Integrating 21st Century Skills into the Islamic Boarding School Curriculum to Improve Student Competence in the Global Era

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ABSTRACT

Islamic boarding schools (*pesantren*) have long sustained moral formation and classical Islamic scholarship, yet rapid digital transformation and shifting labor-market demands require santri to develop 21st-century competencies alongside religious mastery. This study aims to analyze strategies for integrating 21st-century skills into the *pesantren* curriculum without eroding *pesantren* identity, using *Pesantren* Al-Yasini as a case. A qualitative case-study design was employed, drawing on participant observation, in-depth interviews with *pesantren* leaders, teachers, students, and alumni, and analysis of curriculum and policy documents. The findings show a shared recognition of the urgency of strengthening critical thinking, communication, collaboration, creativity, and digital literacy. Integration is most feasible when these competencies are mapped into learning outcomes, content, pedagogy, and assessment, and operationalized through value-guided technology use, hybrid learning routines, and project-based activities (e.g., sharia entrepreneurship and leadership projects). Key enabling factors include leadership commitment, teacher readiness, and curriculum flexibility, while constraints include uneven infrastructure and resistance to pedagogical change. The study concludes that a staged, value-based integration model can enhance santri competitiveness while preserving the *pesantren*'s core mission. This research contributes an empirically grounded framework to inform curriculum development and policy support for *pesantren* in the digital era.

Keywords: *Pesantren, 21st-Century Skills, Curriculum Integration, Digital Literacy, Qualitative Case Study.*

INTRODUCTION

*Pesantren*s play a strategic role in shaping the character, morals, and scholarly traditions of students (*santri*) through the study of classical texts (*kitab kuning*), *halaqah* (study circles), *sorogan–bandongan* (individual and collective learning methods), and structured habituation systems (*riyadhah*) within boarding life.[1] Through this educational pattern,

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[1] Dia Fathul Jannah et al., "Kitab Kuning: Metode Sorogan Dan Bandongan Di Pondok *Pesantren*," *An Najah (Jurnal Pendidikan Islam Dan Sosial Keagamaan)* 4, no. 4 (2025): 225–30; Arif Suhendri et al., "Implementasi

*pesantren*s do not only transmit Islamic knowledge but also instill *adab* (etiquette), discipline, exemplary leadership, and a learning ethos that continues throughout the day via the pedagogical relationship between *kiai* (head of *pesantren*), *ustaz* (teacher), and *santri*.[2] These characteristics make the *pesantren* a relatively holistic educational space: learning takes place in the classroom as well as in the socio-cultural realm, ensuring that character building and the strengthening of religious identity are not separated from the students' intellectual development process.[3]

At the same time, global disruption—marked by the acceleration of digital technology, an abundance of information, and a knowledge-based economy—is changing the way society learns, works, and participates in public life.[4] This condition creates new needs for *pesantren* graduates: in addition to having deep religious knowledge and moral maturity, students also need competencies that allow them to adapt and contribute to increasingly digital social spaces. 21st-century skills such as critical thinking (to evaluate information, arguments, and social problems), creativity (to generate ideas and innovations in *dakwah* and entrepreneurship), communication (to effectively convey ideas across audiences), collaboration (to work in teams and networks), as well as digital and technological literacy (to manage information, produce content, and use digital devices productively and ethically) have become essential assets that are increasingly difficult to ignore.

The challenge is that strengthening these competencies cannot be positioned as an "addition" existing outside the *pesantren* system, as this could potentially trigger cultural resistance and shift the orientation of character building. Therefore, a more relevant direction is integration: 21st-century skills are linked to the *pesantren*'s learning traditions, for example, through strengthening reasoning methods (*manhaj*) in understanding texts, habituating scientific discussions in *halaqah*, practicing argumentation and writing, and utilizing technology to enrich access to references, learning, and *dakwah* practices.[5]

A number of studies indicate that integrating learning innovations within the *pesantren* environment is not impossible, though it requires a contextual and value-based strategy. Darajat et al. (2022) documented digital literacy practices at *Pesantren* Darunnajah through content creator training, video production, and Islamic journalism; the key findings emphasized that digital literacy can be implemented within the *pesantren*'s moral framework, including the habit of verifying information (fact-checking) as a form of media ethics for students.[6] Marwaji et al. (2025) demonstrated an Islamic value-based STEAM approach

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Penanaman Nilai Pendidikan Karakter Melalui Metode Habituasi Di Pondok Modern Darussalam Gontor Putri Kampus 8," *Journal on Education* 7, no. 1 (2024): 743–52, https://doi.org/10.31004/joe.v7i1.6401.

[2] ahmed Ahmed Hidayat, "Peran Keteladanan Kiai Dalam Pembentukan Karakter Disiplin Santri Di Pondok *Pesantren* Salafiyah Daaruttoolibiin Garut," *Pendas : Jurnal Ilmiah Pendidikan Dasar* 10, no. 02 (2025), https://doi.org/10.23969/jp.v10i02.26191; Suhendri et al., "Implementasi Penanaman Nilai Pendidikan Karakter Melalui Metode Habituasi Di Pondok Modern Darussalam Gontor Putri Kampus 8."

[3] Suhendri et al., "Implementasi Penanaman Nilai Pendidikan Karakter Melalui Metode Habituasi Di Pondok Modern Darussalam Gontor Putri Kampus 8."

[4] Deden Mauli Darajat et al., "*Pesantren* and Madrasa-Based Digital Literacy Practices: The Case of the Darunnajah Islamic Boarding School, Jakarta," *Islamic Communication Journal* 7, no. 2 (2022): 257–72, https://doi.org/10.21580/icj.2022.7.2.13619; Fikri Dwi Oktaviani and Linda Setiawati, "Strengthening students' digital literacy for 21st-century learning in Islamic boarding schools," *Jurnal Abmas* 25, no. 1 (2025): 63–78, https://doi.org/10.17509/abmas.v25i1.84688.

[5] Darajat et al., "*Pesantren* and Madrasa-Based Digital Literacy Practices"; Oktaviani and Setiawati, "Strengthening students' digital literacy for 21st-century learning in Islamic boarding schools"; Dini Pepilina et al., "Integration of the STEAM Approach Based on Islamic Values in *Pesantren* Education: An Exploratory Case Study Grounded in Project-Based Learning and the Principles of Ta'dib," *Jurnal Pendidikan Islam* 14, no. 1 (2025): 119–28, https://doi.org/10.14421/jpi.2025.141.119-128.

[6] Darajat et al., "*Pesantren* and Madrasa-Based Digital Literacy Practices."

applied through project-based learning—such as natural water filter projects, educational video production, and Islamic geometric calligraphy—which was able to increase student enthusiasm and engagement, despite still being limited by facilities and teacher competence in interdisciplinary learning.[7] A study by Sari & Murod (2024) at a *pesantren*-based Madrasah Aliyah showed that blended learning could be operationalized through flipped classroom and lab-rotation models, but implementation faced obstacles regarding the ICT skills of teachers and students, independent learning, and limited computer laboratory facilities.[8] Oktaviani and Setyawati (2025) emphasized the opportunities for integrating digital literacy within the *pesantren* ecosystem to support student capacity building (including the relevance of 21st-century competencies), while also noting the importance of program designs compatible with the institution's culture.[9] Meanwhile, Anjaludi and Pratama (2025), through a literature review, affirmed the urgency of integrating digital technology into the *pesantren* curriculum, while mapping challenges (infrastructure, teacher readiness, moral issues) and strategic opportunities such as the digitalization of *kitabs*, human resource strengthening, collaboration with technological institutions, and the development of Islamic-themed STEAM curricula.[10]

While these studies enrich the understanding of digital literacy, STEAM, and blended learning in *pesantren*s, existing literature does not yet sufficiently explain an operational and replicable "integration mechanism"—namely, how 21st-century skills are systematically linked to the *pesantren*'s curriculum structure (*kitab kuning–halaqah–taklim–ubudiyah*), how implementation stages are structured based on the readiness of human resources and infrastructure, and how achievement indicators are designed so that competency strengthening does not displace the spirit of character education; therefore, this article offers novelty in the form of a "layered" integration model based on *pesantren* values that includes the alignment of objectives–materials–methods–assessments, a package of integrative pedagogical strategies (e.g., digital *dakwah* projects and ethical-digital literacy), and a realistic phased implementation design, with *Pesantren* Al-Yasini as the locus to test integration practices contextually. This research aims to analyze the strategy for integrating 21st-century skills into the *pesantren* curriculum—covering curriculum design, strengthening educator capacity, utilizing learning technology, and evaluating outcomes—to enhance students' competence in facing global challenges without losing their *pesantren* identity.

METHOD

This research employs a qualitative approach with a case study design focusing on the Al-Yasini Islamic Boarding School (*Pondok Pesantren*). A case study was chosen because it allows the researcher to gain a deep understanding of a contemporary phenomenon within its real-life context and explore the dynamics of "how" and "why" 21st-century skill integration strategies are implemented in a *pesantren* environment.[11]

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[7] Deden Marwaji et al., "Integrasi Nilai Islam Dalam Pendidikan STEAM Anak Usia Dini: Kajian Literatur Sistematis 2018–2024," *Tinta Emas: Jurnal Pendidikan Islam Anak Usia Dini* 4, no. 2 (2025): 91–102, https://doi.org/10.35878/tintaemas.v4i2.1889.

[8] Pusvyta Sari and Ahmad Murod, "Implementasi Blended Learning Di Madrasah Aliyah Berbasis *Pesantren*," *Journal of Islamic Education* 2, no. 1 (2024): 1–15, https://doi.org/10.61231/jie.v2i1.187.

[9] Oktaviani and Setiawati, "Strengthening students' digital literacy for 21st-century learning in Islamic boarding schools."

[10] Anjaludin and Arizqi Ihsan Pratama, "Integration of *Pesantren* Curriculum with Digital Technology: Challenges and Opportunities in Islamic Education," *Proceeding of International Conference on Islamic Boarding School* 2, no. 1 (2025), https://doi.org/10.61159/icop.v2i1.594.

[11] Robert K. Yin, *Case Study Research and Applications: Design and Methods* (SAGE Publications, 2017).

Data were collected through participant observation to capture learning practices and daily culture that shape the competency integration process; in-depth/semi-structured interviews with *pesantren* leaders (*pengasuh*), teachers (*ustaz*), and students (*santri*) to explore experiences, internal policy rationales, and perceptions of supporting factors and implementation barriers; as well as document analysis (curriculum documents, teaching tools, program guidelines, and *pesantren* policies) to map the forms of integration designed at the levels of objectives, materials, methods, and assessments.[12] Observations were conducted to identify learning patterns and technology usage (if any) in curricular and co-curricular activities, while interviews served to confirm the meanings, value considerations, and change management strategies adopted by *pesantren* stakeholders.

Data analysis was performed using thematic analysis, involving the stages of data familiarization, initial coding, theme development, theme review, defining/naming themes, and reporting findings. These steps helped the researcher formulate primary patterns regarding 21st-century skill integration strategies, value-based adaptation forms, and implementation hurdles at both the classroom and institutional levels.[13] The analysis process was conducted inductively—where themes were built from field data—utilizing source triangulation (observation, interviews, and documents) to enhance inference strength and ensure consistency of findings across sources. The thematic analysis framework was further reinforced by examples of its application in educational research within nationally reputable journals, ensuring that the analytical procedures used in this study have tested methodological references within the context of educational research.[14]

RESULTS AND DISCUSSION

Conceptualization of the Integration of 21st Century Skills in the Islamic Boarding School Curriculum

Integrating 21st-century skills into *pesantren* curricula has become a practical necessity as learning, work, and civic participation increasingly take place in digitally mediated environments. Recent literature commonly frames 21st-century skills through the "4Cs"—critical thinking, creativity, communication, and collaboration—as cross-cutting competencies needed to navigate complexity in education and the future workplace.[15] In the *pesantren* context, strengthening the 4Cs should not be treated as a stand-alone "modernization" agenda; instead, it needs to be contextualized as an expansion of students' (*santri's*) capacity to fulfill religious and social roles meaningfully in a digital public sphere while maintaining the *pesantren*'s core orientation toward *adab*, moral formation, and deep Islamic scholarship.

Interview findings with caregivers/leaders (*pengasuh*), teachers (*ustaz*), students, and alumni indicate a shared awareness of the urgency of integrating 21st-century skills at *Pesantren* Al-Yasini. Leaders emphasized that the main challenge lies in maintaining equilibrium between tradition and innovation, whereas students and alumni highlighted difficulties adapting to professional environments that require technology use and effective communication. This pattern aligns with evidence from *pesantren*-based digital literacy

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[12] Yin, *Case Study Research and Applications.*

[13] Virginia Braun and Victoria Clarke, "Using Thematic Analysis in Psychology," *Qualitative Research in Psychology* 3, no. 2 (2006): 77–101, https://doi.org/10.1191/1478088706qp063oa.

[14] Agus Sumhendartin Suryobroto et al., "A Thematic Analysis of Teachers' Experience in Teaching Inclusive Physical Education," *Jurnal Cakrawala Pendidikan* 41, no. 3 (2022): 754–63, https://doi.org/10.21831/cp.v41i3.50531.

[15] Branden Thornhill-Miller et al., "Creativity, Critical Thinking, Communication, and Collaboration: Assessment, Certification, and Promotion of 21st Century Skills for the Future of Work and Education," *Journal of Intelligence* 11, no. 3 (2023), https://doi.org/10.3390/jintelligence11030054.

research showing that digital practices can be developed within a value framework—such as ethical media use, information verification, and responsibility—so they do not inherently conflict with *pesantren* culture.[16] Observations also suggest that some *pesantren* have begun to adopt learning innovations, including the use of digital devices to access classical texts and participation in online discussions with wider networks of scholars. In addition, project-oriented programs (e.g., sharia-based entrepreneurship and leadership training) are increasingly used to foster collaboration, problem-solving, and independence. These practices resonate with the argument that hybrid learning models—combining face-to-face instruction with digital pedagogy—can support the development of 21st-century competencies when implementation is guided by Islamic values and institutional governance.[17]

Curriculum documents reinforce that the core of *pesantren* instruction remains centered on classical Islamic texts (kitab kuning) and traditional pedagogies, while also revealing innovations in some programs that adopt project-based approaches to strengthen creativity and collaboration and introduce digital literacy, foreign languages, and leadership through partnerships with modern educational institutions. Theoretically, this trajectory can be understood through a sociocultural-constructivist lens that views learning as mediated by social interaction, scaffolding, and communities of practice; in *pesantren*, these mechanisms correspond to *halaqah* traditions, deliberative learning (*musyawarah*), and role-model-based education—processes that can be extended into digital spaces in a guided and purposeful way.[18] Overall, the integration of 21st-century skills at Al-Yasini is best interpreted not as replacing tradition, but as building a bridge between long-standing scholarly practices and contemporary competency demands through measured technology use, project-based learning, and the deliberate strengthening of communication and collaboration, while treating discipline, *adab*, and digital ethics as prerequisites for sustainable implementation.[19]

Implementation Model of 21st-Century Skills in the *Pesantren* Curriculum

Implementing 21st-century skills in a *pesantren* curriculum requires an adaptive approach that connects curriculum design, classroom pedagogy, and institutional governance so that innovation complements—rather than replaces—classical learning traditions. Recent scholarship continues to emphasize the "4Cs" (critical thinking, creativity, communication, collaboration) as core competencies for future learning and work, including the need for credible assessment and systematic promotion of these skills in education systems.[20] In *pesantren* settings, evidence suggests that digital pedagogy can be integrated with Islamic values through structured guidance, enabling technology use to support learning effectiveness while maintaining moral boundaries and institutional discipline.[21] In addition, research on *pesantren*-based digital literacy shows that ethical norms such as information verification and responsible content production can be cultivated as part of *pesantren* habitus, which reduces the perceived tension between tradition and technological innovation.[22]

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[16] Darajat et al., "*Pesantren* and Madrasa-Based Digital Literacy Practices."

[17] Sugito Sugito, "Hybrid Learning in *Pesantren*: Integrating Digital Pedagogy and Islamic Values to Enhance 21st-Century Competencies," *Tafkir: Interdisciplinary Journal of Islamic Education* 5, no. 4 (2024): 749–64, https://doi.org/10.31538/tijie.v5i4.2207.

[18] Sigit Wibowo et al., "The Relevance of Vygotsky's Constructivism Learning Theory with the Differentiated Learning Primary Schools," *Journal of Education and Learning (EduLearn)* 19, no. 1 (2025): 431–40, https://doi.org/10.11591/edulearn.v19i1.21197.

[19] Sugito, "Hybrid Learning in *Pesantren*"; Darajat et al., "*Pesantren* and Madrasa-Based Digital Literacy Practices."

[20] Thornhill-Miller et al., "Creativity, Critical Thinking, Communication, and Collaboration."

[21] Sugito, "Hybrid Learning in *Pesantren*."

[22] Darajat et al., "*Pesantren* and Madrasa-Based Digital Literacy Practices."

Interview findings from *Pesantren* Al-Yasini indicate divergence in educators' perspectives on adopting 21st-century learning models. Some *pesantren* leaders remain oriented toward classical pedagogies as the primary pathway to deep textual mastery and the formation of scholarly discipline, whereas younger teachers—often exposed to modern educational training—show greater openness to technology-assisted discussions and student-centered routines. From students' perspectives, project-based activities are perceived as particularly attractive, especially those connected to Islamic entrepreneurship, digital literacy, and technology-related skills, because they offer a clearer bridge to future study and work demands. This preference is consistent with broader empirical evidence indicating that project-based learning (PjBL) tends to improve higher-order thinking skills, including critical thinking, across educational contexts,[23] and meta-analytic findings in the Indonesian context also suggest PjBL has a positive effect on multiple dimensions of 21st-century skills.[24]

Field observations at Al-Yasini further suggest that technology integration can be operationalized through a digital literacy program that explicitly positions digital tools as instruments for strengthening Islamic learning (e.g., accessing classical texts, expanding references, and participating in moderated online scholarly exchanges), rather than as merely "modern additions." The *pesantren*'s emerging use of hybrid learning patterns mirrors findings from research on hybrid learning in *pesantren* contexts, which highlights that digital pedagogy can be aligned with Islamic values when the institution regulates learning objectives, ethics, and teacher facilitation.[25] Where digital infrastructure and teacher readiness remain constraints, evidence from education management studies on blended learning underscores the importance of strengthening teachers' competence in managing blended learning materials, processes, and assessment so implementation does not remain superficial or uneven.[26] In practical terms, this supports a staged model for *pesantren*: start with value-based digital literacy and teacher capacity building, then expand into more complex hybrid and project-based designs as readiness increases.

Document analysis also indicates that some *pesantren* ecosystems pursue partnerships with higher education institutions and external sectors to broaden students' exposure through internships, community projects, and vocational experiences (e.g., halal industry placements). This partnership strategy can be strengthened by adopting value-based STEAM implementations, because recent *pesantren*-based research shows that STEAM can be implemented through project-based learning while explicitly linking activities to Qur'anic verses and hadith, increasing student engagement and active participation despite constraints in facilities and interdisciplinary teaching skills.[27] Taken together, the implementation model emerging from the Al-Yasini case can be framed as a structured pathway: (1) mapping the 4Cs into curriculum goals and *pesantren* learning traditions, (2) adopting project-based and hybrid learning in selected modules, (3) institutional governance for adab and digital ethics, (4) teacher training and infrastructure strengthening, and (5) partnership programs (higher

[23] Tafakur Tafakur et al., "Effectiveness of Project-Based Learning for Enhancing Students Critical Thinking Skills: A Meta-Analysis," *JINoP (Jurnal Inovasi Pembelajaran)* 9, no. 2 (2023): 191–209, https://doi.org/10.22219/jinop.v9i2.22142.

[24] Muhammad Minan Chusni, *Meta-Analysis of the Effect of Project-Based Learning on Enhancing 21st Century Skills | Edu Sains Jurnal Pendidikan Sains & Matematika*, May 26, 2024, https://e-journal.iain-palangkaraya.ac.id/index.php/edusains/article/view/5934.

[25] Sugito, "Hybrid Learning in *Pesantren*."

[26] Ita Naharani and Saefudin Saefudin, "Pengelolaan Pembelajaran Blended Learning Masa Covid 19," *Jawda: Journal of Islamic Education Management*, November 19, 2024, 165–83, https://doi.org/10.21580/jawda.v5i2.2024.23022.

[27] Pepilina et al., "Integration of the STEAM Approach Based on Islamic Values in *Pesantren* Education."

education/industry) that expand opportunities while keeping *pesantren* identity and moral formation as the primary anchor.

Supporting and Inhibiting Factors in Integrating 21st-Century Skills

The successful integration of 21st-century skills into *pesantren* curricula is shaped by interrelated internal and external factors, particularly teacher readiness, institutional culture, and the availability of digital infrastructure. Internally, the readiness of educators to adopt technology-supported pedagogy and student-centered strategies is a decisive driver, because 21st-century learning requires teachers who can design interactive learning, facilitate collaboration, and guide students' ethical engagement with digital tools. Evidence from *pesantren*-focused studies highlights that digital competence development among teachers and students depends heavily on institutional leadership support, continuous training, and clear learning policies; without these, technology integration tends to remain fragmented or symbolic rather than instructional.[28] Likewise, systematic reviews on technology integration in *pesantren* emphasize that learning effectiveness improves when innovation is accompanied by internal regulations, digital literacy training, and a "moderated" approach that aligns technology use with Islamic values and character formation.[29] In contrast, rigid curriculum structures and a strong reliance on exclusively traditional routines can become practical constraints when they limit opportunities for project work, collaborative problem solving, and the development of digital literacy in ways that are compatible with *pesantren* identity.[30]

Externally, policy support and access to infrastructure play a major role in determining whether *pesantren* can implement technology-supported learning consistently. Research on *pesantren* in the modern era identifies limited technological resources, uneven digital literacy, and concerns about technology's potential negative impact on character as recurring barriers; however, it also notes that partnerships with external institutions can help strengthen infrastructure and expand learning opportunities. This aligns with broader evidence in Indonesia that the digital divide—especially the gap between urban and rural connectivity—continues to limit equitable implementation of digital learning, affecting institutions that lack stable internet access and sufficient devices.[31] In practical terms, this means *pesantren* are more likely to succeed when government programs, private-sector partners, and community stakeholders contribute to connectivity, devices, and teacher capacity-building, while the *pesantren* maintains strong governance to prevent uncontrolled or value-inconsistent technology use.

From a learning-theory perspective, these supporting and inhibiting factors can be interpreted through a sociocultural-constructivist view: learning is strengthened when students interact within structured social environments that provide scaffolding and meaningful participation. In *pesantren* settings, this implies that discussion, collaborative problem-solving, and guided digital learning can become effective vehicles for 21st-century skills when teacher facilitation is strong and institutional rules protect discipline and adab. A complementary lens comes from connectivism, which views learning in the digital era as the ability to form and navigate networks of information and people; in this view, *pesantren* that

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[28] Kardina Engelina Siregar Kardina Engelina Siregar, "Islamic Boarding School Education in the Digital Era; Literature Review About Building a Relevant and Adaptive Curriculum," *Proceeding of International Conference on Islamic Boarding School* 1, no. 1 (2024): 46–62, https://doi.org/10.61159/icop.v1i1.240.

[29] Muhammad Najihul Huda et al., "*Pesantren* Technology-Friendly: Enhancing Learning Effectiveness in The Modern Era," *Nadwa: Jurnal Pendidikan Islam* 19, no. 1 (2025): 1–22, 2025, https://doi.org/10.21580/nw.2025.19.1.26173.

[30] Huda et al., "*Pesantren* Technology-Friendly."

[31] Astari and Dwi Yulianto, "A Bridging the Digital Divide in Education: Disparities in Google Classroom Utilization and Technical Challenges among Urban and Rural Teachers," *Journal of Education Technology* 9, no. 2 (2025): 258–70, https://doi.org/10.23887/jet.v9i2.92897.

can provide safe access to digital knowledge networks—and train students to evaluate, curate, and ethically share information—are better positioned to produce santri who are adaptive and resilient in contemporary knowledge environments.[32]

Overall, evidence suggests that *pesantren* with better access to technology resources, stronger leadership commitment, clearer internal regulations, and active external partnerships tend to adapt more quickly to 21st-century skill-oriented learning, while *pesantren* facing infrastructure shortages, limited teacher digital competence, and cultural resistance to pedagogical change face slower and more uneven implementation. Therefore, achieving effective integration requires coordinated action: strengthening teacher capacity, ensuring curriculum flexibility at the unit/module level, improving infrastructure, and building partnerships—while keeping Islamic values and character education as the governing foundation for how technology and innovation are used.

Evaluating the Impact of 21st-Century Skills Integration on Santri Competencies

Evaluating the impact of integrating 21st-century skills into *pesantren* curricula can be conducted by tracing changes in santri's thinking patterns and demonstrated competencies—especially critical thinking, creativity, collaboration, communication, and digital literacy—because these domains capture both cognitive and practical readiness for contemporary study and work.[33] Interview evidence from teachers and santri in modern *pesantren* contexts indicates that students who repeatedly participate in project-oriented learning tend to show stronger problem-solving behaviors than peers whose learning is dominated by memorization-only routines, because project tasks require defining problems, testing solutions, negotiating roles, and producing outputs. In your empirical narrative, this appears in santri's reported ability to identify challenges, propose solutions, and work in teams—patterns that are consistent with the broader finding that PjBL is positively associated with higher-order competencies, including 21st-century skill development.[34]

Beyond cognitive outcomes, observations in your text suggest that discussion-based learning (e.g., structured debates, collaborative project work) supports santri's social and emotional competencies, such as communication confidence, leadership emergence, and teamwork discipline. This aligns with the idea that social and emotional learning (SEL) strengthens learners' ability to build relationships, make responsible decisions, and handle challenges—capabilities that directly support collaboration and communication in 21st-century learning environments.[35] Therefore, your evaluation logic can treat socio-emotional growth as a valid "impact channel" of curriculum integration, not as a side effect, because competence formation in *pesantren* is traditionally inseparable from adab, self-regulation, and responsibility.[36]

Alumni survey insights in your section—showing better perceived readiness for work and higher education among those exposed to 21st-century competency-oriented experiences—are also coherent with labor-market evidence that skills requirements are shifting alongside technology adoption, with employers increasingly emphasizing analytical thinking, problem-solving, and human-interaction competencies. This orientation is widely documented in the World Economic Forum's report on the changing skill landscape and the

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[32] George Siemens, *Connectivism: A Learning Theory for the Digital Age*, n.d.

[33] Thornhill-Miller et al., "Creativity, Critical Thinking, Communication, and Collaboration."

[34] Chusni, *Meta-Analysis of the Effect of Project-Based Learning on Enhancing 21st Century Skills | Edu Sains Jurnal Pendidikan Sains & Matematika*.

[35] Jody McBrien, *Social and Emotional Learning (SEL) of Newcomer and Refugee Students: Beliefs, Practices and Implications for Policies across OECD Countries*, OECD Education Working Papers no. 266, vol. 266, OECD Education Working Papers (2022), https://doi.org/10.1787/a4a0f635-en.

[36] McBrien, *Social and Emotional Learning (SEL) of Newcomer and Refugee Students*, vol. 266.

acceleration of technology adoption, which implies that education providers need to strengthen both cognitive and human skills to reduce skills gaps.[37] Taken together, these findings support the argument that integrating 21st-century skills in *pesantren* is not merely an "innovation," but a strategic bridge between Islamic learning traditions and contemporary competence demands—provided that digital and project-based strategies remain governed by Islamic ethics and institutional discipline.[38]

Developing an "Ideal" *Pesantren* Curriculum Model for 21st-Century Skills

Based on your findings, an ideal model for a *pesantren* curriculum that integrates 21st-century skills should maintain deep Islamic scholarship and moral formation as the anchor while creating structured spaces for scientific, technological, and socio-economic competencies relevant to contemporary life. A feasible strategic direction is value-based STEAM integration, where project activities explicitly connect scientific inquiry and creative production with Qur'anic and hadith-based ethical meaning-making, so students experience modern knowledge as spiritually grounded rather than value-neutral. Evidence from *pesantren* research shows that STEAM grounded in Islamic values can be implemented through project-based learning (e.g., building a natural water filter, producing educational videos, creating Islamic geometry-based calligraphy), and this approach can increase students' engagement and active participation despite constraints such as limited facilities and interdisciplinary teacher skills.[39] This provides a concrete reference point for your argument that balancing Islamic learning with science/technology is workable when integration is designed as "value-led interdisciplinarity," not as a parallel curriculum.

At the level of curriculum architecture, the model should be implemented through interdisciplinary units that contextualize Islamic subjects within contemporary challenges—such as digital ethics, environmental stewardship, halal entrepreneurship, information integrity, and data literacy—so that santri develop broader reasoning and applied problem-solving without diluting the *pesantren*'s identity. To strengthen the "technology-based learning materials" aspect, evidence from Islamic education contexts also suggests that STEM-based digital learning resources embedded with religious values can be designed to support learning quality and practicality for educators and learners.[40] In other words, the "ideal model" you propose becomes more credible when it is paired with realistic instruments: modules, projects, and learning resources that translate integration into day-to-day teaching.[41]

Implementation, Assessment, and Policy Implications

To operationalize the ideal model, your text already points to three implementation levers that can be treated as a staged pathway: (1) blended/hybrid learning for flexible access to resources, (2) project-based learning for problem-solving and collaboration, and (3) structured digital literacy programs governed by Islamic ethics. Evidence from *pesantren*-focused hybrid learning research indicates that digital pedagogy can be integrated with Islamic values to strengthen 21st-century competencies when institutions regulate objectives, teacher facilitation, and ethical boundaries. For assessment, your recommendation to move beyond purely academic outputs toward formative and authentic evaluation (portfolios, collaborative projects, community engagement) is consistent with the idea that 21st-century

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[37] World Economic Forum, *The Future of Jobs Report 2020* (Geneva, 2020).

[38] Sugito, "Hybrid Learning in *Pesantren*."

[39] Pepilina et al., "Integration of the STEAM Approach Based on Islamic Values in *Pesantren* Education."

[40] Ruhban Masykur et al., *Development of Science E-Modules with the STEM (Science, Technology, Engineering, and Mathematics) Approach for Islamic Schools | Indonesian Journal of Science and Mathematics Education*, August 15, 2024, https://ejournal.radenintan.ac.id/index.php/IJSME/article/view/20835.

[41] Pepilina et al., "Integration of the STEAM Approach Based on Islamic Values in *Pesantren* Education"; Masykur et al., *Development of Science E-Modules with the STEM (Science, Technology, Engineering, and Mathematics) Approach for Islamic Schools | Indonesian Journal of Science and Mathematics Education.*

skills require explicit assessment attention—not only content mastery—because communication, collaboration, creativity, and critical thinking need performance-based evidence rather than recall-based tests. At the policy level, your call for adaptive regulation, teacher training, and digital infrastructure support can be strengthened by connecting it to the continuing digital divide challenge and unequal access to digital learning opportunities, which limits how consistently institutions can implement technology-supported learning at scale.[42]

Finally, your emphasis on stakeholder synergy (government–*pesantren*–industry–community) matches wider workforce evidence that rapid technology adoption is shifting skill demands and requires coordinated responses from education and employers, including partnerships that provide practical exposure and reduce skills gaps. In this framework, *pesantren* partnerships (internships in halal industries, community projects, collaborations with universities) should be positioned as "controlled external extensions" of *pesantren* education—expanded opportunity structures that remain *pesantren*-led and value-guarded so institutional identity and character formation remain the foundation.[43]

CONCLUSION

This study concludes that integrating 21st-century skills into *pesantren* curricula is feasible without undermining *pesantren* identity, as long as innovation is framed as value-based strengthening of adab, moral formation, and the classical scholarly tradition. The findings indicate shared awareness among *pesantren* leaders, teachers, students, and alumni that competencies such as critical thinking, communication, collaboration, creativity, and digital literacy are increasingly necessary for further study and employment. Practically, the most relevant pathway is to map these competencies into learning outcomes–content–methods–assessment, use technology in a guided way to enrich Islamic learning, and apply project-based learning that connects knowledge with real-life challenges (e.g., sharia entrepreneurship and leadership). Successful integration is shaped by internal factors (teacher readiness, leadership support, curriculum flexibility, academic culture) and external factors (digital infrastructure, supportive policy environment, and partnerships with universities/industry).

The main limitations of this study are its single-case focus—so the findings cannot represent the diversity of *pesantren* contexts—and its largely qualitative impact assessment, which does not yet measure competency growth quantitatively or over time. Future research should expand to multi-site comparative studies (e.g., salaf, modern, and integrated *pesantren*) and/or adopt mixed methods to test the effectiveness of integration models using more measurable indicators such as project rubrics, portfolios, and authentic assessments of the 4Cs and digital literacy. Further studies should also examine digital-ethics governance in *pesantren* (e.g., device rules, source curation, information literacy) and develop evidence-based teacher training models to ensure sustainable innovation without shifting the *pesantren*'s core mission.

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[42] Astari and Yulianto, "A Bridging the Digital Divide in Education."

[43] Oktio Frenki Biantoro and M. Akhsanudin, "The Concept of Islamic Education for Early Childhood as an Effort to Cultivate Morals," *Al-Munawwarah: Journal of Islamic Education* 1, no. 1 (2025): 57–66, https://doi.org/10.38073/almunawwarah.v1i1.2521.

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