



Implementation Quality of Character Education Based on A Digital Learning Ecosystem in Senior High Schools

Sri Puji Utami^{1*}, Nurtanio Agus Purwanto²

Universitas Negeri Yogyakarta

Corresponding Author: Sri Puji Utami: sri0053fip.2025@student.uny.ac.id

ARTICLE INFO

Keywords: Character Education, Digital Learning, Implementation Quality, Secondary School, SLR, Local Culture, Learning Ecosystem.

Received : 27 March

Revised : 20 April

Accepted: 25 May

©2026 Utami, Purwanto (s):
This is an open-access article distributed under the terms of the [Creative Commons Atribusi 4.0 Internasional](https://creativecommons.org/licenses/by/4.0/).



ABSTRACT

Digital transformation in secondary schools has reshaped learning patterns, interaction, and the internalization of student values. However, the implementation of character education in digital learning ecosystems is still often understood as the use of media or platforms, rather than as a quality system that integrates governance, pedagogy, culture, and evaluation. This study aims to analyze the implementation quality of character education based on a digital learning ecosystem in senior high schools and to formulate an empirical synthesis as a basis for developing a quality framework for digital character education. The search was conducted in the Scopus database using the criteria of publication year 2021–2026, journal article, English language, open access, valid DOI, and primary data. From 166 initial documents, 104 articles were obtained after bibliographic filtering, and a rigorous selection process resulted in 10 highly relevant articles. The findings indicate that implementation quality is determined not only by the presence of LMS, digital media, or technology-based curricula, but also by value management, content validity, teacher readiness, student acceptance, local culture, and continuous evaluation. Digital character education is considered more effective when religious values, Pancasila, gotong royong, cultural identity, and digital ethics are integrated into contextual learning designs. This review concludes that the digital learning ecosystem should be managed as a planned, measurable, and sustainable space for value internalization to strengthen the quality of character education in secondary schools.

INTRODUCTION

Digital transformation has reshaped the ways schools manage learning, interaction, and student value formation. In secondary education, digitalization should not be understood merely as the transfer of instructional materials to online platforms, but as a transformation of the learning ecosystem that influences digital citizenship, ethics, participation, and social responsibility. The digital citizenship framework emphasizes that students' competencies need to include safe, critical, ethical, and responsible technology use (Chen et al., 2021). Other findings indicate that blended learning based on local wisdom can support character strengthening through more contextual learning experiences (Astawan et al., 2025). Digital literacy has also been reported as a transformative framework for the internalization of moral values in basic Islamic education (Putra et al., 2026). Therefore, digital character education should be positioned as a school quality agenda that connects technology, values, and learning experiences in an integrated manner.

Recent studies show that character education in the digital era has developed along three major trajectories, namely the integration of cultural values, the strengthening of digital literacy, and the development of learning media based on local contexts. Islamic character education based on local wisdom is considered relevant for responding to the character crisis marked by violence, bullying, and weakening social interaction among children (Subandi et al., 2025). The integration of local cultural values has also been shown to be important because values that are close to students' lives can strengthen character formation from an early age (Sakti et al., 2024). At the same time, the sustainability of local values in school life requires consistent institutional practice, not merely symbolic insertion into learning materials (Hanapi et al., 2025). A similar need is evident in the development of learning modules based on Ki Hadjar Dewantara's values to respond to students' social problems (Setyaningsih et al., 2024). Thus, the research map indicates that digital character should be built through alignment among school culture, local values, and learning design.

Although research on digital learning and character continues to grow, a knowledge gap remains in the integration of implementation quality, secondary school contexts, and digital learning ecosystems. Some studies have emphasized supporting factors for mobile learning through students' initial characteristics, learning styles, and the need for authentic activities (Hidayati et al., 2022). Other studies have developed character-based learning models integrated with digital life skill technology to improve critical thinking, technology mastery, and student character (Apdoludin et al., 2025). The use of mobile games based on Pancasila values shows that digital numeracy activities can contain social practices and national values (Novianto et al., 2026). Ethnoscience animation video-assisted PjBL has also been reported to be effective in improving problem-solving skills and Pancasila student profiles (Juanta et al., 2025), while the Upanishad model based on blended learning has been shown to affect character development and creativity (Suwendra et al., 2023). The main gap lies in the limited synthesis

explaining how these findings can be interpreted as a foundation for the implementation quality of digital character education.

Based on this gap, this study was directed to systematically examine how the implementation quality of character education based on a digital learning ecosystem is constructed, enacted, and evaluated in secondary school contexts. The research questions address how character, technology, school culture, and pedagogical design are integrated in empirical studies on digital learning, what factors support and hinder implementation quality, and what contribution can be formulated for the development of digital character education models in senior high schools and madrasahs. The urgency of these questions is strengthened by research on AI literacy in secondary education, which emphasizes the importance of critical questioning when students interact with generative technology (Tang et al., 2026). Digital history literacy has also been shown to require ethical reasoning so that students' critical thinking can develop meaningfully (Nurhasanah et al., 2025). Haug and Mork (2021) affirm that 21st-century skills require professional development support that is concretely enacted in classrooms. Accordingly, this study contributes to the formulation of a conceptual and empirical foundation for research development on the implementation quality of digital character education.

METHOD

This study was designed as a systematic literature review, and the screening procedure was structured according to PRISMA principles. The initial search was conducted in the Scopus database using the search string "character education" AND QUALITY AND implementation AND "digital learning" AND school, which generated 166 documents. The first screening was conducted by applying the publication year limit of 2021–2026, leaving 163 documents. After the document type filter "article" was applied, 127 articles remained. The English-language filter yielded 125 articles, and the All Open Access filter produced 104 articles. Subsequently, the 104 articles were examined through metadata, titles, abstracts, DOI status, research subjects, research design, and thematic relevance to the implementation quality of character education based on a digital learning ecosystem in senior high schools.

The inclusion criteria covered English-language journal articles published from 2021 to 2026, active DOI availability, open-access status, primary data, and empirical designs, including quantitative, qualitative, mixed-methods, experimental, R&D, SEM, and case study designs. The articles were also required to address at least two of four main focuses, namely character or value education, digital learning ecosystems, implementation quality, and secondary school, senior high school, or Islamic senior high school contexts. The exclusion criteria covered purely conceptual articles, bibliometric studies, systematic reviews, articles without primary data, studies focused on higher education without school-level relevance, articles discussing technology without character or value dimensions, duplicate articles, and articles indicated as retracted.

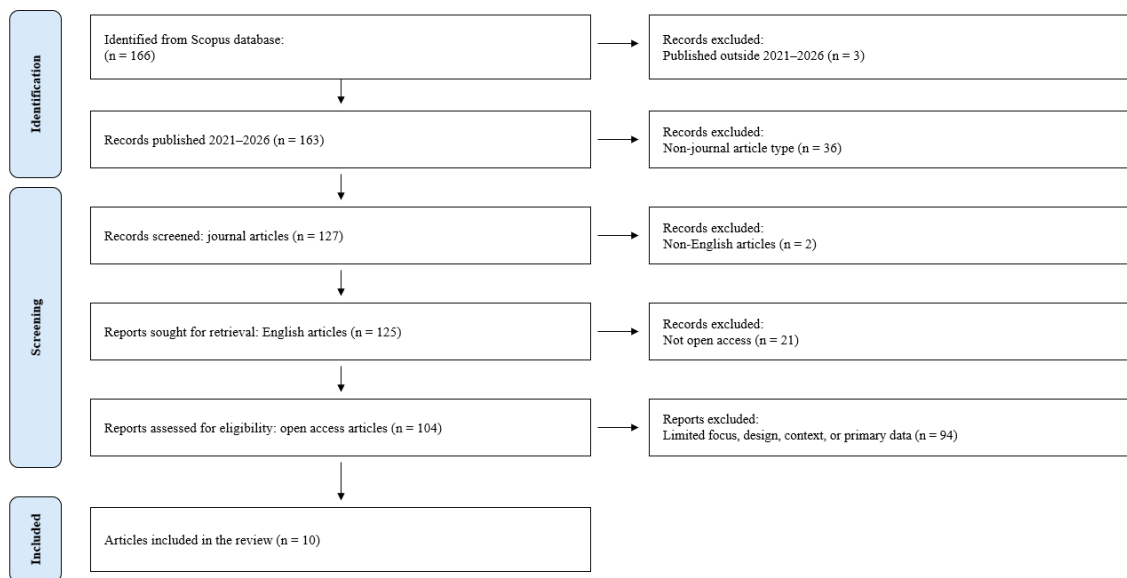
At the initial identification stage, the Scopus search generated 166 articles. After the 2021–2026 filter was applied, 163 articles remained. After the journal article filter was applied, 127 articles remained. After the English-language filter

was applied, 125 articles remained. After the All Open Access filter was applied, 104 articles remained. After title and abstract screening, 94 articles were excluded because they did not meet the criteria for focus, design, context, or primary data. The final eligibility assessment established 10 articles as included studies. Therefore, the final synthesis was limited to 10 empirical articles that met the inclusion criteria, had valid DOIs, and showed no retracted status.

PRISMA Flowchart

The following section presents the article selection flow according to PRISMA guidelines, from identification in the Scopus database to the final inclusion of articles that met the eligibility criteria for further analysis. This flow describes the number of records at each stage and the reasons for systematic exclusion, as shown in Figure 1.

Figure 1. PRISMA Flowchart



RESULTS

The final screening yielded 10 articles that were most relevant to the focus on the implementation quality of character education based on a digital learning ecosystem. The included articles were dominated by studies in senior high school, Islamic senior high school, secondary school, and culture- and religion-based learning contexts. The research designs included qualitative case studies, explanatory quantitative designs, ADDIE-based R&D, 4D-based R&D, mixed-methods, SEM, and validation studies of learning tools. The synthesis shows that the implementation quality of digital character education is shaped by the relationship among value governance, media quality, teacher readiness, content validity, student acceptance, cultural identity, and institutional evaluation.

Table 1. Article Review Results

No	Author(s)	Finding
1	Anwar et al. (2026)	P5-PPRA strengthens character when Pancasila and Rahmatan lil' alamin values are managed through leadership, curriculum, teacher facilitation, and institutional evaluation.

No	Author(s)	Finding
2	Rohid et al. (2026)	LMS management has a positive effect on learning outcomes and Islamic character, although value integration in digital content remains insufficiently systematic.
3	Zuhri et al. (2026)	Madrasahs build character through religious foundations, social ethics, local wisdom, character-based digital literacy, and school-family-community synergy.
4	Murtadlo et al. (2024)	Gen-Z students still perceive gotong royong as important, but schools need to optimize online character learning so that collective values are not weakened.
5	Ansoriyah et al. (2026)	Digital folktale media are valid, reliable, and effective in improving writing skills while strengthening cultural identity and educational sustainability.
6	Fahrudin et al. (2025)	Digital history media increase cultural awareness. Learning engagement is strongly correlated with cultural understanding and the preservation of local values.
7	Fikri et al. (2026)	Media quality and content validity increase user acceptance. User acceptance becomes the strongest predictor of local history learning effectiveness.
8	Birsyada et al. (2025)	Digital history curriculum is proven to be valid, practical, adaptive, and effective in increasing students' participation, historical understanding, and contextual analysis.
9	Nisa et al. (2025)	CRT-TPACK-based learning tools are valid and effective because they combine cultural relevance, digital pedagogy, and improved learning outcomes.
10	Usman and Ibrahim (2023)	Acehnese Islamic culture-based EFL materials are considered valid and practical for supporting cultural identity and deradicalization character among senior high school students.

DISCUSSION

The main findings indicate that the implementation quality of digital character education is determined not only by the availability of platforms, but also by institutional governance that consistently connects planning, implementation, monitoring, and value evaluation. In Islamic senior high schools, LMS management has been shown to be positively associated with learning outcomes and Islamic character formation, although its influence on character is lower than its influence on cognitive achievement (Rohid et al., 2026). A similar pattern is evident in the implementation of P5-PPRA, which becomes more effective when Pancasila and Rahmatan lil'alam values are integrated into school strategic management (Anwar et al., 2026). Cross-level madrasah studies also affirm that digitalization should be directed as an ethical ecosystem rather than merely as an instructional tool (Zuhri et al., 2026). Therefore, character outcomes should be positioned as institutional outputs that are

consciously, measurably, and sustainably managed. Accordingly, the implementation quality of digital character education depends on school capacity to transform technology into a planned, monitored, and functional value system.

Local culture emerges as an important anchor so that digital character education is not detached from students' social realities. The preservation of *gotong royong* among Gen-Z shows that collective values are still regarded as important, but they may weaken when digital media use is not directed through meaningful online character learning activities (Murtadlo et al., 2024). AR/VR-based history media, simulations, and narrative quizzes indicate that learning engagement can increase cultural awareness among senior high school students (Fahrudin et al., 2025). Digital folktale media also demonstrate that digital platforms can mediate literacy, cultural identity, and educational sustainability (Ansoriyah et al., 2026). Therefore, the central debate does not concern whether technology threatens values, but how schools design technology as a space for cultural internalization that remains relevant to adolescents. Digital character education becomes stronger when students' digital experiences are connected to identity, solidarity, and social responsibility.

From the perspective of learning design, implementation quality increases when digital media are pedagogically validated, accepted by users, and adjusted to school readiness. The SEM model in local history learning shows that media quality and content validity influence user acceptance, while user acceptance becomes the strongest predictor of learning effectiveness (Fikri et al., 2026). The ADDIE-based digital history curriculum is also considered feasible because expert validation, teacher validation, and classroom trials show consistent effectiveness across schools with different levels of technological readiness (Birsyada et al., 2025). The integration of CRT and TPACK extends these findings by emphasizing that digital materials should be culturally relevant and technologically pedagogically sound (Nisa et al., 2025). The synthesis of the 10 included articles shows that this review is important because it provides an empirical basis for formulating a research framework on the implementation quality of character education in digital learning ecosystems. Implementation quality should not be measured only by media innovation, but by design coherence, content validity, teacher readiness, and student acceptance.

Although most articles report positive findings, the available evidence also reveals implementation weaknesses that require critical interpretation. LMS has not fully contained Islamic value content in a systematic manner, which means that character formation may still occur incidentally (Rohid et al., 2026). P5-PPRA in Islamic senior high schools still faces limited human resources, infrastructure constraints, resistance to change, weak collaboration, and underdeveloped evaluation (Anwar et al., 2026). At the broader *madrasah* level, character challenges in the Society 5.0 era are technological, social, cultural, and institutional, so they cannot be solved merely through device training (Zuhri et al., 2026). Acehese knowledge-based EFL materials show potential for strengthening deradicalization character, but product quality remains dependent on curriculum validity and practicality (Usman & Ibrahim, 2023). Therefore,

implementation quality requires repeated evaluation so that digital innovation does not stop as a product, but develops into school culture.

The overall synthesis points to an ecosystem model that integrates value management, digital pedagogy, local culture, and quality evaluation. CRT-TPACK-based learning demonstrates the importance of alignment among student identity, teacher strategy, and digital tools (Nisa et al., 2025). The digitalization of gotong royong and folktale media shows that character is not built merely through normative lectures, but through learning experiences that enable reflection, collaboration, and emotional engagement, as shown by Murtadlo et al. (2024) and Ansoriyah et al. (2026). At the same time, digital history media and adaptive curricula indicate the need for infrastructure, content validation, and user acceptance so that values can become embedded in classroom practice, as shown by Fahrudin et al. (2025), Fikri et al. (2026), and Birsyada et al. (2025). This orientation places schools as managers of the relationship among technology, values, and learning experiences. Therefore, digital character education in senior high schools and madrasahs reaches its highest quality when schools manage technology as a valuable, contextual, and evaluable learning ecology.

CONCLUSION

This review concludes that the implementation quality of character education based on a digital learning ecosystem in secondary schools cannot be reduced to the use of LMS, interactive media, or learning applications. Quality is more appropriately understood as the integration of school governance, pedagogical design, value integration, content validation, teacher readiness, student acceptance, and continuous evaluation. Within this framework, technology functions effectively when it is positioned as a space for value internalization, not merely as a channel for distributing materials.

The 10 included articles reveal three main patterns. First, digital character education requires strategic management so that Pancasila values, religiosity, digital ethics, gotong royong, and cultural identity are embedded in school planning and evaluation. Second, quality digital learning should be contextual, culturally responsive, and aligned with students' needs. Third, successful implementation is strongly determined by media validity, user acceptance, infrastructure readiness, and teacher capacity. Accordingly, the strongest implementation model is a digital ecosystem that integrates values, local culture, pedagogy, technology, and the school quality system.

REFERENCES

- Ansoriyah, S., Sarifah, I., Oktaviani, R., & Muawanah, U. (2026). Contextual learning for sustainable education using digital folktale materials. *Discover Sustainability*, 7(1), 659. <https://doi.org/10.1007/s43621-026-02956-w>
- Anwar, H., Luneto, B., Pratiwi, W., Irawan, I., & Musthofa, M. (2026). Strategic management of Pancasila and Rahmatan Lil' alamin values in state Islamic senior high schools. *Jurnal Ilmiah Peuradeun*, 14(1), 275-298. <https://doi.org/10.26811/peuradeun.v14i1.2381>

- Apdoludin, Eriyani, E., Ridhoh, A., & Isma Putri, D. (2025). Development of a character-based debate, analysis and findings learning model integrated with digital life skill technology in elementary schools in Indonesia. *Qubahan Academic Journal*, 5(4), 723–742. <https://doi.org/10.48161/qaj.v5n4a2042>
- Astawan, I. G., Utama, I. D. G. B., Paramartha, W. E., Abdurahman, A., & Maidin, S. S. (2025). Blended learning for character education: Integrating Tri Hita Karana wisdom to develop graduate competencies aligned with SDGs. *Journal of Educational Technology and Learning Creativity*, 3(2), 407–422. <https://doi.org/10.37251/jetlc.v3i2.2498>
- Birsyada, M. I., Wibowo, B. A., Kusumaningrum, R. N., & Fahrudin. (2025). Curriculum innovation in history education: Reflective integration of technology and historical reasoning in a contextually adaptive model for Indonesian senior high schools. *International Journal of Learning, Teaching and Educational Research*, 24(8), 813–841. <https://doi.org/10.26803/ijlter.24.8.36>
- Chen, L. L., Mirpuri, S., Rao, N., & Law, N. (2021). Conceptualization and measurement of digital citizenship across disciplines. *Educational Research Review*, 33, 100379. <https://doi.org/10.1016/j.edurev.2021.100379>
- Fahrudin, Salamah, Nurgiansah, T. H., Rosidi, M. I., Fitroh, I., Zulkarnain, Darsono, Judijanto, L., & Saefudin, A. (2025). Integrating educational technology in history learning: Advancing cultural awareness and preservation in Indonesia. *International Journal of Information and Education Technology*, 15(9), 1952–1966. <https://doi.org/10.18178/ijiet.2025.15.9.2395>
- Fikri, A., Isjoni, Warsani, H., & Ramona, N. (2026). Digital learning media effectiveness in Indonesian local history education: A structural equation modeling approach. *Journal of Education and Training Studies*, 14(2), 84–93. <https://doi.org/10.11114/jets.v14i2.8190>
- Hanapi, Pageh, I. M., Mudana, I. W., & Margi, I. K. (2025). Sustaining the integration of local wisdom into school life: A case study and bibliometric approach. *International Journal of Sustainable Development and Planning*, 20(11), 4903–4917. <https://doi.org/10.18280/ijstdp.201129>
- Haug, B. S., & Mork, S. M. (2021). Taking 21st century skills from vision to classroom: What teachers highlight as supportive professional development in the light of new demands from educational reforms. *Teaching and Teacher Education*, 100, 103286. <https://doi.org/10.1016/j.tate.2021.103286>
- Hidayati, A., Bentri, A., & Eldarni. (2022). Supporting factors for the implementation of mobile learning for elementary school students using an authentic approach and real-world activities. *International Journal of Interactive Mobile Technologies*, 16(5), 107–120. <https://doi.org/10.3991/ijim.v16i05.26551>
- Juanta, P., Festiyed, Diliarosta, S., Lufri, Yohandri, & Moyo, K. (2025). Enhancing entrepreneurial skills and Pancasila student profiles through digital learning tools in science education. *Aptisi Transactions on Technopreneurship*, 7(2), 605–615. <https://doi.org/10.34306/att.v7i2.518>

- Murtadlo, M., Albana, H., Helmy, M. I., Libriyanti, Y., Izazy, N. Q., & Saloom, G. (2024). Preserving the gotong royong character for Indonesian Gen-Z in the digital era. *International Journal of Evaluation and Research in Education*, 13(3), 1631–1640. <https://doi.org/10.11591/ijere.v13i3.27175>
- Nisa, K., Syafitri, E., & Simanungkalit, A. (2025). Integrating culturally responsive teaching and TPACK frameworks in the design and validation of Indonesian language learning tools for multicultural schools. *International Journal of Learning, Teaching and Educational Research*, 24(12), 268–294. <https://doi.org/10.26803/ijlter.24.12.12>
- Novianto, A., Firmansyah, Setiana, D. S., & Prasetyo, I. (2026). Exploring elementary school children's numeracy activities integrated with Pancasila values in mobile games. *International Journal of Learning, Teaching and Educational Research*, 25(1), 694–719. <https://doi.org/10.26803/ijlter.25.1.31>
- Nurhasanah, A., Nadiroh, & Maksum, A. (2025). Bridging cognition and ethics: Socio-emotional skills and digital history literacy in fostering critical thinking. *Social Sciences & Humanities Open*, 12, 101786. <https://doi.org/10.1016/j.ssaho.2025.101786>
- Putra, P., Ilias, M. F., Hartono, R., Burhanuddin, Saputra, N., & Barsihanor. (2026). Digital literacy as a transformative framework for character education: A case study in Madrasah Ibtidaiyah. *Nazhruna: Jurnal Pendidikan Islam*, 9(1), 33–51. <https://doi.org/10.31538/nzh.v9i1.429>
- Rohid, N., Masitoh, S., Arianto, F., Badiah, L. I., & Rohid, N. (2026). The influence of learning management system management on Islamic character development in madrasahs. *Munaddhomah: Jurnal Manajemen Pendidikan Islam*, 7(1), 77–91. <https://doi.org/10.31538/munaddhomah.v7i1.2372>
- Sakti, S. A., Endraswara, S., & Rohman, A. (2024). Integrating local cultural values into early childhood education to promote character building. *International Journal of Learning, Teaching and Educational Research*, 23(7), 84–101. <https://doi.org/10.26803/ijlter.23.7.5>
- Setyaningsih, Hidayatullah, F., Asrowi, & Rahman, A. (2024). Integrating Ki Hadjar Dewantara's values in learning modules in elementary schools: Analysis of teacher and student needs. *Journal of Education and E-Learning Research*, 8(6), 814–826. <https://doi.org/10.55214/25768484.v8i6.2105>
- Subandi, G., Eriyanti, R. W., Karmiyati, D., Nurfaishal, N., & Widodo, J. (2025). A response to the character crisis: Can a digital Islamic character education based on local wisdom be the solution? *Perspectives in Education*, 43(3), 255–268. <https://doi.org/10.38140/pie.v43i3.8097>
- Suwendra, I. W., Suarnaya, I. P., Widiani, I. W., & Asli, N. L. (2023). The integration of the self-concept-based Upanishad learning model in blended learning and its impact on character development and creative thinking skills. *Journal of Education and E-Learning Research*, 10(1), 1–9. <https://doi.org/10.20448/jeelr.v10i1.4342>
- Tang, K.-S., Cooper, G., Rappa, N., & Edwards, J. (2026). Critical questioning with generative AI: Developing AI literacy in secondary education. *Thinking Skills and Creativity*, 59, 102043. <https://doi.org/10.1016/j.tsc>

- Usman, J., & Ibrahim, L. (2023). Augmenting the quality of Acehese knowledge-based EFL material through a 4D model. *Studies in English Language and Education*, 10(3), 1342–1357. <https://doi.org/10.24815/siele.v10i3.29782>
- Zuhri, A., Alnashr, M. S., Nihayah, H., Ihsan, Ulumuddin, I. K., Darnoto, & Munjiat, S. M. (2026). How madrasahs build students' character in Indonesia's Society 5.0 era: Emerging challenges. *Nazhruna: Jurnal Pendidikan Islam*, 9(1), 166–186. <https://doi.org/10.31538/nzh.v9i1.412>