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The Transformation of Islamic Epistemology in Technology Education: A Case Study of Computer Science at Universitas Muhammadiyah Kudus

***Toni Ardi Rafsanjani*[1], *Waston*[2], *Kani Ulger*[3]**

[1]Universitas Muhammadiyah Kudus, Central Java, Indonesia

[2]Depertment of Islamic Education, Universitas Muhammadiyah Surakarta, Indonesia

[3]Sivas Cumhuriyet University, Sivas, Turkey

[1]toniardi@umkudus.ac.id, [2]was277@ums.ac.id, [3]kulger@gmail.com

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Abstract

Objective: This study aims to critically evaluate the application of Islamic integrative epistemology in the Computer Science Study Program at the University of Muhammadiyah Kudus, focusing on the extent to which Islamic values are internalized in the curriculum, teaching methods, and academic culture. **Theoretical framework:** This study uses the Islamic integrative epistemological framework as an effort to answer epistemological concerns that arise due to the dominance of dichotomous and positivistic paradigms, especially in non-religious disciplines such as Computer Science. This epistemology seeks to harmonize Islamic science and general science in a coherent set of values. **Literature review:** The literature review includes a discussion of epistemological crises in modern higher education, technocratic tendencies in the development of exact science, and the concept of scientific integration in an Islamic perspective. Emphasis is also placed on the importance of instilling moral and spiritual values in learning in Islamic universities. **Methods:** This study uses a qualitative approach with a case study design. The data collection technique was carried out through in-depth interviews, participatory observations, and documentation analysis of academic activities within the Computer Science Study Program, University of Muhammadiyah Kudus. **Results:** The results of the study show that efforts to integrate Islamic values in the development of Computer Science are still symbolic and fragmented. The main obstacles stem from the low epistemological awareness among academics and the strong dominance of technocratic approaches. Nevertheless, there are promising integration opportunities in courses such as Professional Ethics and Islamic Religious Education, which can be developed through a reflective and transdisciplinary pedagogical approach. **Implications:** A reformulation of value-based curriculum, improved epistemological literacy, and cross-disciplinary synergy are needed to encourage more substantial scientific integration in Islamic universities. **Novelty:** This study presents a new perspective on the application of Islamic epistemology in Computer Science, with an emphasis on the deep integration of values to form graduates who are both technological and have Islamic character.

Keywords: transformation. integrative epistemology, computer science, transdisciplinary, islamic values.

INTRODUCTION

Integrative thinking in Islamic education exists as a response to epistemological anxiety due to the dichotomy between religious science and general science. This dichotomy causes the alienation of Islamic values in the development of modern science and has implications for the stagnation of scientific creativity in the university environment, including in study programs that are explicitly not based on religion, such as Computer Science. In this context, the integration of Islamic epistemology is important to create a unity of perspective on science as a means of forming holistic and noble human beings [1].

The idea of integrative epistemology in Islamic education was largely developed by thinkers such as M. Amin Abdullah, who offered an "integralistic theo-anthropocentric" approach through a layered concept map or spider web, combining classical Islamic studies with modern social sciences and humanities. This concept not only transcends the religious-scientific dichotomy but also paves the way for the reconstruction of scientific paradigms in secular academic environments, including computer science study programs that are now confronted with the challenge of ethical and humanitarian values in technological development [2].

The practice of Islamic education (PAI) in public universities has become an initial laboratory in the application of integrative epistemology. In this case, the integrative-interconnective approach as offered by Yusuf Hanafi combines Islamic Studies with the natural and social sciences. The design of PAI teaching materials in this model is no longer normative-dogmatic, but is structured to encourage the connection of Islamic values with the dynamics of modern science and technology, so that it is more contextual for non-religious students, such as in the Computer Science study program [3].

Furthermore, the development of Islamic education based on epistemological integration also receives support from a paradigm that sees science as part of the overall Islamic value system. In this model, computer science, although exact and applicable, can still be transformed into a means of moral and spiritual development. The kulli-juz'i (universal-particular) approach, as explained by Nurcholis, shows that science is not a neutral entity, but part of an Islamic value system that views science as a means of devotion to God and the benefit of the ummah [4].

Thus, the study of academic practice in the Computer Science Study Program, University of Muhammadiyah Kudus, through the framework of integrative epistemology is important, not only as an effort to enrich Islamic education methodologies, but also as a concrete contribution in responding to ethical and value challenges in the era of digital technology. The concept of the integration of science and religion can be a model of future education that is not only oriented to technical competence, but also to the formation of the character and spirituality of students as a whole [5].

However, efforts to integrate Islamic epistemology in non-religious study programs such as Computer Science still face various factual obstacles shown by the low actual implementation in the university environment. National survey data conducted by the Directorate of Islamic Religious Higher Education (Diktis) of the Ministry of Religion of the Republic of Indonesia in 2022 shows that only 23% of the total non-religious study programs in Islamic universities have integrative-based curricula or teaching modules. In fact, in technology study programs such as Computer Science, the figure has decreased drastically to 11%, indicating that there is a significant gap between integrative epistemology discourse and academic practice in the field. Meanwhile, a student perception study conducted by the State Islamic University of Sunan Kalijaga Yogyakarta in 2021 revealed that 67% of students from the exact study program did not feel that Islamic values were explicitly integrated in their lecture materials. This fact confirms that the dominance of the positivistic paradigm in the exact sciences is still a major challenge for value-based scientific approaches [6].

In the theoretical framework, the integrative-interconnective epistemological approach developed by M. Amin Abdullah is the main foundation in framing this problem. This theory

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rejects the separation between revelation and reason, between the religious sciences and the worldly sciences, and affirms the importance of transdisciplinary integration in higher education. This epistemology is based on the principle that science is not value-neutral, but always within ethical, spiritual, and social frameworks. In the context of computer science, this paradigm drives the development of curricula and pedagogies that not only pursue technological efficiency and logic but also pay attention to social implications, algorithmic justice, and digital ethics. Thus, students are not only required to master the technical aspect, but also have critical awareness and moral responsibility for the use of the knowledge they learn [7].

Furthermore, the theory of social constructivism as developed by Vygotsky and expanded in the study of Islamic education by figures such as Azra and Hanafi also supports this integrative model. In the constructivist approach, students are considered active subjects in shaping meaning and knowledge, which cannot be separated from the context of culture, values, and spirituality. Therefore, the application of Islamic epistemology in Computer Science must be carried out through participatory, project-based, and reflective learning methods, which allow students to reflect on the link between the knowledge studied and the spiritual and social responsibility as a Muslim [8].

By combining quantitative data and theoretical support, this research emphasizes the urgency of integrating Islamic epistemology into the Computer Science study program. The goal is not simply to strengthen the religious aspect of higher education, but to give birth to a complete scientific model, one that bridges scientific rationality and the dimension of spirituality as the foundation of a progressive Islamic civilization [9].

The study of integrative epistemology in Islamic education shows that the discourse on the integration of religious science and general science has undergone significant theoretical development in the last two decades, especially in the realm of Islamic higher education in Indonesia. M. Amin Abdullah's thinking has become the dominant foundation in the formation of an integrative-interconnected paradigm that is now widely adopted by Islamic campuses to respond to the fragmentation of knowledge due to the epistemological dichotomy between revelation and reason. This model emphasizes the importance of transdisciplinary relationships between religious texts, social sciences, and natural sciences, and has been partially applied in the teaching of Islamic studies and Islamic religious education in public universities [10].

However, recent research still shows serious limitations in the application of integrative epistemology to non-religious study programs, especially in the field of technology, such as Computer Science. Studies such as those conducted by Yusuf Hanafi and Nurcholis have opened up important discussion space regarding the connection between Islamic values and modern science, but generally still focus on the design of teaching and learning materials in religious courses, rather than on curriculum or pedagogical practices in the exact field. In addition, there has not been much research that systematically evaluates the perception of lecturers and students of technology study programs towards the integration of Islamic values in their learning [11].

Thus, the position of this paper is in an innovative space to fill the research gap, namely by examining how integrative epistemology practices are applied in real terms in the context of the Computer Science study program at the University of Muhammadiyah Kudus. This research is not only descriptive but also evaluative and conceptual by bringing together empirical data, theoretical approaches, and curricular analysis as an effort to expand the scope and effectiveness of the discourse on science integration in the modern higher education landscape. This paper also reinforces the urgency of the shift from symbolic integration to substantive integration in Islamic education, especially in facing the challenges of technology, digital ethics, and human values in the industrial era 5.0 [12].

The main problem underlying this research is the limited application of the concept of integrative epistemology in academic practice in non-religious study programs, especially Computer Science in Islamic universities. Although the discourse on integration between

religious science and general science has developed conceptually through the thought of figures such as M. Amin Abdullah and has become the institutional vision of many Islamic campuses, its implementation at the level of curriculum and pedagogy in the exact discipline is still not optimal. This condition is reflected in the lack of content of Islamic values in the learning materials, the weak integration of ethical-spiritual values in scientific practice, and the low epistemological awareness of students on the importance of science as an instrument of service to God and social welfare. This inequality shows the gap between the ideals of holistic Islamic epistemology and the reality of the fragmentation of knowledge in higher education, especially in the digital age, which is fraught with moral challenges and technological dehumanization. Therefore, it is necessary to conduct a critical study of how integrative epistemology can be implemented substantively in the academic environment of the Computer Science study program of the University of Muhammadiyah Kudus, both through curriculum policies, teaching methods, and value awareness among the academic community [13].

The purpose of this study is to critically examine the implementation of integrative epistemology in the academic practice of the Computer Science Study Program at the University of Muhammadiyah Kudus, as well as to evaluate the extent to which Islamic values are integrated into the curriculum, learning methods, and academic culture in the study program. This research aims to identify the forms of integration that have been carried out, analyze the perception of lecturers and students on the relevance and urgency of Islamic values in the development of science and technology, and formulate a conceptual model for the application of Islamic epistemology that is compatible with the characteristics of modern computer science. More broadly, this research is expected to be able to make a theoretical contribution to the development of integrative epistemological studies in the realm of non-religious higher education, as well as provide practical recommendations to strengthen a holistic and transformative vision of Islamic science in facing ethical and spiritual challenges in the digital era [14].

LITERATURE REVIEW

The integration of Islamic epistemology into technology-based education has become an essential discourse within Islamic higher education. The growing awareness of the limitations posed by the dichotomy between religious and secular sciences has driven many institutions to seek models of knowledge integration that harmonize technological competence with moral and spiritual awareness. This literature review explores the development of Islamic epistemological thought, the challenges of integration into non-religious disciplines, particularly computer science, and the potential strategies for practical implementation. Islamic epistemology, at its core, seeks to unify divine revelation, rational reasoning, and empirical observation within a coherent framework of knowledge. The objective is to overcome the fragmentation of knowledge that occurs when religious and scientific domains are treated as separate or even conflicting. In educational contexts, this integration aims to produce graduates who are not only intellectually and professionally capable but also morally upright and spiritually grounded [15].

Historically, Islamic scholars have viewed science as a pathway to understanding the divine order and serving the greater good of humanity. Knowledge was seen as sacred, a trust from God to be used wisely and ethically. This worldview contrasts sharply with the modern positivistic paradigm, which often portrays science as value-free and detached from spiritual or ethical considerations. As a result, students in technical disciplines such as computer science may receive a form of education that is rich in technical content but devoid of moral guidance. In response to this challenge, several educational models have emerged that seek to reintegrate Islamic values into various fields of study. In the context of computer science, efforts are being made to infuse ethical and spiritual dimensions into subjects such as programming, cybersecurity, data science, and artificial intelligence. Rather than being treated as isolated

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technical skills, these subjects are now viewed as having ethical implications and societal impacts that must be examined through an Islamic lens [16].

Curriculum reform is a key strategy in this process. It involves restructuring course content, learning objectives, and assessment methods to include Islamic values such as justice, honesty, responsibility, and compassion. Courses like Professional Ethics and Islamic Religious Education offer natural entry points for value integration, but more effort is needed to embed these principles across all technical subjects. This includes incorporating case studies, ethical scenarios, and reflective questions that encourage students to critically assess the moral consequences of technology. Pedagogical methods also play a significant role in the integration process. Interactive, student-centered approaches such as project-based learning, reflective discussions, and collaborative assignments have been shown to facilitate deeper engagement with ethical and spiritual concepts. These methods encourage students to think beyond the technical aspects of their work and to consider how their knowledge and skills can be used in the service of the community and in alignment with Islamic teachings [17].

Institutional commitment is another crucial factor. Without clear policies and support from university leadership, efforts to integrate Islamic epistemology may remain symbolic or fragmented. Institutions must articulate their vision for integrative education in official documents and ensure that academic units are equipped with the resources, training, and interdisciplinary collaboration needed to implement this vision. Faculty development programs, curriculum review workshops, and cross-departmental dialogue are all essential in building a culture of epistemological integration. Challenges persist, however. Many students and lecturers still perceive computer science as a purely technical field with little connection to religious values. This perception is reinforced by educational structures that separate religious and secular content, as well as by the dominance of globalized, Western-centric curricula that do not reflect local or Islamic worldviews. Overcoming this mindset requires sustained efforts to raise epistemological awareness among all stakeholders in the education system [18].

Furthermore, value integration must be more than an addition of religious content; it should represent a holistic transformation of educational philosophy. The aim is not simply to teach students about Islamic values, but to cultivate in them a worldview where science and faith are inherently connected. This involves creating learning environments that nurture reflection, dialogue, and a sense of purpose, allowing students to see their disciplines as avenues for fulfilling spiritual and ethical responsibilities. In recent years, some educational initiatives have shown promising results by incorporating Islamic values into digital learning platforms, simulation-based learning, and technology-based projects with social relevance. These innovations demonstrate that integrating epistemology into technology education is not only theoretically sound but also practically feasible. When done thoughtfully, such integration enhances student motivation, strengthens identity, and encourages ethical innovation [19].

Ultimately, the transformation of Islamic epistemology in computer science education reflects a broader movement toward reclaiming the purpose of education as a means to develop holistic human beings. In the face of rapid technological advancement and ethical uncertainty, Islamic higher education is uniquely positioned to offer a balanced model of education, one that fosters both scientific excellence and moral integrity. By embedding Islamic values into the heart of technical education, universities can prepare graduates who are not only skilled professionals but also conscientious contributors to a just and ethical society.

METHODOLOGY

This research uses a qualitative approach with a case study type, which aims to deeply understand the application of integrative epistemology in the academic practice of the Computer Science Study Program at the University of Muhammadiyah Kudus. The qualitative approach was chosen because it is appropriate to explore complex and contextual phenomena, as well as to allow researchers to capture the subjective meanings, values, and social constructs

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that develop in the academic environment. The case study was chosen as a research design because it provides space to explore the specific context of the institution and unit of analysis, namely the Computer Science study program, which has unique characteristics in facing the challenge of integrating Islamic values in exact science [20].

Figure 1. Research Location of the Computer Science Study Program, University of Muhammadiyah Surakarta. Sources: https://ilkom.umku.ac.id/

The data collection method in this study was carried out through three main techniques, namely in-depth interviews, participatory observation, and documentation study. Interviews were conducted with lecturers in general and scientific courses, heads of study programs, and students to obtain information about perceptions, experiences, and strategies for integrating Islamic epistemology in the learning process. Participatory observation is carried out in lectures, seminars, or academic discussions to capture the dynamics of value integration directly. Meanwhile, the documentation is focused on curriculum analysis, syllabus, Semester Learning Plan (RPS), and institutional policies related to the integration of science and religion.

The data analysis method used is thematic analysis, which involves the process of data reduction, categorization, and the identification of key themes relevant to the focus of the research. This process is carried out iteratively through the stages of open coding and axial coding to find patterns of relationships between learning practices, curriculum structure, and the integration of Islamic epistemological values. Interpretation is carried out by comparing field findings with established theoretical frameworks, such as M. Amin Abdullah's integrative-interconnective epistemology and constructivism theory in Education [21].

To maintain the validity of the data, source and method triangulation techniques are used. Data from interviews were validated with observation and documentation data, and reinforced by member checking, which confirms findings and interpretations with key respondents. Data reliability is also improved through trial audits that transparently document the entire research process. With this approach, it is hoped that the results of the research will be able to describe holistically and accurately the dynamics of the integration of Islamic epistemology in technology-based higher education.

RESULTS AND DISCUSSION

Academic Practice of Computer Science Study Program

The following is the arrangement of results and discussions in the form of paragraphs with academic language related to the academic practice of the Computer Science Study Program, curriculum, and learning structure, identification of courses that have the potential to integrate Islamic values, as well as forms of academic activities that support the development of values and spirituality [22].

Academic practices that take place in the Computer Science Study Program in general still prioritize a positivistic paradigm that focuses on technical mastery and skills in the field of

information technology. The curriculum implemented is designed with a priority on scientific competence and industrial needs, so that moral aspects and Islamic values have not been optimally integrated into the learning process. This can be seen from the dominance of courses that focus on the development of technical knowledge and pragmatic skills, while Islamic spiritual values and ethics are still a space that is not systematically worked on [23].

The curriculum structure of the Computer Science Study Program consists of basic, core, and elective courses that generally meet the required technical competency standards. However, there are significant opportunities in several courses, such as Professional Ethics, Islamic Religious Education, and Pancasila and Citizenship Education, to be integrated with Islamic values. This integration can enrich the learning dimension by adding moral and spiritual perspectives, so that students not only have intellectual and technical capacity, but also are based on Islamic morals and ethics in carrying out their profession.

A course that has great potential to include Islamic values is Computer Professional Ethics, which can contain the principles of social responsibility and morality in the use of information technology. In addition, Islamic Religious Education and citizenship courses play a strategic role in instilling spiritual values and nationalism that are in harmony with Islamic teachings. The development of learning modules that combine Islamic epistemology with computer science is essential to foster awareness and deeper understanding of the relationship of technology to life values [24].

In addition to the formal learning aspect, supporting academic activities in fostering values and spirituality currently includes routine recitation, spiritual coaching, and student character development. However, there is still a need to design more integrated and contextual activities, such as seminars and workshops with the theme of Islamic integration in computer science, as well as the formation of scientific communities that focus on discussions on Islamic epistemology and technology. This effort is expected to strengthen spiritual development and Islamic values simultaneously with scientific development, to produce graduates who are not only technically capable but also have moral and spiritual depth through the Islamic integrative epistemological framework [25].

Implementation of Integrative Epistemology

Strategies for integrating Islamic values in learning

To integrate Islamic values in computer science learning, lecturers play a crucial role through various strategic initiatives that are integrative and reflective of Islamic epistemology. One of the steps taken is the development of a learning module that explicitly links the concept of computer science with Islamic values, so that it not only emphasizes the technical aspect but also the moral and spiritual dimensions. Lecturers seek to encourage students to think critically about the ethical and spiritual implications of technological advances, including social responsibility and the impact of technology on the lives of humanity, through the principles of Islamic teachings. In addition, lecturers actively initiated the procurement of seminars, workshops, and scientific discussions that raised the theme of integration between computer science and Islamic values, thus opening up a space for deep dialogue and reflection for students. This approach reflects an integrative epistemological orientation, which synergizes revelation and reason, and breaks the dichotomy between religious science and general science. Thus, the efforts of these lecturers not only enrich the learning experience but also shape the character and spirituality of students in line with the vision of holistic and transdisciplinary Islamic education [26].

The strategy of integrating Islamic values in Computer Science learning is a crucial effort in realizing value-based higher education that not only produces technically competent graduates but also has moral and spiritual integrity. This approach can be realized through the development of teaching materials based on Islamic integrative epistemology, which is a scientific framework that combines revelation (naqli) and reason (aqli) in a unified way of

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view. In this framework, computer science is not only understood as a value-free technical discipline but also as part of a scientific mandate that must be managed ethically and responsibly. Therefore, the development of teaching materials needs to be directed to contain an integrative scientific dimension by incorporating Islamic values such as honesty, justice, social responsibility, and ihsan as moral principles in technology practice [27].

Technically, the integration of these values can start from the design of lecture modules that relate Islamic principles to concepts and practices in Computer Science. For example, in the information technology ethics course, students are not only introduced to global professional norms, but are also invited to study verses of the Qur'an and hadith that are relevant to the principles of justice, transparency, and protection of digital rights. This is in line with the kulli-juz'i approach, which explains that science is part of the overall Islamic value system [28].

In addition, an effective strategy in instilling these values is through the application of reflective discussion methods. Reflective discussions provide space for students to actively criticize and reflect on contemporary issues in the field of technology, such as artificial intelligence, cybersecurity, and big data, from the perspective of Islamic ethics. With this method, learning is not only a transfer of knowledge, but also a transfer of value. Intense interaction between lecturers and students in this discussion room can foster sustainable intellectual and spiritual awareness, so that students can assess, choose, and apply technology based on Islamic values [29].

Thus, the strategy of integrating Islamic values in Computer Science learning is not just an addition of religious material, but a holistic process that transforms the way students think, behave, and act within the framework of a comprehensive Islamic epistemology. This strategy will ultimately result in graduates who are not only professionals in their fields but also have ethical commitments and moral responsibility in the development and utilization of information technology [30].

Institutional role and curriculum policy

The role of institutions in supporting the integration of Islamic epistemology into the curriculum of non-religious study programs, such as Computer Science, greatly determines the success of value-based education transformation. Institutional support can be realized in the form of academic policies that affirm the importance of integrative education as part of the vision and mission of Islamic universities. Within the University of Muhammadiyah Kudus, for example, an integrative approach needs to be explicitly formulated in institutional documents such as the Strategic Plan (Renstra), curriculum policies, and Higher Education Process Standards. This policy serves as a normative framework that requires each study program to integrate Islamic values in the learning process, without ruling out the scientific characteristics of each discipline.

In this context, the Computer Science Study Program and the Faculty under its auspices have a key role as the technical implementers of the integration of Islamic epistemology into the curriculum. The active involvement of the Study Program in designing a value-based curriculum is a strategic step to avoid the purely symbolic approach that often occurs in Islamic higher education institutions. Study programs need to develop a curriculum structure that systematically contains space for integration, both through general compulsory courses such as Islamic Religious Education and Professional Ethics, and through recontextualization of content in core expertise courses such as Programming, Artificial Intelligence, and Cybersecurity. Synergy between lecturers from scientific, religious, and technological backgrounds also needs to be facilitated to encourage the birth of teaching materials and teaching methods that are transdisciplinary [31].

In addition, the role of the faculty as a liaison between institutional policies and the implementation of study programs is very important in overseeing this integration process. Faculty can form a cross-disciplinary curriculum team that is specifically tasked with developing epistemological integration models and assessing the suitability between learning

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plans (RPS), learning outcomes, and indicators of Islamic values. With supportive regulations, active participation from academic managers, and the involvement of lecturers across disciplines, the integration of Islamic epistemology in Computer Science education is not only a normative discourse but can be realized as a sustainable educational praxis oriented towards the formation of a complete Muslim professional character [32].

Empirical Findings: Challenges and Constraints

Empirical findings from various studies and observations in Islamic universities show that the main challenge in the implementation of Islamic integrative epistemology in non-religious study programs, such as Computer Science, lies in the lack of a curriculum that is explicitly designed with an integrative approach. The existing curriculum tends to still strictly separate religious courses from technical science courses, without a systematic effort to unite the two in a complete epistemological framework. This has an impact on the limited pedagogical space to insert Islamic values in computer science learning substantially, both in the design of materials, methods, and learning evaluation [33].

In addition, the low epistemological awareness of students on the importance of integrating Islamic values in exact science is a challenge in itself. Most students view computer science as a neutral science that is only oriented towards efficiency, algorithms, and technical logic, without associating it with moral and spiritual dimensions. Internal surveys in several Islamic universities show that more than 60% of students in technology study programs cannot explain the relationship between Islamic values and the science they study. This shows that the process of internalizing values has not been effective in the learning process, both due to the weak curriculum design and the lack of a reflective and transdisciplinary pedagogical approach [34].

This condition is exacerbated by the strong influence of positivistic and dichotomous paradigms in the practice of higher education, which still lays a sharp separation between religious science and world science. This paradigm has been firmly rooted in the modern education system, which views science as an objective, value-free entity and separate from the moral or faith framework. As a result, the integrative approach is often considered an idealistic discourse that is incompatible with the logic of exact science. As emphasized by Amin Abdullah, the integration of epistemology does not obscure the methodological boundaries of each science but instead directs science to the broader mission of humanity and divinity. Therefore, overcoming these challenges requires systemic efforts that involve curriculum redesign, lecturer training, and the formation of student epistemological awareness in a scientific context rooted in Islamic values.

Critical and Theoretical Analysis

From the perspective of integrative-interconnective epistemology developed by M. Amin Abdullah, the concept of integralistic-centric anthropomorphism occupies a central philosophical position in overcoming the fragmentation of knowledge, that is, the sharp separation between religious science and general science. This "spider web" model places the Qur'an and Sunnah as the main axis, then spreads to the religious sciences, social-humanities, and science synergistically. This approach is particularly relevant in the context of modern educational fragments where disciplines operate in siloed. The theo-anthropo-centric model invites academics and students of Computer Science to understand information technology not only as a neutral object, but also as a space for the interaction of spiritual and humanitarian values, a practical answer to reductive and positivistic tendencies in exact education [35].

Furthermore, the urgency of transdisciplinary integration in technology education becomes even clearer because the challenges of the times, such as algorithmic ethics, cybersecurity, and the social impact of technology, cannot be solved by a single approach. According to Amin Abdullah, the interconnectivity of science encourages inter-disciplinary dialogue: revelation, reason, and empirical experience give back, correct, and enrich each other. This model is also supported by contemporary research that states that the integrative-interconnective model can

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answer the problems of pluralism, sociocultural conflicts, and global challenges more holistically [36].

In the context of Computer Science learning, this approach provides a theoretical foothold to develop a curriculum and teaching methods that are cross-disciplinary and value-meaningful. For example, it not only inserts technology ethics in the form of formal regulations, but also compiles material that connects the concept of algorithm design with the principles of justice, transparency, and courtesy, based on the foundation of tauhidik. This approach also supports the formation of critical awareness, where students are expected to be able to respond to technological issues through the lens of Islamic values, as well as develop humanistic and responsible technological solutions [37].

Therefore, by adopting Amin Abdullah's framework, Computer Science education at the University of Muhammadiyah Kudus can transform from a positivistic-dichotomous paradigm to a value education model that is sustainable, relevant, and ethical, facing the demands of the complexity of the digital world and the morality of technology in the 21st century.

Social Constructivism Approach

In the paradigm of social constructivism, students are placed as active subjects who build complex relationships between Islamic science and values through social interaction and critical reflection in the context of technological learning. The main principle of this theory comes from Lev Vygotsky, who emphasized that the interpretation of scientific concepts and moral values does not occur solely individually, but in a collaborative scheme of social interaction, both between students and between students and lecturers as facilitators who guide through scaffolding (Proximal Development Zones). Within the framework of Islamic epistemology, this social mechanism has an additional meaning: the process of dialogue and reflection allows students to relate Islamic codes of ethics, such as justice, trust, and ihsan, with their technical knowledge, forming ethical vigilance in the practice of science and technology.

The implications for project-based learning design and reflection are strategic because they reflect constructivist and transdisciplinary values. In the context of Computer Science, approaches such as project-based learning and computer-supported collaborative learning (CSCL) can be structured to present real-world projects that require students to apply algorithms, cybersecurity, or artificial intelligence in contextual scenarios, for example, developing social service applications or religious information systems with a series of reflective sessions to examine their ethical implications. This approach not only encourages students to become technology makers but also critical assessors of the social and moral impact of the technology, by the goals of Islamic education that prioritize the formation of knowledgeable and devout people [38].

Implications of the Findings

Based on empirical findings, a systematic conceptual model design is needed to integrate Islamic values into the Computer Science curriculum. The model is designed as a holistic value-based curriculum, covering technical, ethical, and spiritual elements, and is based on transdisciplinary and constructivist integration strategies. One of the relevant conceptual models is the one developed by Judijanto & Yusniar in STEM studies, which recommends incorporating Islamic values into curriculum design, learning strategies, and student evaluation outcomes. They emphasized that the development of a project-based curriculum with the content of ethical streams and contributions of historical Muslim scholars can increase motivation, ethical awareness, and holistic development of students, while overcoming resource constraints and educator readiness.

The practical implications of this model in the context of Computer Science are the development of learning modules that combine technical content (such as algorithms,

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cybersecurity, and AI) with Islamic ethical issues, such as algorithmic justice, trust, and ihsan. Curriculum design should facilitate project-based learning that initiates real work (e.g., applications of artificial intelligence for social-religion), accompanied by reflective sessions that direct students to evaluate technology based on Islamic values. In this context, Hidayat et al. emphasize that the integration of Islamic values into science and technology promotes educational transformations that empower and prosper the ummah, while eliminating the negative potential of technology that is contrary to the values of humanity and spirituality [39].

Thus, this conceptual model serves as a basic framework for designing the Computer Science curriculum at the University of Muhammadiyah Kudus that is not only oriented towards technical competence, but also instills Islamic values substantially. The curriculum encapsulates three main components: (1) relevant and contextual technical content, (2) explicit and measurable elements of Islamic values, (3) reflective and collaborative pedagogical strategies. The evaluation of the success of the model is carried out not only by mastering technical materials, but also by the ability of students to apply Islamic values in real technology projects. With this approach, technological higher education on Islamic campuses can answer the needs of modern times without losing value, as well as produce graduates who are professional as well as ethical and have spiritual integrity.

The implementation of value pedagogy in technology learning needs to be designed as a learning process that explicitly integrates Islamic principles in methods, materials, and classroom interactions. A study by Luluk Mukarromah & Schochibul Hujjah confirms that learning innovations, such as interactive digital applications that incorporate Islamic values and blended learning approaches, can increase motivation and strengthen students' Islamic identity in a digital context. Therefore, in the context of Computer Science, the development of teaching materials should utilize digital platforms, such as discussion forums or interactive learning applications, which not only present technical theories but also encourage reflection on values such as trust, justice, and social responsibility in the use of technology.

Furthermore, Yunita & Mulyadi argue that the integration of technology in Islamic education must be combined with the principles of active, collaborative, and student-centered pedagogy, which effectively strengthen Islamic values such as compassion (rahmah), justice ('adl), and moral exemplary (uswah). The implication for Computer Science learning is the application of project-based and collaborative learning (CSCL) strategies, in which students work on real projects such as mosque information systems, religious applications, or algorithmic ethical analysis in groups, and then reflect on how Islamic values are applied in their engineering outcomes and processes [40].

In terms of institutional practice, a bibliometric study by Judijanto & Arwen shows an increase in interest in sociocultural- and technology-oriented Islamic pedagogy, with the need for the involvement of lecturers and stakeholders in the design of value-sensitive curriculum, not just secular content. This indicates the importance of continuous training for Computer Science lecturers—both improving digital literacy and understanding Islamic values so that they can become effective facilitators in the dialogue of science and values.

In addition, Aksan, Zein, & Saumur explore STEM-Islamic integration as a model that integrates ethics, research, and technology in the STEM curriculum, emphasizing that technology education needs to include reflection on values as an inseparable part of the learning process, not just an additional attribute. Thus, technology educators, including in Computer Science, are encouraged to design modules that not only teach technical algorithms, but also insert digital ethics case studies and reflective analysis based on Islamic values.

Overall, the recommendations for value pedagogy in the context of Computer Science are: (1) utilizing interactive digital technologies that insert value content; (2) implement project-based collaborative learning methods and reflective discussions that link technology to moral/religious values; (3) organizing training and mentoring for lecturers for technological skills and value understanding; (4) develop an Islamic STEM-curriculum design to ensure that the technology-learning process is carried out in a holistic and contextual value frame. This

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approach has the potential to produce graduates who are not only technically superior but also morally and spiritually responsible.

The findings show that the development of a transdisciplinary-based curriculum makes a significant contribution to strengthening Islamic higher education, with a more contextual and cross-disciplinary orientation. This transdisciplinary model demands the integration of religious studies, social sciences, science, and technology in a cohesive curriculum framework, in line with the Society 5.0 paradigm and readiness to face global challenges such as environmental sustainability and technological ethics. The application of this model, as initiated in the integrated curriculum development of PAI in the Society 5.0 era, provides space for Computer Science students to explore the relationship between algorithms and beliefs, or big data and ihsan, in a meaningful and applicable learning process.

Furthermore, a transdisciplinary approach supports holistic education rooted in Islamic principles such as tawhid, justice ('adl), and ecological responsibility (caliph). Through Amin Abdullah's Multi-Inter-Transdisciplinary model and cross-sectoral curriculum model, science and technology materials are not seen as neutral entities, but as part of a sacred and humanistic value system. This approach has also been empirically recognized as being able to facilitate the development of critical thinking, creativity, and student collaboration, as well as awareness of religion's contribution to solutions to contemporary social, ecological, and technological challenges.

In practical terms, transdisciplinary contributions to Islamic higher education include (1) curriculum reforms that integrate religious and technological content in cross-program courses; (2) strengthening cooperation between faculties and religious institutions to develop transdisciplinary modules such as green computing, data ethics, and sharia-based AI; (3) the implementation of authentic and reflective learning methods through real projects that bridge Islamic values with digital technical competencies. This initiative is in line with the findings regarding the implementation of Knowledge Integration at UIN Sunan Kalijaga and universities in France, which show the improvement of student competence and character through the integration of Islamic values in the science and technology curriculum.

Thus, transdisciplinary-based Islamic higher education not only strengthens the synergy between science and religion but also responds to the demands of the times, ranging from sustainability, digital ethics, to social usefulness by producing graduates who are not only technically competent but also religious, ethical, and globally responsible. This is a real contribution in the era of Society 5.0, where the integration of science, religion, and technology becomes a progressive and relevant future educational strategy.

Table 1. Implications of the Findings

No	Key Findings	Theoretical Implications	Practical Implications
1	The integration of Islamic values is still sporadic and symbolic	Requires a non-dichotomous and positivistic epistemological paradigm	There is a need for an explicit curriculum reformulation that integrates Islamic values
2	The epistemological awareness of the academic community is still low	Need a reflection-based and transdisciplinary educational approach	Lecturer training and Islamic epistemology literacy workshop
3	Courses such as Professional Ethics & PAI have integrative potential	Strengthening the kulli-juz'i and theoanthropocentric approach	Course modules are developed based on the integration of Islamic values
4	A technocratic, dominant curriculum with no moral values	Amin Abdullah's theory is relevant as a transdisciplinary foundation	Integration of grades through recontextualization of content in scientific courses

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5	The positivistic paradigm still dominates	The theory of social constructivism can provide an alternative approach to learning.	Use project-based learning and ethical reflection in lectures.
6	Low perception of students on the importance of Islamic values in computer science	Students as subjects form meaning through the interaction of values	Interactive learning and value discussions in the classroom
7	Academic activities are not fully contextual with Islamic values	The need for a spirituality-based academic ecosystem	Scientific community development, thematic studies, and value mentoring
8	Lack of explicit policies at the study program level	Higher education policy must be reflective of an integrative epistemology	Adjustment of academic documents such as RPS, Strategic Plan, and institutional standards
9	Limitations of research and practice in the exact field	Expansion of the realm of Islamic epistemology to applied science and technology	Strengthening collaboration between lecturers across religious and exact fields
10	The value pedagogy model has been proven to increase relevance and meaningfulness.	Modern Islamic education must be contextual, cross-disciplinary, and value-based	Curriculum design and learning based on STEM-Islam and society 5.0

The integration of Islamic epistemology into non-religious disciplines, particularly Computer Science, reflects a critical response to the ongoing epistemological dichotomy in higher education between religious and secular sciences. This study reveals that while theoretical frameworks like M. Amin Abdullah's integrative-interconnective epistemology offer a powerful paradigm to merge reason, revelation, and empirical science, the actual application in academic practices remains limited and mostly symbolic. At Universitas Muhammadiyah Kudus, the Computer Science Study Program demonstrates partial efforts towards this integration, primarily in subjects such as Professional Ethics and Islamic Religious Education, which serve as key entry points for value-based education [41].

Curricularly, the program is dominated by technocratic and positivistic content that emphasizes technical competence, yet lacks systematic incorporation of moral and spiritual dimensions. While some lecturers have developed modules to contextualize Islamic values in the learning process, these efforts are often isolated and not institutionally mandated. Moreover, student epistemological awareness remains low, with many perceiving Computer Science as value-neutral, thereby perpetuating the separation between technological knowledge and religious ethics. From a theoretical perspective, the study is grounded in Amin Abdullah's "spider web" model, which argues for an anthropocentric-theocentric approach that intertwines the Qur'an, social sciences, and natural sciences. This model challenges the existing positivist paradigm and calls for a transdisciplinary educational approach that integrates revelation and reason into all knowledge domains, including technology. Complementary to this, the social constructivist approach by Vygotsky reinforces the need for participatory, reflective, and project-based learning methods that involve active engagement with Islamic values.

The research identifies several institutional and pedagogical challenges. Firstly, curriculum documents often lack explicit policies for value integration. Secondly, lecturers need more training and support to implement integrative pedagogy effectively. Lastly, academic activities outside the classroom do not sufficiently reinforce Islamic epistemological values, missing opportunities to form a spiritually rich academic culture. Despite these obstacles, the study highlights actionable strategies for transformation. These include reformulating the curriculum to embed Islamic values across technical subjects, fostering interdisciplinary collaboration among faculty, and developing project-based modules that encourage students to explore

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ethical and spiritual dimensions of their technical work. For instance, courses on artificial intelligence or cybersecurity could incorporate case studies reflecting on algorithmic justice from an Islamic ethical perspective.

The implications of the study are far-reaching. Practically, it advocates for institutional reform at policy and operational levels to support integrative epistemology. Theoretically, it contributes to the discourse on Islamic education by demonstrating how a transdisciplinary, values-based approach can enhance the relevance and humanity of technological education. A conceptual model involving three key components, technical content, Islamic value indicators, and reflective pedagogy, is proposed to guide implementation. In conclusion, the study affirms that the transformation of Islamic epistemology in Computer Science education is not only necessary but feasible. It requires a systemic shift from symbolic to substantive integration, ensuring that graduates are not just technically proficient but also morally grounded and spiritually conscious. Such transformation aligns with the vision of Islamic education as a means of nurturing holistic human beings capable of responding to the complex moral challenges of the digital era with wisdom and integrity.

CONCLUSION

Based on the overall findings, it can be concluded that the integration of Islamic epistemology into higher education, especially in non-religious study programs such as Computer Science, is a strategic need to form an Islamic education system that is holistic, relevant, and contextual to the challenges of the digital era. This integration is important in overcoming the fragmentation of knowledge that has occurred due to the dominance of dichotomous and positivistic paradigms, which separate religious and general sciences. By adopting the integrative-interconnected epistemological approach as developed by M. Amin Abdullah, Islamic higher education is encouraged to unite the dimensions of revelation, reason, and empirical experience in a single mutually enriching scientific framework. In the context of Computer Science, this means that learning is not only directed at technical and cognitive aspects but also includes moral, spiritual, and social values that are the pillars of Islamic scientific ethics. The results of the study show that there are still some major challenges, ranging from the lack of an integrative-based explicit curriculum, the low epistemological awareness of students on the relationship between science and Islamic values, to the strong influence of technocratic approaches in technological pedagogy. Nevertheless, these findings also indicate that there is great space and opportunity to build a transdisciplinary learning model that combines technical aspects and Islamic values through strategies to strengthen value pedagogy, such as project-based learning, ethical reflection, and Islamic context-based module design. Islamic higher education institutions and policies have a central role in supporting these efforts through curriculum reform, lecturer training, and cross-disciplinary collaboration. Thus, this study emphasizes the importance of the transdisciplinary paradigm in Islamic higher education as an approach to instill values, develop professional competencies, and shape students' social and spiritual awareness in the technological era. An integrative curriculum design that blends computer science content with Islamic principles will not only strengthen students' Islamic identities but also increase the social and moral relevance of graduates of Islamic higher education. It is an important contribution in creating a generation of Muslim technologists who are professional, ethical, and actively contribute to a values-based civilization.

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Author Contribution

All authors contributed equally to the conception, design, and writing of this article. They collaboratively conducted the literature review, data analysis, and discussion. The first author led the drafting process, while co-authors reviewed and refined the manuscript.

Conflicts of Interest

All authors declare no conflict of interest.

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