

Transformation of Learning in The 4.0 Era through Educational Technology and Its Implications for Ethical Humanistic Religious Values

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Abstract

This study analyzes the transformation of learning in the Industry 4.0 era through digital technology and its implications for ethical, humanistic, and religious values. Using a qualitative conceptual approach and literature review, data were collected from books, journals, and scientific articles on digital learning, educational ethics, and moral-spiritual development. Analysis was conducted descriptively and critically to explore the relationship between digital practices and student character formation. Results indicate a shift from teacher-centered to learner-centered learning, with digital technology supporting active engagement, collaboration, and critical thinking. Integrating ethical, humanistic, and religious values helps students understand the moral and social consequences of their actions, enhancing integrity, empathy, social responsibility, and spiritual awareness. The study highlights the importance of balanced digital learning strategies that strengthen both technical competencies and character development, providing guidance for educators and policymakers to design adaptive, inclusive, and character-building learning in the digital era.

Keywords: Learning transformation, Era 4.0, Digital learning, Educational ethics, Humanistic, Religious

Introduction Section

Development of information and communication technology in era of Industrial Revolution 4.0 has brought significant changes across various aspects of life, including education. Digital technology is no longer limited to learning media or instructional tools but has reshaped perspectives on teaching and learning processes, including shifting roles of teachers and students. Learning has gradually moved from conventional patterns toward models that are more flexible, open, and adaptive to contemporary demands (Risnawati et al., 2025). Consequently, learning transformation in Industrial Revolution 4.0 era has become an inevitable necessity, driven by rapid technological advancement that fosters innovation in learning methods, media, and interactions, as well as changes in teaching practices. More broadly, this transformation reflects a shift in educational paradigm in response to demands of Industrial Revolution 4.0, requiring systemic changes such as strengthening competencies, curriculum development, and integration of technology into learning processes (Lase, 2019). Educators and students must actively adapt to changes in learning paradigms, both in terms of technological mastery and pedagogical interaction patterns within digital learning environments.

Transformation of learning in era of Industrial Revolution 4.0 is characterized by increasing integration of digital technology into teaching and learning processes. Digital technology enables more personalized, flexible, and collaborative learning experiences while redefining role of educators as facilitators who provide meaningful learning environments (Lestari et al., 2025). This encourages students to become more active, independent, and participatory in constructing knowledge through various digital sources (Susilo et al., 2024). However, learning transformation that prioritizes efficiency and technological innovation may weaken pedagogical relationships if not accompanied by reinforcement of value-based dimensions in educational practice (Reski et al., 2024). Integration of digital technology in learning should therefore be implemented through strategies that balance technological innovation with reinforcement of ethical, humanistic, and religious values (Rosidin et al., 2024). This approach ensures learning remains meaningful and supports students in developing critical, creative, and collaborative thinking skills required to meet demands of 21st-century competencies (Trilling & Fadel, 2009).

Education does not focus solely on knowledge mastery and skill development but also plays a crucial role in shaping values and character, which are reflected in attitudes, behaviors, and interactions with surroundings. Through a humanistic approach, students are positioned as whole subjects of learning, encompassing intellectual, emotional, social, and moral dimensions (Rosidin et al., 2024). Ethical and religious values serve as foundations for moral awareness, social responsibility, and integrity based on societal religious principles. Thus, the use of educational technology must not only improve learning effectiveness and efficiency but also strengthen internalization of ethical, humanistic, and religious values, supporting students' attitudes and character amid digital transformation.

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Studies on digital ethics emphasize importance of educator professionalism and efforts to maintain spiritual values amid technology-based learning innovations (Alfiyansyah et al., 2025). Use of digital media poses ethical challenges affecting students' behavior and character formation (Az-zahra et al., 2025). Challenges include misuse of digital media, weak self-control in digital environments, and reduced sensitivity to moral values during technology-based interactions, highlighting importance of humanistic values in maintaining human-centered learning (Reski et al., 2024; Rosidin et al., 2024). Religious humanistic values provide a moral foundation for shaping students' ethical attitudes and social responsibility amid digitalization (Salmadatu, 2024). These values should be consistently internalized through ethical, reflective, and character-building digital learning practices, ensuring technology functions not only as a tool for knowledge transfer but also as a medium for holistic student development.

Most previous studies show a tendency toward fragmented discussions, where ethical, humanistic, and religious aspects are examined separately. Studies on ethics generally focus on use of educational technology and educators' responsibilities in digital learning practices (Alfiyansyah et al., 2025; Az-zahra et al., 2025). Research on humanistic aspects highlights importance of maintaining human dimension in digital learning to support character education (Reski et al., 2024; Rosidin et al., 2024). Studies on religious aspects emphasize spiritual values as moral foundation for shaping attitudes and social responsibility (Salmadatu, 2024). However, these studies have not yet integrated three value dimensions comprehensively within framework of digital learning transformation in Industrial Revolution 4.0 era. Technology-based learning transformation affects not only technical and methodological aspects but also significantly shapes students' values, character, and behavior in modern learning context.

Based on this background, this study aims to analyze implications of learning transformation in Industrial Revolution 4.0 era through use of educational technology, with a focus on strengthening ethical, humanistic, and religious values. Specifically, this study addresses gaps in literature that tend to examine these three value dimensions separately, offering a comprehensive perspective on how digital learning transformation fosters technological innovation while supporting students' character, ethical and moral attitudes, social responsibility, and religious awareness. Findings are expected to contribute conceptually to development of meaningful, character-oriented digital learning models grounded in humanistic and religious values.

Research Method

This study adopts a qualitative paradigm aimed at gaining an in-depth understanding of learning transformation in the era of the Industrial Revolution 4.0 and its implications for ethical, humanistic, and religious values. The research employs a library research design, with data derived from relevant scholarly sources, including books, academic articles, and scientific journals. A philosophical and reflective approach is used to emphasize the exploration of values, meanings, and underlying concepts of learning transformation, while critically interpreting the literature to construct an analytical framework.

Data were collected through documentation techniques by reviewing and recording information from sources relevant to the research focus. Data analysis was conducted using thematic content analysis, beginning with the identification of key categories, followed by the classification of themes related to digital learning transformation and the examination of ethical, humanistic, and religious implications emerging from the literature. The findings were then synthesized into an analytical description highlighting the balance between technological innovation and the strengthening of ethical, humanistic, and religious values in education.

Result and Discussion

Transformation of Learning in the Era of the Industrial Revolution 4.0

Learning transformation in the era of the Industrial Revolution 4.0 is a response to the rapid development of digital technology that has comprehensively influenced educational systems and practices. This transformation is not merely reflected in the integration of technological tools into teaching and learning activities but also represents a shift in educational paradigms toward more flexible and participatory learning processes oriented toward the development of 21st-century competencies. A transition from teacher-centered to learner-centered learning positions students as active participants who not only receive information but also construct knowledge through interaction, collaboration, and critical reflection (Pratidhina, 2020). This paradigm shift encourages the adoption of teaching methods and learning patterns that are more adaptive to learners' needs. New learning concepts within school digitalization emphasize learner-centered approaches, multimedia use, and the strengthening of critical and collaborative thinking skills as key 21st-century competencies (Kementerian Pendidikan dan Kebudayaan, 2019). Furthermore, flipped classroom and blended learning models provide opportunities for students to manage learning more independently while maintaining pedagogical interaction through classroom discussions and practices. In addition, e-learning implementation not only facilitates access to learning materials but also promotes independent and reflective learning, thereby contributing to overall learning

effectiveness (Ratnawati & Werdiningsih, 2020). This transformation indicates that changes in learning methods are closely linked to shifts in how students understand, interpret, and internalize knowledge.

Technology functions as a facilitator of learning rather than an end in itself. Digital platforms such as the Rumah Belajar Portal provide a wide range of learning resources and services that enable personalized learning based on students' abilities and needs (Kementerian Pendidikan dan Kebudayaan, 2019). In addition, technology expands opportunities for collaboration and communication, both between teachers and students and among learners, allowing learning to transcend spatial and temporal limitations. However, the effectiveness of technology integration is largely determined by teachers' pedagogical capacity to design meaningful learning experiences. Optimal outcomes are achieved when technology integration is accompanied by enhanced teacher competencies and the ability to utilize learning data to adjust instructional strategies according to individual learning needs (Nurbaity et al., 2023). Learning development in the digital era has also substantially reshaped teaching–learning dynamics, with teachers increasingly assuming facilitative roles that guide, motivate, and support students' learning rather than merely transmitting knowledge. Flexibility enabled by blended learning and e-learning allows students to revisit learning materials as needed and collaborate in digital spaces, thereby strengthening active engagement and learning responsibility (Sabaruddin, 2022). Empirical studies indicate that technology integration grounded in sound pedagogical approaches can improve participation, learning motivation, and interaction quality within learning processes (Ratnawati & Werdiningsih, 2020). Consequently, learning transformation influences not only process efficiency but also the quality of educational relationships between teachers and students.

Learning development in the era of the Industrial Revolution 4.0 shapes patterns that encourage greater student independence and reflectivity. Access to digital learning resources reduces reliance on teachers as the sole source of knowledge while fostering lifelong learning skills, in line with principles of self-directed learning in Education 4.0 (Pratidhina, 2020). Learning is no longer viewed merely as an information transfer process but as knowledge construction involving critical thinking, problem-solving, and social collaboration as core 21st-century skills that can be developed through differentiated learning strategies (Yuliana & Irawan, 2024). Technology plays an increasingly strategic role in enriching learning experiences when intentionally integrated within a clear pedagogical framework, enabling it to function not only as a tool but also as a medium for promoting students' creativity, independence, and collaboration (Pratidhina, 2020; Setiawan et al., 2023).

Implementation of technology-based learning in the era of the Industrial Revolution 4.0 presents several challenges that need to be critically addressed, including gaps in technological infrastructure, disparities in teachers' digital competencies, and variations in students' readiness. When learning transformation is understood merely as digitalization without a strong pedagogical foundation, it risks becoming technocratic and losing its educational meaning. Therefore, the success of learning transformation requires a balanced integration of technology, adaptive pedagogical approaches, relevant curriculum planning, and a supportive school culture (Nurbaity et al., 2023). In this context, learning transformation also encourages students to develop adaptive abilities, digital literacy, creativity, and collaboration in using technology responsibly. Improved access to learning resources and collaborative opportunities enables students to manage their own learning processes, construct deeper understanding, and develop competencies relevant to 21st-century demands (Pratidhina, 2020; Sabaruddin, 2022). This condition highlights the importance of integrating technology with well-planned pedagogical strategies to ensure that learning remains meaningful and sustainable.

Digital literacy development has become an essential element in ensuring that learners are able to use technology critically and independently. The ability to access, evaluate, and process digital information effectively supports critical and reflective thinking skills, thereby maintaining the relevance of learning to the demands of the 21st century (Furbani et al., 2025). Digital literacy also encourages learners to engage in reflective and responsible learning through the ethical use of online learning resources while preparing them to face global challenges. Moreover, learning transformation in the digital era increasingly leverages data and learning analytics to enhance teaching effectiveness. Through data analysis, teachers are able to monitor students' progress in real time, adjust instructional strategies, and provide appropriate interventions based on individual learning needs, thereby supporting the achievement of 21st-century competencies (Kharis & Zili, 2022). This data-driven approach helps teachers understand students' learning patterns, evaluate instructional methods, and adapt strategies to be more responsive and personalized without rendering the learning process rigid.

Ethical Implications in Digital Learning

Development of digital technology has brought significant changes to learning methods in schools, but these changes also present serious ethical challenges that need to be addressed. Transformation of digital learning provides opportunities for broader access to information, more dynamic interactions, and a variety of learning methods. On the other hand, it opens up the possibility of unethical behavior if not accompanied by strong moral guidance (Nisa et al., 2025). One of the real challenges in digital ethics is how learners adjust their behavior to norms and moral values when interacting in digital world.

Changes in digital learning can create ethical dilemmas for students, especially when they must distinguish between responsible use of technology and behaviors that can harm themselves or others (Nisa et al., 2025). This phenomenon reflects how digital transformation can influence students' moral perceptions if digital ethics education has not been fully implemented. Additionally, the issue of students' personal data security is equally important in digital learning. Many

students still pay insufficient attention to protection of personal data when using digital platforms, and unwise use of internet can lead to privacy breaches and misuse of personal information. This indicates that digital transformation is not only about tools, but also about understanding students' social responsibility in maintaining digital privacy (Febriani et al., 2025). Interactions among students in cyberspace also create opportunities for rude or negative behavior, such as cyberbullying or spreading harsh comments. Digital literacy education that instills values of empathy and mutual respect can minimize harmful or negative behavior online. Strengthening digital citizenship helps students reduce risk of such behavior and enhances their sense of respect and social responsibility when interacting online (Rizki & Iskandar, 2025).

Teacher professionalism is a key factor in facing challenges of digital ethics. Educators are not only required to master technology but must also serve as moral exemplars for students, including in maintaining integrity, accountability, and responsibility when using learning technologies (Penara et al., 2025). Teachers who model ethical behavior and facilitate discussions and reflections on digital ethics help students understand moral consequences of their actions in the digital realm. Support in the form of digital literacy training for teachers is also necessary so they become more competent in guiding students to face various ethical challenges arising from technology use (Febriani et al., 2025). Schools need to implement systematic strategies to strengthen ethical values among students. Integrating value-based curricula, such as digital literacy and digital citizenship, into formal subjects helps students understand ethical behavior in a tangible way during everyday learning activities (Wahyuni et al., 2025). Cultivating digital ethics through case simulations, group discussions, and regular reflection on online behavior can shape students' habits in using technology responsibly (Agustina et al., 2023). Schools also need to develop internal regulations, such as guidelines for technology use and sanctions for ethical violations, to provide clear boundaries regarding acceptable behavior both in school and online.

Impact of digital learning transformation on students' norms and morals is evident in social behavior aspects. Students equipped with digital literacy and ethics show increased moral awareness, the ability to analyze risks of online interactions, and the capacity to consider social consequences of their actions. Students involved in digital behavior education tend to act more responsibly, respect others' rights, and reject negative actions such as cyberbullying (Wahyuni et al., 2025). Enhanced understanding of digital literacy and ethics in social media helps students exhibit responsible digital behavior, including rejecting cyberbullying and maintaining politeness in all digital responses. Students with higher levels of digital literacy are generally more capable of assessing the context of digital information and responding appropriately to unethical behavior, making digital interactions in the learning environment safer and more ethical (Fercia et al., 2025). Various learning models that integrate digital literacy with character education, such as Project-Based Learning (PjBL), have proven effective in enhancing students' ethical awareness regarding technology use. Implementation of PjBL, which requires students to create digital content contextually, encourages them to think critically about moral consequences of the content they produce and how they use technology, thereby strengthening overall digital ethics competence within school environments (Nikmah, 2025).

Transformation of digital learning is not merely a change in tools or methods, but a moral and social transformation that requires emphasis on value-based learning, teacher professionalism, strengthening digital literacy, and systematic efforts to instill social responsibility. This holistic approach plays a crucial role in ensuring that the generation growing up in the digital era not only has technological skills but also possesses morals, integrity, and responsibility in every interaction, both online and offline (Agustina et al., 2023; Febriani et al., 2025).

Religious Humanistic Implications in Digital Learning

Digital learning not only focuses on the technical aspects of using technology but also has the potential to instill humanistic and religious values that support students' character development. These values include empathy, collaboration, effective communication, appreciation of differences, and the integration of moral and religious teachings such as honesty, discipline, tolerance, and holistic spiritual awareness into learning activities (Salmadatu, 2024). In a humanistic digital learning context, each learner is recognized as a whole individual, while social skills such as interpersonal communication and collaboration are actively fostered. Education grounded in humanistic values can create an inclusive learning environment that nurtures empathy, encourages respect for diversity, and promotes cooperative engagement in a digitally mediated setting (Rosidin et al., 2024). These values are essential because, without guidance from humanistic educational principles, digital learning carries the risk of diminishing meaningful human interaction.

Religious values play a crucial role in providing a strong moral foundation in digital learning, particularly in school environments with a religious atmosphere. Integrating values such as honesty, discipline, and tolerance into learning activities not only enhances academic competencies but also strengthens students' spiritual dimension (Atmaja & Wantini, 2025). Humanistic-religious-based education creates a harmonious learning environment by combining humanitarian values and religious teachings, enabling students to develop intellectually, morally, and spiritually (Salmadatu, 2024). Effective learning models in this context emphasize values, reflection, and collaboration. Value-based Project-Based Learning (PjBL) is particularly relevant as it engages students in projects that require technological proficiency alongside social and moral skills, including teamwork, communication, and problem-solving grounded in humanistic values (Muharromah & Manshur, 2025). Additionally, spiritual reflection and moral discussion activities can be incorporated into digital learning to address ethical and religious issues in real-life contexts, such as the responsible and fair use of technology (Almardiah & Muis, 2025).

Use of digital storytelling that incorporates moral narratives has proven effective in enhancing students' emotional engagement and understanding of ethical values through digital media. This method encourages active participation in creating digital narratives that reflect moral principles, allowing students to internalize values such as honesty, empathy, and responsibility. Research indicates that digital storytelling strengthens empathy and ethical understanding by connecting learning experiences with social and moral contexts via interactive multimedia (Trisnawati et al., 2025). Furthermore, collaboration in digital projects integrating character values has been shown to reinforce tolerance, honesty, and social responsibility. Project-based learning that combines creative tasks with moral values encourages students to work together, respect diverse ideas, and complete assignments requiring ethical communication and social awareness, highlighting the importance of integrating character education to develop collaborative skills, empathy, and responsibility in the digital era (Purba et al., 2025).

Positive implications of integrating religious humanist values into digital learning are very significant. This approach helps strengthen students' character by combining cognitive, social, and spiritual aspects, so they are not only skilled in technology but also develop soft skills such as work ethics, empathy, and social responsibility (Patimah et al., 2025). Through meaningful and contextual learning, students can understand the relationship between moral or religious values and real-world challenges in the digital era, thereby increasing motivation to learn and engagement in learning processes (Almardiah & Muis, 2025). Criticism of digital learning also needs to be considered. Although technology can expand access to and reach of education, there is a risk that human interaction in learning will decrease, especially if technology is used mechanistically without considering deep interpersonal values. Furthermore, spiritual engagement of learners may decline if religious learning content is positioned instrumentally or merely as material, without adequate reflective space to internalize spiritual values (Patimah et al., 2025). This situation may lead to a tendency for learning to become technical in nature, losing humanistic and religious significance, thus requiring special attention in digital pedagogy design (Almardiah & Muis, 2025).

Effective digital learning is not only related to mastering technology but also to shaping students as whole human beings, both humanistically and religiously, through integration of moral and spiritual values at every stage of learning. Learning models that emphasize collaboration, empathy, moral reflection, and meaningful communication positively impact the development of students' character, while also addressing concerns about potential reduction of human interaction in digital contexts (Rosidin et al., 2024; Salmadatu, 2024).

Balancing Technology with Ethical and Religious Humanistic Values in Learning

Transformation of digital learning presents an opportunity not only to enhance efficiency and accessibility but also to instill ethical, humanistic, and religious values in learners (Iskandar et al., 2025). Technology designed with a value-oriented approach can strengthen students' morality, empathy, and social responsibility, ensuring that learning develops not only technical skills but also well-rounded character. For instance, digital tools can integrate fundamental character education values, including Islamic principles, into classroom activities, allowing technology to serve not only as a tool but also as a medium for value-based learning (Barus et al., 2025). A practical example is implementation of a Learning Management System (LMS) with reflective modules, which encourages students to critically consider moral implications of digital actions. Through this approach, learners can connect content with values such as honesty, responsibility, and respect for others, rather than focusing solely on grades or task completion. This aligns with research findings highlighting that integrating technology and ethical-religious values contributes to shaping morally and spiritually aware generations in digital era (Sulisno et al., 2025).

Practices in implementation of valuable digital learning show that integrating technology with collaborative projects emphasizing ethics and responsibility can enhance social engagement and cooperation among students, while also reinforcing humanistic values in learning context (Mulidi & Badriyah, 2024; Rahmi et al., 2025). These collaborative projects combine use of technology with learning experiences that challenge students to solve real-world problems creatively while instilling moral and religious aspects in the process. This demonstrates that technology, when guided by strong pedagogical values, can enhance quality of character education, not just knowledge transfer. Role of teachers is very important in this context, serving as both role models and connectors between values and technology. Teachers not only guide use of digital tools but also help students understand ethical implications of using technology in everyday life. Teachers play a role in embedding moral discussions, directing students' spiritual reflection, and being tangible examples of ethical digital behavior. Research shows that effective teacher strategies in instilling technology-based character values, such as digital literacy grounded in Islamic values, can strengthen students' ethical awareness and social responsibility in digital spaces (Nasution et al., 2025).

Curriculum must explicitly include ethical, humanistic, and religious competencies so that digital learning can encompass affective and spiritual aspects in every activity. This integration provides foundation for students to see connection between technological content and broader moral values, ensuring that learning is not merely fragmented by technology but connected to comprehensive character development (Iskandar et al., 2025). Evaluation and monitoring of success of digital learning transformation need to expand indicators. Success is not only measured by academic achievements or technological skills, but also by students' ability to think critically, creatively, collaboratively, and act ethically in digital context. Important indicators in evaluation include students' involvement in discussions about values,

ability to identify and resolve ethical dilemmas in digital spaces, and self-reflection skills. Other studies confirm that integration of values into digital media can strengthen positive behaviors such as responsibility, tolerance, and discipline among students (Muslimah & Risa, 2024).

Criticism of digital education transformation arises when focus is only on technological efficiency without strengthening values, as dominance of digital tools can erode human and spiritual dimensions of learners. Many negative phenomena in digital spaces, such as unethical content or lack of moral reflection, appear when technology is viewed merely as a technical tool. Addressing this challenge requires strengthening value-based pedagogy by incorporating moral reflection, fostering digital ethics, and developing character in every design of digital learning activities. This approach ensures that technology not only facilitates learning but also enriches learners' moral and spiritual experiences, enabling generation being shaped to think and act ethically both online and offline (Barus et al., 2025; Nasution et al., 2025).

Digital learning practices accompanied by consistent moral and religious reflection activities can strengthen students' awareness of spiritual and ethical values. For instance, students may be asked to evaluate impact of their digital actions on themselves, friends, and society from a moral and religious perspective. This approach encourages students to think critically, connect digital experiences with moral principles, and foster a comprehensive sense of responsibility (Almardiah & Muis, 2025). Project assignments that integrate social and religious objectives allow students to apply digital skills while emphasizing values such as tolerance, honesty, and care for others. Technology serves as a medium that enhances spiritual and social understanding, so learning emphasizes not only technical ability but also character formation based on ethics and religiosity (Patimah et al., 2025).

Conclusion

Transformation of learning in era of Industrial Revolution 4.0 brings fundamental changes in education paradigm, shifting from teacher-centered to student-centered learning. Learners become active subjects who construct knowledge through interaction, collaboration, and critical reflection. Use of digital technology serves as facilitator that expands access, increases flexibility, supports independent learning, and enables personalized learning according to learners' needs. This transformation encourages development of adaptive abilities, digital literacy, creativity, and social skills relevant to 21st-century demands. Beyond technical aspects, digital learning transformation has important ethical, humanistic, and religious implications. Digital literacy, character education, and reinforcement of moral and spiritual values are key for students to use technology responsibly, respect others' rights, and internalize humanistic and religious values. Integration of these values through project-based learning, moral reflection, digital storytelling, and collaborative activities fosters empathy, tolerance, honesty, social responsibility, as well as critical and creative thinking skills. This approach ensures digital learning not only enhances technical competencies but also shapes students' character comprehensively.

Role of teachers in this context is crucial. Teachers act as learning facilitators, moral and spiritual role models, and guides for ethical and humanistic reflection in using technology. Success of learning transformation also depends on infrastructure readiness, supportive school culture, and relevant curriculum planning. Without balanced integration of technology, pedagogy, and ethical as well as religious humanistic values, learning risks becoming technocratic and losing educational significance. Therefore, success of digital learning is measured not only by technological mastery or academic achievement, but also by students' abilities to think critically, creatively, collaboratively, and to act ethically, responsibly, and maturely both morally and spiritually. Integration of technology with ethical, humanistic, and religious values enriches learning experiences, strengthens students' motivation and engagement, and shapes a well-rounded, characterful generation prepared to face global challenges in digital era. This transformation demonstrates that technology, when guided by effective pedagogy and strong moral principles, serves as a medium for developing academic, social, and spiritual competencies holistically.

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