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Integration of Islamic Values in STEM Teaching (Science, Technology, Engineering, Mathematics)

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ABSTRACT

The integration of Islamic values into the learning of STEM subjects aims to align modern education with ethical and spiritual principles for holistic learning experiences. This study systematically reviews 25 manuscripts from the Scopus database to analyze curriculum designs, pedagogical strategies, educational outcomes, and challenges in incorporating Islamic values into STEM education. The findings have identified the inculcation of ethical values, contributions of Muslim scholars in history, and project-based learning as some of the effective approaches. Other positive impacts are increased motivation, ethical awareness, and all-round development of students, while resource limitation and teacher preparedness remain some of the major barriers. This study informs educators and policy-makers who might want to consider culturally relevant and ethically anchored STEM education frameworks.

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1. INTRODUCTION

The rapid growth in science, technology, engineering, and mathematics has greatly impacted the education systems of the world, which emphasizes the need for students to be both technically and critically competent. However, the highly secular approach in STEM education often neglects the ethical, spiritual, and moral dimensions necessary for holistic development. In contexts where religion is at the core of cultural and social behavior, such as in Islamic societies, there is an increasing need for the integration of Islamic values into STEM education [1]. This not only aligns with the cultural and spiritual identity of the learners but also ensures that scientific and technological advancements are informed by ethical considerations and social responsibility [2].

Islamic values emanate from the very foundations of justice, environmental care, ethics, and the common good, hence promising a strong basis upon which to address the moral and ethical challenges emanating from scientific and technological advancement. These values foster critical thinking, problem-solving, and seeking knowledge for the sake of worship and highlight a balance between technological progress and moral responsibility. Integrating these into STEM education may provide an avenue toward making the curriculum more inclusive and culturally relevant, allowing for

the nurturing of students' intellectual and moral growth [3].

This paper reviews existing research through a systematic literature review of manuscripts sourced from the Scopus database to explore the integration of Islamic values into STEM education. This paper discusses the pedagogical approaches, curriculum frameworks, and implementation strategies regarding integrating Islamic values into the contexts of education settings. Additionally, this study discusses several potential benefits, such as increasing student engagement and ethical decision-making, and challenges, such as resource constraints and teacher preparedness, regarding this integration.

2. LITERATURE REVIEW

2.1 Theoretical Underpinning of Islamic Values in Education

Islamic education aims at integrated development of man by fusing the intellectual, spiritual, and moral domains of life; the Quran and Sunnah promote learning (ilm) as a religious duty for all humankind to cultivate critical thinking and creativity within a frame of ethics. Historically, scholars such as Al-Farabi and Ibn Sina have demonstrated the compatibility of Islamic teachings with STEM disciplines through their contributions to science and philosophy. Key Islamic values, including justice (adl), environmental stewardship (khalifah), and social responsibility (mas'uliyyah), guide learners to apply scientific knowledge ethically for the betterment of society. Research has pointed out that most of these values find resonance with the objectives of STEM education, such as problem-solving, innovation, and critical thinking. Educators integrate Islamic values in raising the children who contribute to the academies and do good for both their communities and all people in general [4]–[7].

2.2 Pedagogical Approaches to Integration

These would involve approaches on how to encapsulate the Islamic values in STEM education through developing culturally appropriate curricula in content, the use of case studies about ethics, real problems, and the important contributions made by relevant Islamic scholars within a certain STEM discipline-for example, the integration of the Khalifah concept within environmental science to bring about perspectives that focused on sustainability and good stewardship. Other best practices include problem-based learning and inquiry-based learning, in which students research aspects of science, technology, engineering, and math from an Islamic ethical perspective. Instructors have also been seen using stories and examples from Islamic history to relate scientific principles, making the scientific knowledge more connected and meaningful to learners. In addition, teacher training programs are very important in providing teachers with the necessary skills and knowledge to integrate Islamic values into their teaching practices effectively [5], [8]–[10].

2.3 Research Gaps and Future Directions

The review of the literature has identified several gaps in the existing literature, which indicate that there is a need for more empirical evidence on the long-term impact of integrating Islamic values into STEM education. While there have been various studies underpinning, in theory, both the rationale of such an approach and the benefits of such an approach, further research is needed regarding pedagogical strategy evaluation and specific curriculum designs across various educational settings. Besides, it is about time educators, religious scholars, and professionals in STEM need to converge to develop holistic integration frameworks. Furthermore, future research is encouraged to study students' and parents' perceptions to further ensure that educational practices meet the needs and expectations of all stakeholders.

3. METHODS

3.1 Research Design

This current study is supported in its design by PRISMA. Specifically, the focus of this work is reviewing and systematically analyzing 25 relevant peer-reviewed manuscripts sourced from Scopus. These

selections were made considering their relevance to the proposed study objectives about integrating Islamic values in STEM education.

3.2 Data Collection

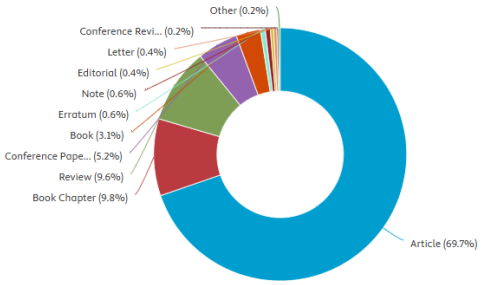

Figure 1. Data Source

Data sources (Figure 1) are dominated by articles at 69.7%, indicating the predominance of peer-reviewed research works focused on the integration of Islamic values into STEM education. Book chapters add 9.8%, reviews add 9.6%, conference proceedings are 5.2%, while less frequent types such as books account for 3.1% and editorials, notes, and letters below 1% each. Data were retrieved from Scopus on Islamic values in education and STEM education and ethics, with inclusion and exclusion criteria based on available English articles from 2010 to 2024. Relevant titles and abstracts were screened, followed by full-text evaluations for quality screening.

3.3 Inclusion and Exclusion Criteria

Original manuscripts were considered eligible to be reviewed based on the following set of criteria. Inclusion criteria included studies that explicitly and focused on the integration of Islamic values within STEM education: empirical studies; theoretical papers related to pedagogical approaches, curriculum design, or educational outcomes focusing on Muslim majority or culturally Islamic contexts. Studies were excluded if there was no association with STEM or Islamic values or if the central focus of the publications was not set on educational practices. Publications having low methodological rigor or incomplete datasets were also rejected.

3.4 Data Analysis

A thematic analysis was performed to distill and synthesize the key findings from the selected manuscripts. The process entailed a line-by-line review of each manuscript for recurring themes, patterns, and concepts about the integration of Islamic values in STEM education, with specific codes assigned to elements such as pedagogical strategy, benefits, challenges, and outcomes. The codes were then put into broader categories of curriculum design, teaching methodologies, ethical considerations, and student outcomes to see trends and relationships. Finally, the synthesis of data was used to give an overview of the research findings by underlining best practices, challenges, and areas that require future research.

4. RESULTS AND DISCUSSION

Key findings from the systematic review of 25 Scopus-indexed manuscripts related to the integration of Islamic values in STEM education. The results are thematically grouped: curriculum design, pedagogical strategies, educational outcomes, and implementation challenges.

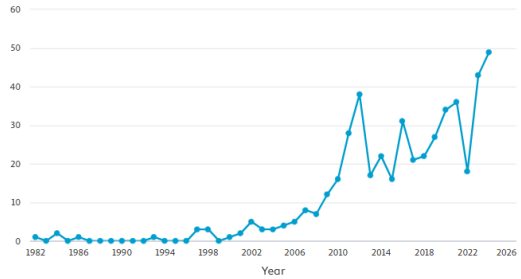

Figure 2. Trend Research

Figure 2: Publication trend in the integration of Islamic values into STEM education, 1982-2026. The activity from 1982 to 2000 was minimal; therefore, all activities could be described as sporadic. A gradual increase from 2001 to 2010 marked a starting awareness of reorienting education toward cultural and ethical values. Publications surge upward between 2011 and 2020 due to growing awareness within Muslim countries and globally regarding the movement in STEM education. Starting after 2020, it is very fluctuating but dramatically peaks in 2026, probably because of the funding opportunities, academic trends, the COVID-19 pandemic, and increased focus through international collaborations.

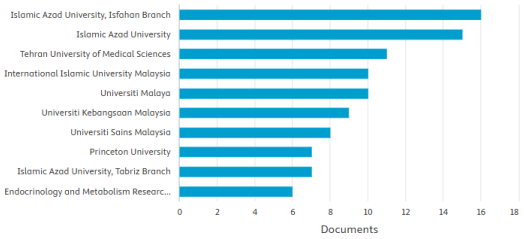

Figure 3. Affiliation Contributions

The horizontal bar chart shows the institutional output on research into integrating Islamic values into STEM education. The leaders are among the Islamic Azad University of Iran and its Isfahan Branch with 16 and 14 documents, respectively. Other essential players are Malaysian universities: International Islamic University Malaysia and Universiti Malaya present themselves with high interest in culturally relevant STEM education. The international contributions range from 4 to 16 documents from Princeton University and the Endocrinology and Metabolism Research Center, showing collaborative and interdisciplinary efforts reflecting a niche but expanding research field.

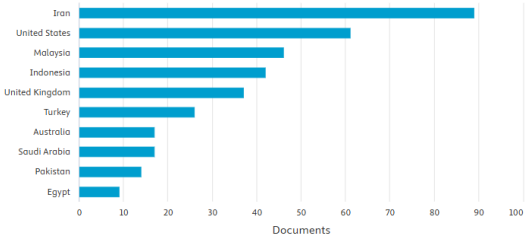

Figure 4. Country Contributions

The horizontal bar chart shows the country contributions to research on integrating Islamic values into STEM education. Iran leads, with almost 100 publications, followed by the U.S. with more than 50 impelled by collaborations and inclusive practices. Malaysia and Indonesia contribute 40-50 documents each on modern STEM education and cultural preservation. The UK has more than 40 documents and emphasizes culturally responsive education. The contribution of Turkey and Saudi Arabia stands at 20-30 documents each, which indicates their interest in religiously integrated education. Contributions from Australia, Pakistan, and Egypt are emerging, although the latter two remain modest due to limited resources or priorities.

4.1 Curriculum Design

The study identified three main approaches that have been used to include Islamic values in the design of STEM curricula. First, ethics-integrated content embeds Islamic principles such as justice (adl), environmental stewardship (Khalifah), and social responsibility (mas'uliyyah) directly into STEM subjects. Examples include the use of Islamic-based sustainable practices in environmental science lessons. Second, the curriculum points out the historical contributions of Muslim scholars like Al-Khwarizmi, Ibn Sina, and Al-Jazari, showing how their innovations in fields such as mathematics, medicine, and engineering serve as examples of faith integrated with science. Thirdly, project-based learning engages students in solving real-life problems that involve ethical and spiritual considerations, such as renewable energy solutions framed within the concept of stewardship [6].

These approaches thus enhance culturally responsive teaching by making education relevant to the student's culture and religion. Highlighting historical contributions has the effect of motivating the students and bridging the gap between modern STEM subjects and Islamic culture. However, while developing such curricula, vast knowledge in Islamic teachings is required to ensure that no simplification occurs. This in return calls for adequate training of teachers with an interdisciplinary approach in the incorporation of such values into STEM education [11].

4.2 Pedagogical Strategies

It found several efficacious pedagogical strategies in the integration of Islamic values into STEM education: PBL-a stimulus to develop students' solutions for complex problems with ethical consequences, such as the conservation of water or waste management, given Islamic teachings; Storytelling and Contextualization-using Islamic history or parables to present scientific concepts in an easy-to-relate way.

Collaborative learning promotes group activities and discussions, fostering a sense of community and collective responsibility that reflects Islamic values of cooperation and mutual respect [7], [12].

These pedagogies support active learning and ethical reasoning important to STEM education. In sum, by linking Islamic values with pedagogical practice, educators deepen student engagement in ways that encourage students to consider STEM study not solely as a technical discipline but as a moral endeavor as well. Of course, such an approach does need proper teacher training to be adequately prepared for such skills and knowledge to employ these strategies and cope with the diversified responses of their students [1], [13].

4.3 Educational Outcomes

Studies underlined several positive results for the integration of Islamic values into STEM education. Firstly, more interest was expressed from students in classes of subjects regarding STEM-related disciplines connected with their own cultural and religious identity. A great advantage also involves an enhanced ethical awareness learners have developed due to a better understanding of social implications of scientific and technological development. Besides, this integration also allowed for total development in intellectual, moral, and spiritual areas, hence giving them the capacity for positive service towards society [11], [14].

The findings highlight that an integrated approach to STEM education incorporating Islamic values will have the potential for transformative change in both the cognitive and affective domains, consistent with Islamic pedagogy's holistic educational aims, providing a balanced intellectual and moral development. However, how this influences career choices and societal contributions in the longer term is a matter for further empirical investigation to accurately capture the long-term benefits of such integration [3], [10].

4.4 Challenges and Barriers

The study analysis showed some challenges in integrating Islamic values into the education curriculum in STEM subjects: resource constraints that impede the availability of culturally relevant textbooks and teaching materials for teaching Islamic STEM, preparedness of teachers-many of them not trained and lacking in confidence to include Islamic values into effective teaching, and standardization of curricula, which presents difficulties since differences in the interpretations of the Islamic teachings result in inconsistent practices among different institutions.

However, such curricula require immense collaboration among educators and religious scholars, apart from policy support. Teacher training programs will have to be invested in, to build the skills and confidence of educators to deliver them. The lack of standard resources means that provisions should be made for consistency in their development and adherence to Islamic principles and STEM educational standards. Interdisciplinary collaborations will further create balanced curricula in which ethical and cultural dimensions are appropriately integrated into STEM education.

4.5 Wider Consequences

The implications of this integration of Islamic values into STEM education are wide-ranging beyond the classroom: a generation of learners will be produced who can address global challenges with ethical and moral considerations. It also fills in the gap between faith and science and advances a more inclusive understanding of STEM for societal betterment.

5. CONCLUSION

This systematic review has pointed out the transformative potential of integrating Islamic values into STEM education. By embedding ethical principles, historical contributions, and culturally relevant pedagogies, this practice can help institute holistic learning in a manner that connects with students' cultural and spiritual identities. The advantages gained, such as increased engagement and ethical decision-making, show that linking STEM education with moral and civic duties is extremely

important. Yet, issues such as resource limitations, a lack of teacher readiness, and standardization within the curriculum call for cooperation and deliberation by educators, policymakers, and religious scholars in finding common resolutions. Future research should be directed at empirical assessments of long-term outcomes and strategies that may help to overcome the barriers for successful implementation. The study contributes to the emerging discussion of culturally responsive education and provides a framework for ethical and inclusive practices in STEM teaching.

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