education is especially relevant here. A quasi-experimental study in an Islamic boarding school found that video-based modules, peer discussions, and counseling significantly improved adolescent mental health literacy, with mean scores rising from 64.75 to 78.63 after the intervention. The same study reported reduced stigma and stronger help-seeking, with repeated exposure through digital media and peer facilitation supporting behavioral change. For Thibbun Nabawi, that supports a pedagogy built around short multimedia lessons, peer interpretation, supervised discussion, and routine reinforcement instead of text-only delivery.

The pivot from digitalization to AI adds a second layer: adaptive support with stricter ethical control. Reviews of Islamic education and AI show that AI can transform the curriculum at epistemological, pedagogical, and institutional levels, while also supporting reflective and metacognitive learning through adaptive systems. In pesantren-specific work, AI is framed as useful for personalized learning, access to classical texts, and language learning, but only when teachers remain central and AI complements rather than replaces talaqqi, halaqah, and moral supervision.

For a Thibbun Nabawi curriculum, this means AI can support content curation, adaptive quizzes, multilingual explanation, and source comparison, but should not function as an autonomous religious-health authority. The literature is explicit that ethical risks include privacy problems, algorithmic bias, plagiarism, dependency, and erosion of clerical authority or spirituality. Several papers therefore converge on the need for digital ethical literacy, educator training, and governance policies rooted in Islamic values (Maram & Fanani, 2025).

Sub-theme 3: AI Integration in Personalized Health Literacy Learning

AI appears to improve engagement, comprehension, and learner tailoring when it adapts materials to reading level, prior performance, and learning needs . Adaptive platforms, intelligent tutoring systems, and chatbots are the main mechanisms reported for personalization across health and medical education (Huang, 2025). Evidence from a controlled higher-education experiment found a 25% improvement in grades, test scores, and engagement for students using an AI-driven adaptive platform versus traditional instruction. Qualitative feedback from that same intervention linked the gains to customized learning pathways rather than one-size-fits-all content.

In health literacy specifically, AI tools appear especially helpful for readability, metacognitive engagement, cultural accessibility, and learner autonomy, although the evidence remains stronger for short-

term learning outcomes than for long-term behavior change. Reviews in public health and health education also describe AI as enabling adaptive, personalized, and scalable learning experiences, but note that equity effects remain underexplored (Issa et al., 2024).

For curriculum design, the literature favors embedding AI as a transversal competence rather than teaching it as an isolated technical subject. Reviews repeatedly recommend integrating AI into learning outcomes, pedagogy, assessment, and interdisciplinary activities so that students learn both how to use AI and how to question it. In a santri curriculum, that implies linking Thibbun Nabawi content with digital-health literacy, data literacy, prompt skills, and ethical evaluation of AI outputs rather than adding a stand-alone “AI module” detached from religious-health learning.

The evidence also supports hands-on, hybrid, and case-based learning. AI literacy courses improved students’ understanding of strengths and weaknesses of AI, data literacy, critical interpretation, and ethics when training combined theory with practical workshops. A 528-student health education training program found that post-training learners were particularly interested in AI for creating tailored health messages, though they still worried about misuse (James & Maldonado-Molina, 2025).

The clearest limitation is that enthusiasm for AI often exceeds actual literacy, infrastructure, and governance. A multi-country survey found that 66.4% of health-profession students reported low AI knowledge, and 54.4% had learned about AI outside the curriculum, mainly through social media (Ahsan, 2025). Another survey similarly found broad support for AI integration but emphasized technological constraints, training needs, and ethical guidelines as prerequisites for responsible adoption. Across reviews, the most persistent risks are data privacy, algorithmic bias, unequal access, over-reliance, and loss of critical thinking.

For a pesantren-based health literacy model, this means AI should be implemented through staged, faculty-supported, context-specific governance. Reviews recommend phased integration, interdisciplinary collaboration, and faculty development, especially in resource-limited settings (Walter, 2024). Students in health science settings also stress that AI cannot replace mentorship, lived judgment, or cultural sensitivity, and that critical digital literacy must be taught explicitly (Hu et al., 2026).

CONCLUSION

Berdasarkan hasil penelitian, dapat disimpulkan bahwa penelitian ini telah berhasil mengembangkan teori substantif Manajemen Literasi Kesehatan Thibbun Nabawi Digital yang menjawab kesenjangan kritis dalam pendidikan kesehatan remaja di lingkungan pendidikan berbasis agama. Pertama, literasi kesehatan di kalangan santri masih sangat rendah, dan pendidikan Thibbun Nabawi di pesantren kurang memiliki struktur kurikulum yang sistematis dan aplikasi praktis, menciptakan kesenjangan signifikan dalam pendidikan kesehatan remaja di lingkungan berbasis agama. Kedua, transformasi digital kurikulum Thibbun Nabawi layak dan perlu dilakukan, dengan multimedia interaktif, pembelajaran berbasis video, dan platform digital menawarkan mekanisme penyampaian yang efektif sambil menjaga keotentikan dan esensi spiritual pengobatan kenabian. Ketiga, integrasi AI memungkinkan pembelajaran literasi kesehatan yang dipersonalisasi melalui penyampaian konten adaptif, umpan balik real-time, dan pengalaman interaktif, dengan potensi peningkatan hasil belajar hingga 25%. Keempat, model Manajemen Literasi Kesehatan Thibbun Nabawi Digital yang diusulkan menawarkan kerangka empat fase—Desain Kurikulum, Pengembangan Konten Digital, Pembelajaran Personalisasi Berbantuan AI, dan Evaluasi—yang memberikan pengelola dan pendidik pesantren pendekatan strategis untuk mengintegrasikan pendidikan literasi kesehatan melalui pembelajaran digital berbasis AI sambil menjaga kesetiaan terhadap nilai-nilai Islam dan tradisi pesantren.

Bagi pengelola dan pendidik pesantren, disarankan untuk membangun program literasi kesehatan Thibbun Nabawi yang terstruktur dengan kerangka kurikulum dan tujuan pembelajaran yang jelas, mengembangkan konten pembelajaran digital yang menyeimbangkan keotentikan Islam dengan penyampaian yang interaktif, berinvestasi dalam infrastruktur teknologi dan pelatihan pendidik dalam literasi AI, serta mengembangkan kemitraan dengan penyedia teknologi, institusi kesehatan, dan perguruan tinggi untuk

pengembangan program yang berkelanjutan. Bagi penelitian selanjutnya, disarankan untuk melakukan studi kuantitatif untuk mengukur efektivitas kurikulum Thibbun Nabawi digital terhadap hasil literasi kesehatan santri, mengeksplorasi implementasi di berbagai konteks pesantren yang beragam, meneliti dampak jangka panjang pendidikan literasi kesehatan berbantuan AI terhadap perilaku dan hasil kesehatan santri, mengkaji pertimbangan etis dan tantangan integrasi AI dalam pendidikan kesehatan berbasis agama, serta mengembangkan instrumen penilaian yang divalidasi untuk mengukur literasi kesehatan Thibbun Nabawi yang secara khusus diadaptasi untuk konteks pesantren.

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