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DESIGNING AN AI-INTEGRATED CURRICULUM INNOVATION FRAMEWORK FOR HIGHER EDUCATION

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ABSTRAK

Latar Belakang: Integrasi Kecerdasan Buatan (AI) yang pesat dalam pendidikan tinggi menghadirkan peluang sekaligus tantangan bagi desain kurikulum. **Tujuan:** Penelitian ini bertujuan mengembangkan dan memvalidasi Kerangka Inovasi Kurikulum Terintegrasi AI dengan Perspektif Islam, yang memadukan dimensi teknologi, pedagogi, etika, dan spiritual secara holistik. **Metode:** Menggunakan desain metode campuran sekuensial eksploratif, data kualitatif dikumpulkan melalui wawancara dan diskusi kelompok terfokus dengan 25 partisipan (dosen, mahasiswa, dan administrator), sedangkan validasi kuantitatif melibatkan survei terhadap 115 responden. Analisis tematik mengidentifikasi empat dimensi inti — Literasi AI, Personalisasi Berbasis Data, Etika & Tata Kelola, serta Adaptivitas & Keterampilan Masa Depan — yang diuji menggunakan Analisis Faktor Konfirmatori (CFA) dan Pemodelan Persamaan Struktural (SEM). **Hasil:** Hasil menunjukkan validitas konstruk yang kuat, dengan *Etika & Tata Kelola* serta *Literasi AI* sebagai prediktor utama adaptivitas dan keterampilan masa depan. Integrasi nilai-nilai Islam seperti *ta'līm* (pendidikan), *ḥikmah* (kebijaksanaan), dan *maqāṣid al-sharī'ah* memastikan AI berfungsi bukan sekadar alat teknis, melainkan katalis transformasi kurikulum yang berorientasi nilai. **Kesimpulan:** Secara teoretis, penelitian ini menjembatani teori kurikulum klasik dengan kajian AI secara praktis, Kerangka Kurikulum Terintegrasi AI berpotensi merevitalisasi tata kelola akademik, memperkuat literasi digital, dan membentuk ekosistem pembelajaran adaptif, etis, serta berkelanjutan di institusi pendidikan tinggi.
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Keywords:
AI Curriculum Framework, AI Ethics in Education, or AI Literacy in Higher Education

ABSTRACTS

Background: The rapid integration of Artificial Intelligence (AI) in higher education presents both opportunities and challenges for curriculum design. **Purpose:** This study aims to develop and validate an AI-Integrated Curriculum Innovation Framework with an Islamic Perspective, which holistically integrates technological, pedagogical, ethical, and spiritual dimensions. **Method:** Using an exploratory sequential mixed-methods design, qualitative data were collected through interviews and focus group discussions with 25 participants (lecturers, students, and administrators), while quantitative validation involved a survey of 115 respondents. Thematic analysis identified four core dimensions—AI Literacy, Data-Driven Personalization, Ethics & Governance, and Adaptivity & Future Skills—which were tested using Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM). **Result:** Results demonstrated strong construct validity, with *Ethics & Governance* as well as *AI Literacy* as a major predictor of future adaptability and skills. Integration of Islamic values such as *ta'lim* (education), *ḥikmah* (wisdom), and *maqāṣid al-sharī'ah* ensuring that AI functions not merely as a technical tool, but as a catalyst for values-oriented curriculum transformation. **Conclusion:** Theoretically, this research bridges classical curriculum theory with AI studies; practically, the AI-Integrated Curriculum Framework has the potential to revitalize academic governance, strengthen digital literacy, and establish an adaptive, ethical, and sustainable learning ecosystem in higher education institutions.

A. INTRODUCTION

Higher education in the post-digital era faces enormous pressure to adapt to the acceleration of disruptive technology, one of which is through integration. *Artificial Intelligence* (AI). AI is no longer seen as merely a digital tool, but rather as a catalyst for transformation that shapes new paradigms in learning, curriculum design, and graduate competencies (Abbasi et al., 2025). This situation demands that universities design curricula that not only keep pace with digitalization but also systematically integrate AI to produce graduates with 21st-century competencies.

Historically, curriculum has been at the heart of higher education. Classical models of curriculum development, such as Tyler's Rationale (1949), Taba's Inductive Model (1962), and Oliva's Comprehensive Framework (2010), emphasize the balance between educational objectives, content, learning strategies, and evaluation. However, the emergence of AI challenges these traditional approaches by introducing new dynamics in learning that are adaptive, data-driven, and individual centered (Print, 1993; Ornstein & Hunkins, 2018). Therefore, a reinterpretation of classical curriculum theory is necessary to maintain its relevance in the context of the intelligent learning ecosystem.

The four key dimensions of the AI Integrated Curriculum Framework—AI Literacy, Data-Driven Personalization, Ethics & Governance, and Adaptivity & Future Skills—conceptually align with the fundamental principles of traditional curriculum theory. AI Literacy represents an extension of these dimensions. *Objective* in Tyler's rationale, where learning objectives now include not only cognitive achievements, but also the ability to understand, assess, and use technology ethically and reflectively. Data-Driven Personalization enriches the concept *content* and *learning experiences* in

the Taba model, because learning experiences can now be adaptively designed based on the unique needs of learners through data analytics and *machine learning*.

Furthermore, AI Ethics & Governance revives the values implicit in Oliva's framework, which emphasizes the balance between efficiency and humanization of the curriculum. The integration of these dimensions emphasizes that the curriculum should not only be technologically efficient but also uphold the principles of responsibility, transparency, and digital justice in the context of higher education. Meanwhile, Adaptivity & Future Skills serves as a dynamic bridge connecting all elements of the curriculum—objectives, content, strategies, and evaluation—to maintain relevance to social change and the needs of the AI-based industry. This dimension reflects the transformation from a static curriculum model to a curriculum that *living and learning continuously* (Oliva, 2010).

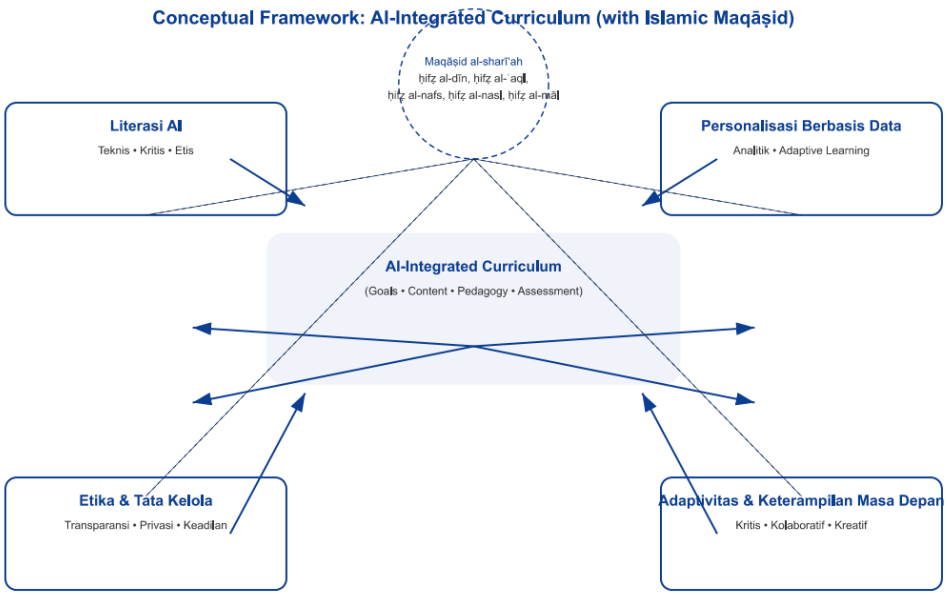
Recent literature suggests that AI has significant potential as a catalyst for curriculum innovation. Schmidt et al., (2025) highlight the positive perceptions of AI by faculty and students, while Chu & Ashraf, (2025) and McCarthy et al., (2025) demonstrate the power of data-driven personalization in improving retention and learning engagement. However, much of the research remains fragmented—focusing on literacy, personalization, or ethics separately—without linking it to established theoretical frameworks for curriculum.

Furthermore, studies on AI literacy (Tadimalla & Maher, 2024; Zhong et al., 2025) and AI ethics and governance (Mahajan, 2025; Walter et al., 2024) emphasize the urgency of multidimensional competencies encompassing technical, social, and moral aspects. However, conceptual integration of these dimensions with the foundations of classical curriculum theory remains rare. Consequently, a gap exists between AI-based innovation practices and established higher education conceptual frameworks.

Thus, there are three main gaps: (1) previous research still separates technological, pedagogical, and ethical aspects; (2) there is no framework that bridges AI with classical curriculum theories such as Tyler, Taba, and Oliva; and (3) there is a lack of empirical validation of AI-integrated curriculum models in higher education contexts, especially in developing countries.

Building on this gap, this research positions itself at the intersection of classical curriculum theory and AI-based innovation. The goal is to identify the key elements of the AI-Integrated Curriculum Innovation Framework, assess the perceptions and readiness of higher education actors, and comprehensively test the empirical validity of this framework. Theoretically, this research expands the horizon of the classical curriculum toward an intelligent and sustainable paradigm; practically, it provides design guidance for universities; and policy-wise, it offers a basis for adaptive, ethical, and future-oriented higher education reform.

In the context of Islamic education, the integration of AI in the curriculum cannot be separated from spiritual values rooted in maqāṣid al-sharīʻah, namely protection of religion (*ḥifẓal-dīn*), reason *(ḥifẓ al-ʻaql)*, soul (*ḥifẓal-nafs*), descendants (*ḥifẓal-nasl*), and property (*ḥifẓ al-māl*). This principle strengthens the Ethics & Governance dimension by emphasizing the moral responsibility of AI use, while simultaneously enriching AI Literacy to favor the welfare. The value of maqāṣid also directs Data-Based Personalization to be oriented towards developing human potential, as well as encouraging Adaptivity & Future Skills that are in line with the goals of Islamic education-forming knowledgeable, moral, and contributing individuals to civilization.



B. METHOD

This study employed a mixed-methods approach with an exploratory sequential mixed-method design, as recommended by Creswell & Plano Clark, (2018). This design was chosen because it epistemologically best aligns with the research objectives, namely to develop and validate an AI-integrated curriculum innovation framework. This approach allows researchers to first explore the phenomenon in depth (the qualitative phase) to discover relevant empirical concepts and categories, then statistically confirm and test the model (the quantitative phase). Thus, the research results are not only descriptive but also have strong construct validity and empirical support.

The choice of an exploratory sequential design was also based on the theory-generating nature of the research question—that is, it seeks to bridge classical curriculum theory with AI innovation. As suggested by Ivankova and Wingo (2018), this design allows for the integration of conceptual knowledge and empirical findings so that the developed framework is truly rooted in the social context and practice of higher education.

1. Qualitative (Exploratory) Level

   The first phase focused on exploring stakeholder perceptions, experiences, and practices in the context of AI integration into the curriculum. Data were collected through in-depth interviews and focus group discussions (FGDs) involving 12 lecturers, 10 students, and 3 academic administrators. Informants were selected using purposive sampling with the following criteria: (1) having direct experience in curriculum development or implementation, (2) understanding the context of AI implementation in learning or academic management, and (3) representing a variety of roles in the higher education ecosystem (teachers, students, and policymakers). This approach ensured a diversity of perspectives as well as depth of data obtained (Patton, 2015).

   Interview questions focused on three aspects: perceptions of the role of AI in the curriculum, opportunities and barriers to its integration, and ethical and pedagogical values that need to be maintained in AI-based implementations. Data

were analyzed using thematic coding (Braun & Clarke, 2021) with the help of NVivo 14 software. The validity of the analysis was strengthened through source triangulation and member checking (Miles, Huberman, & Saldaña, 2014). The results of this analysis formed the basis for the development of the initial draft of the AI-Integrated Curriculum Innovation Framework, which includes four main dimensions: AI Literacy, Data-Driven Personalization, Ethics & Governance, and Adaptivity & Future Skills.

2. Quantitative Stage (Confirmatory and Validative)

The second phase aimed to validate the constructs and test the relationships between the dimensions of the proposed framework. Quantitative data were collected through an online survey involving 115 respondents (100 students, 12 lecturers, and 3 academic administrators) from several universities in the Pantura region (Lamongan, Bojonegoro, and Tuban). The survey instrument was developed based on the results of the qualitative phase and previous literature related to AI literacy (Tadimalla & Maher, 2024), data-driven curriculum design (Chu et al., 2025), and AI governance in higher education Mahajan, 2025). The questionnaire used a five-point Likert scale to measure perceptions and readiness for the four dimensions of the framework.

Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) were chosen because these two techniques are most appropriate for testing construct validity and structural relationships between latent variables (Kline, 2016). CFA allows researchers to ensure that indicators developed from qualitative findings represent the intended constructs, while SEM allows for simultaneous testing of the interrelationships between framework dimensions such as AI literacy, ethics, and curriculum adaptability. This approach not only verifies theoretical consistency but also assesses the predictive power and influence between dimensions in the context of AI-based curriculum innovation.

The analysis was carried out in stages: (1) descriptive analysis to see general trends; (2) Exploratory Factor Analysis (EFA) to identify the initial factor structure; (3) CFA to confirm construct validity; and (4) SEM to test causal relationships between dimensions. The results of this analysis serve as the basis for assessing the reliability, goodness of fit, and internal validity of the developed model.

3. Ethical Considerations

This research was conducted in accordance with the guidelines of the British Educational Research Association (BERA, 2018) and the American Educational Research Association (AERA, 2019). All participants were informed about the purpose of the study, their right to withdraw at any time, and guaranteed anonymity and confidentiality of their data. Consent to participate was obtained voluntarily. With this methodology, the research is expected to produce a valid, adaptive, and ethically sound AI-integrated curriculum innovation framework, which not only strengthens classical curriculum theory but also provides a new direction for higher education in facing global digital transformation.

C. RESULT

The research results are presented based on two main stages of analysis: exploratory (qualitative) analysis and confirmatory–structural (quantitative) analysis. The qualitative stage resulted in an initial draft of the AI-Integrated Curriculum Innovation Framework, which was then empirically tested through Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) to ensure construct validity and interdimensional relationships.

1. Qualitative Stage Results: Initial Dimension Identification
   Thematic analysis of interviews and FGDs resulted in four main dimensions that form the foundation of the AI integrated curriculum framework, namely:
   a. AI Literacy – includes the ability to understand basic AI concepts, think critically about its impacts, and apply ethical principles in the use of AI.
   b. Data-Driven Personalization – emphasizes designing adaptive learning experiences by leveraging data and learning analytics.
   c. AI Ethics & Governance – highlights aspects of transparency, privacy, accountability, and regulation in the application of AI in academic settings.
   d. Adaptivity & Future Skills – emphasizes critical, collaborative, and innovative thinking skills in response to the dynamic changes of the digital ecosystem.

   These four dimensions are interrelated and form the conceptual structure of an adaptive curriculum based on values and technology.
2. Quantitative Stage Results: Construct Validation (CFA)
   The first stage of quantitative analysis was conducted through Exploratory Factor Analysis (EFA) to identify empirical factor patterns. The EFA results revealed four factors aligned with the theoretical dimensions, with a Kaiser-Meyer-Olkin (KMO) value of 0.876 and a significant Bartlett's Test of Sphericity ($p < 0.001$), indicating the data were suitable for factor analysis.
   The results of the Confirmatory Factor Analysis (CFA) show that the four-dimensional model has a good model fit (*goodness of fit*) which is very good.

Tabel 1. :Hasil Confirmatory Factor Analysis (CFA)
Framework Construct Validity

Main Dimensions	Number of Indicators	Factor Loading (λ)	AVE	CR	Information
AI Literacy	6	0.72–0.88	0.64	0.89	Valid
Data-Driven Personalization	5	0.70–0.86	0.61	0.88	Valid
Ethics & Governance	5	0.74–0.90	0.66	0.91	Valid
Adaptability & Future Skills	6	0.71–0.87	0.63	0.90	Valid

Note: All factor loadings are significant ($p < 0.001$), AVE > 0.5 and CR > 0.7 indicating that convergent validity and construct reliability are met (Hair et al., 2020).

Overall, the goodness of fit value of the CFA model is in the adequate category: $\chi^2/df = 1.91$; CFI = 0.955; TLI = 0.948; RMSEA = 0.046; SRMR = 0.041. These results confirm that the four main dimensions form an empirically valid and stable conceptual model.

3. Structural Equation Modeling (SEM) Results: Relationships Between Dimensions
SEM analysis was used to examine the relationships between dimensions within the conceptual framework. The structural model assumes that Ethics & Governance and AI Literacy act as primary predictors of Adaptivity & Future Skills, while Data-Driven Personalization serves as a mediator that strengthens the influence of both.

Table 2. Results of Structural Equation Modeling (SEM) Analysis

Interdimensional Relationships	Path Coefficient (β)	t-value	Significance (p)	Interpretation
AI Literacy→Data-Driven Personalization	0.58	8.42	<0.001	Significant positive
Ethics & Governance→Data-Driven Personalization	0.45	7.01	<0.001	Significant positive
Data-Driven Personalization→Adaptability & Future Skills	0.62	9.15	<0.001	Significant positive
AI Literacy→Adaptability & Future Skills	0.27	3.98	<0.001	Significant positive
Ethics & Governance→Adaptability & Future Skills	0.34	4.25	<0.001	Significant positive

Note: All paths are significant ($p < 0.05$), indicating a strong causal relationship and consistent with the theoretical hypothesis.

The structural model also showed a high level of model fit ($\chi^2/df = 1.88$; CFI = 0.957; TLI = 0.952; RMSEA = 0.045; SRMR = 0.038), which indicates the model has good external and predictive validity.

4. Key Findings and Empirical Implications
The study results show that Ethics & Governance and AI Literacy are the strongest predictors of Adaptability & Future Skills. This confirms that AI mastery grounded in moral values and social responsibility is a key foundation in preparing graduates who are resilient in facing digital transformation.
Additionally, Data-Driven Personalization plays a crucial role as a pedagogical bridge between technological literacy and future skills. This dimension strengthens the connection between technical knowledge and data-driven adaptive learning contexts, reflecting the principles of *learner-centered curriculum* which is in line with Taba's curriculum theory (1962).
Overall, the CFA and SEM results prove that the AI-Integrated Curriculum Innovation Framework has strong construct validity, significant relationships between dimensions, and theoretical fit with classical curriculum models extended to the digital and ethical realms.

D. DISCUSSION

The findings of this study confirm that the developed AI-Integrated Curriculum Innovation Framework has a valid conceptual structure and significant relationships between dimensions. SEM analysis shows that Ethics & Governance and AI Literacy act as dominant predictors of Adaptivity & Future Skills, with Data-Driven Personalization serving as a mediator that strengthens the interconnection between dimensions. Theoretically, this relationship illustrates the integrative process between cognitive, affective, and moral dimensions in designing an AI-based curriculum that is relevant to the needs of 21st-century higher education.

1. Empirical and Theoretical Integration: Bridging the Classical Curriculum and the AI Paradigm

   The results of this study conceptually expand classical curriculum theory by positioning AI as a structural element, not merely an additional instrument. In the context of Tyler's (1949) rational model, the AI Literacy dimension serves to expand the realm of *educational objectives to* encompass not only cognitive and psychomotor goals, but also digital competencies and ethical reflection on technology. Tyler emphasizes the importance of measurable goals, while AI literacy adds a dimension-evaluative *reasoning to* the social and moral impacts of technology, making it a reflective and adaptive goal.

   Meanwhile, Data-Driven Personalization enriches Taba's (1962) model, especially in the stages selection *of learning experiences*Taba views curriculum as the result of an inductive process that begins with the needs of the learner; in the context of AI, data-driven personalization serves as a modern manifestation of this principle. Through analytical algorithms and machine *learning*, the process of adapting learning experiences becomes more dynamic, enabling learning that is based on individual needs while remaining grounded in broader curriculum objectives.

   Ethics & Governance actualizes Oliva's (2010) framework, which emphasizes the balance between human values and the efficiency of the education system. The integration of AI into the curriculum risks dehumanization if the ethical dimension is ignored. Therefore, ethical governance ensures that technological innovation remains directed toward serving human interests, not replacing them. In Oliva's framework, ethics acts as a "value regulator" that maintains the balance between technological efficiency and the humanistic mission of education.

   Thus, the SEM results show a significant relationship between Ethics & Governance → Adaptivity & Future Skills shows that ethical *governance is* a primary prerequisite for the development of sustainable 21st-century skills. This reinforces Print's (1993) argument that a good curriculum not only organizes knowledge but also shapes individuals with social and moral awareness.

2. Relevance to the Paradigm of Islamic Education and Maqāṣid al-sharīʿah

   Integration of values maqāṣid al-sharīʿah with in the framework of the AI integrated curriculum provides a spiritual dimension that distinguishes this model from secular approaches. The five principles of maqāyesid — *ḥifẓal-dīn* (guarding religion), *ḥifẓ al-ʿaql* (keep your wits about you), *ḥifẓal-nafs* (guarding the soul), *ḥifẓal-nasl* (taking care of offspring), and *ḥifẓ al-māl* (guarding property) — functions as a basic ethic that directs the use of AI in education to remain on the side of human welfare.

   The Ethics & Governance dimension reflects *ḥifẓ al-ʿaql* and *ḥifẓal-nafs*, by ensuring that AI is used wisely, safely, and without harming human dignity. AI literacy

strengthens *ḥifẓal-dīn* because it fosters ethical awareness and moral responsibility in the use of knowledge. While Data-Driven Personalization is oriented towards *ḥifẓal-nasl*, ensuring that each individual receives a learning experience that matches their potential, so that education becomes a means of preserving and developing generations. Finally, Adaptability & Future Skills are closely related to *ḥifẓ al-māl*, because innovative and productive skills are the key to sustainable economic well-being in the digital era.

Thus, maqāṣid al-sharīʿah provides a normative value framework that ensures AI in education is not only a tool for efficiency, but also a means of moral and humanitarian improvement. This is in line with Al-Attas' (1993) view of the goals of Islamic education as *ta'dīb*— the formation of manners and wisdom rooted in divine consciousness.

3. Theoretical and Practical Implications

   Theoretically, this research contributes to the curriculum development literature by introducing an AI-Integrated Curriculum model that bridges classical theory and contemporary technology. This model demonstrates that curriculum paradigms are not dichotomous between "traditional" and "digital," but rather can synergize through ethical values and maqāṣid al-sharīʿah.

   Practically, the SEM results show the direction of developing higher education policies and strategies based on evidence-driven *innovation*. Educational institutions can utilize the results of this research as an implementation guideline in:

   a. designing value-oriented AI-based courses,
   b. develop an ethical and transparent personalized learning system, and
   c. instilling adaptive competencies that align with industry needs and human values.

   From a policy perspective, this model offers an adoptable framework for building AI governance in higher education, namely a curriculum management system that integrates Islamic ethics, digital governance, and the principles of public accountability.

4. Conceptual Synthesis: Towards a Holistic Curriculum Paradigm Based on AI and Values

   This research ultimately confirms that curriculum development in the era of artificial intelligence (AI) is not simply about integrating technology. The true essence lies in recontextualizing human and spiritual values within an intelligent and adaptive learning process. The four validated core dimensions—AI Literacy, Data-Driven Personalization, Ethics & Governance, and Adaptivity & Future Skills—represent a balance between "digital intelligence" and "educational conscience."

   This framework affirms that modern curricula can remain grounded in classical principles (Tyler, Taba, Oliva) while adopting the AI paradigm, as long as both are returned to the universal values of human welfare as outlined in the maqāṣid al-sharīʿah. Thus, this research provides a conceptual and empirical foundation for the development of a future curriculum that is ethical, contextual, and spiritually oriented.

E. CONCLUSION

This study concludes that the AI-Integrated Curriculum Innovation Framework with an Islamic Perspective is a valid and relevant conceptual model to address the challenges of higher education in the digital era. Confirmatory Factor Analysis (CFA) And Structural Equation Modeling (SEM), it was found that the four main dimensions—AI Literacy, Data-Driven Personalization, Ethics & Governance, and Adaptivity & Future Skills—have a significant and mutually reinforcing relationship in shaping an adaptive, ethical, and future-oriented curriculum. Theoretically, this study extends classical curriculum theory (Tyler, Taba, Oliva) by incorporating artificial intelligence elements as an integral, not an add-on, structure. These findings confirm that digital innovation can be harmonized with humanistic and spiritual principles through the integration of values. maqāṣid al-sharī'ah which ensures that the curriculum remains oriented towards human welfare, wisdom, and ethical balance. Practically, this research recommends that higher education institutions: (1) develop curriculum-based policies AI governance which is based on Islamic ethics and values, (2) training lecturers and curriculum managers in AI literacy and data analytics for adaptive learning, and (3) building an intelligent learning system that pays attention to digital justice, data protection, and social responsibility. Thus, this framework offers not only pedagogical innovation, but also a strategic direction towards higher education that is civilized, sustainable, and based on values, in line with the demands of the digital revolution and the vision of Islamic civilization.

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