



Exploration Of Stem And The Quran For Holistic Teaching And Learning

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Received: September 20, 2024

Accepted: October 03, 2024

Online Published: October 20, 2024

Abstract

This research explores how Science, Technology, Engineering, and Mathematics (STEM) can be combined with teachings from the Quran to create a well-rounded educational approach. The goal is to bring together modern scientific knowledge and spiritual wisdom, fostering a more holistic learning experience. By blending STEM with Quranic principles, the study aims to promote critical thinking, ethical decision-making, and spiritual development in students. The research uses content analysis and begins with a detailed review of existing literature, drawing from databases like PsycINFO, JSTOR, PubMed, and Google Scholar. The findings suggest that a curriculum integrating STEM and Quranic teachings can help students gain the skills and values they need to succeed in today's complex, interconnected world.

Keywords: STEM Education, Q-STEM, Critical Thinking, Spiritual Development.

1. Introduction

Recognizing the requirement of equipping the workforce with proficiency in STEM fields, the United States implemented STEM education as early as the 1990s (Jang, 2016). The National Science Foundation (NSF) introduced the acronym STEM in 1991 as part of a policy reform in the United States education system. Its purpose is to equip every American citizen with the necessary skills and knowledge to pursue careers in Science, Technology, Engineering, and Mathematics (STEM) and related fields. According to the definition of STEM education provided by Moore et al. (2021), the optimal STEM education should involve the convergence of the four components of STEM. The integration of scientific and mathematics teaching and learning concepts with engineering practice should be facilitated by technology. STEM education refers to an educational approach that is grounded in four specific fields: Science, Technology, Engineering, and Mathematics. The implementation of the Malaysian Education Development Plan (PPPM) 2013-2025 places significant emphasis on STEM education (Don et al., 2015). An analysis of the evolution of STEM education and the obstacles encountered in its implementation in Malaysia is the objective of this study.

Malaysia is confronted with several issues in the 21st century, including those arising from globalisation and the advancement of communication technologies. Malaysia highly prioritises STEM education as a means of advancing the nation, attaining the targeted percentage of STEM professionals, and ultimately meeting the requirements and expectations of a STEM-oriented economy. Hence, education assumes a crucial function in cultivating competent and competitive pupils who can confront the obstacles posed by the Industrial Revolution. 4.0. The cultivation of interest in STEM is crucial for the development of individuals who possess the skills to effectively utilize and oversee scientific and technological resources (Vennix et al, 2018). Improving STEM education has been identified as a priority by the Malaysian Ministry of Education (MOE) in 2013. Significant efforts have been undertaken to overhaul STEM education, including the implementation of a new science curriculum in secondary schools in 2017 and the adoption of school-based evaluation in 2011. The primary objective of these efforts is to revolutionize STEM education in Malaysian schools, thereby enhancing students' career aspirations and motivation to pursue Science education and attain global competitiveness (Bunyamin et al, 2020).

The integration of STEM education with the moral and philosophical teachings of the Quran could also serve as a unique pedagogical framework that enhances students' capacity for ethical decision-making in scientific and technological advancements. This dual approach can help students appreciate the broader societal and environmental consequences of their work in STEM fields, aligning their professional goals with a sense of moral responsibility. In this way, STEM education is not just about equipping students with technical proficiency but also about nurturing a sense of stewardship and accountability in their contributions to society. Furthermore, linking STEM education with religious or ethical teachings like those found in the Quran could help address one of the key challenges in STEM education maintaining student engagement and motivation. Research suggests that students are more likely to be engaged in learning when they see personal relevance in the material being taught. By connecting STEM subjects to



students' values and beliefs, educators can create a more meaningful and relatable educational experience, increasing both retention in STEM fields and the likelihood of students pursuing STEM careers (Sahin et al., 2020). This holistic approach to STEM education has the potential to cultivate not only the next generation of engineers, scientists, and technologists but also leaders who are equipped with the moral compass necessary to navigate the ethical dilemmas posed by the rapid advancements of the modern world, such as artificial intelligence, genetic engineering, and environmental sustainability. As Malaysia continues to emphasize STEM education as a national priority, integrating these teachings with ethical considerations may prove to be an innovative and impactful strategy for developing well-rounded, responsible citizens ready to face the challenges of the 21st century.

2. Problem Statement

In 2023, the enrolment of students into the Science, Technology, Engineering & Mathematic (STEM) stream was only 45.73%, according to data from the Education Ministry. This is still quite low which directly indicate the lack of interest among students to pursue their study in STEM. A lot of effort carried out by government such as encourage more students to select STEM majors through RM100 million incentive that would be set aside in budget 2024 (The Sun, 2024) Furthermore, there was a 15.2% decline in the number of STEM stream candidates for SPM last year. This problem could have the worst impact on STEM-related professions that very important in IR 4.0 including medicine, engineering, science, and many more (Berita Harian, 2024). Ministry of Science, Technology and Innovation (MoSTI) also trying their best to promote STEM through the use of gaming, competitions and networking in Malaysia Techlympics 2024 as an alternative format to traditional classroom instruction. This strategy focuses on the younger generation to motivate them exploring STEM (Bernama, 2024). The problem is current syllabus did not comprise any relation of science with religion (al-Quran) or moral values (*akhlak*) causing the subject feel dry, difficult, not valuable, only for top students and not interesting or relate to life at all. The Sciences-based study as the home for physics, chemistry and biology are being separated with religious studies that consider as social science school. However, the function of science in explaining religion phenomenon (al-Quran) is very important. Science can be a valid tool to have better and deeper understanding of various Islamic jurisprudence.

3. Methodology

The methodology for this study using content analysis would involve several steps. Firstly, a comprehensive literature search would be conducted using databases such as PsycINFO, JSTOR, PubMed, and Google Scholar. The search would be guided by keywords and phrases such as "STEM and al-Quran", "STEM for education", "STEM in Islam". The search would also include combinations of these keywords to ensure a thorough exploration of the topic. The criteria for selecting literature would consist of relevance to the research question, recency, and the source's credibility. Once the literature is collected, the content analysis would begin. This would involve systematically coding and categorizing the data to identify patterns, themes, and relationships. Qualitative and quantitative content analysis methods could be used depending on the nature of the data. Qualitative content analysis would involve interpreting the meaning of the content, while quantitative content analysis would involve counting and measuring aspects of the content. The findings from the content analysis would then be used to conclude the influence of STEM and al-Quran education.

4. Discussion

In Islamic philosophy, the pursuit of knowledge, including Science, Technology, Engineering, and Mathematics (STEM), is deeply rooted in the principles of *tawhid* (the oneness of God) and the quest for understanding the natural world as a reflection of divine wisdom. Islamic teachings emphasize that all knowledge, whether derived from divine revelation or empirical investigation, ultimately originates from Allah. This holistic view encourages the integration of religious and scientific knowledge, fostering a comprehensive understanding of the universe. Historically, the Islamic Golden Age, 8th to 14th centuries exemplified this integration, with scholars making significant contributions to various STEM fields (Abas et al., 2024). Figures like Al-Khwarizmi, known as the father of algebra, and Ibn al-Haytham, a pioneer in optics, exemplify how Islamic scholars approached scientific inquiry with a sense of religious duty and intellectual curiosity. Their work was driven by the belief that studying the natural world was a form of worship and a means to appreciate the intricacies of Allah creation. In contemporary times, the integration of STEM education with Islamic values continues to be a focus in many muslim majority countries. Educational initiatives often aim to embed Islamic ethics and character education within STEM curriculum, promoting a balanced approach that respects both scientific rigor and moral considerations. For instance, the development of the Quran-Science, Technology, Engineering, Art, and Mathematics (Q-STEAM) module in Malaysia is an example of how modern educational frameworks can incorporate Quranic teachings to enhance students' understanding of STEM subjects while fostering Islamic character (Abd Rauf & Zulnaidi, 2024).



This approach underscores the importance of ethical considerations in scientific endeavours, aligning with the broader Islamic principle of seeking knowledge for the betterment of humanity (Yasin & Jani (2013). By integrating STEM education with Islamic philosophy, educators aim to produce well-rounded individuals who are not only proficient in technical skills but also guided by strong moral and ethical values (Masud et al., 2023). This holistic educational philosophy reflects the enduring legacy of Islamic scholarship and its commitment to the harmonious development of both the mind and the spirit. The integration of Science, Technology, Engineering, and Mathematics (STEM) with holistic teaching approaches has become increasingly relevant in contemporary education. This exploration can be particularly enriching when viewed through the lens of the Quran, which offers profound insights into the natural world, human existence, and the pursuit of knowledge. STEM education emphasizes critical thinking, problem-solving, and innovation, equipping students with essential skills for the 21st century (Ah-Namand & Osman, 2018). Conversely, holistic teaching promotes an interconnected understanding of various disciplines, nurturing not only cognitive development but also emotional, social, and ethical growth. The Quran, as a foundational text for millions around the world, serves as a rich source of knowledge that can inspire students to appreciate the wonders of the universe and the importance of inquiry.

In order to address this substantial problem, teachers must engage in innovative teaching and learning methods to enhance students' motivation and understanding (Tan, 2021). However, pursuant to the education legislation, educators are also obligated to assist students in enhancing their character. It is imperative for educators to adopt student-centered learning and utilize the student's surroundings as a platform, as required by the contemporary school environment (Yakman, 2008). One educational approach that fulfils these characteristics is the incorporation of project-based learning into the curriculum. Yakman (2008) defines STEAM (Science, Technology, Engineering, Art, and Mathematics) as a comprehensive educational method that combines the disciplines of science, technology, engineering, art, and mathematics into a unified instruction. STEAM learning is a project-based instructional method that is well-suited for enhancing students' mathematical abilities, as well as fostering their aesthetic values and social skills that are essential for their everyday lives (Badriyah et al., 2020). Additionally, it emphasizes the proficiency in language, which is the primary instrument for success in the modern industrial age. Considerable research and development of teaching media applying the STEAM approach has been conducted. However, this research fails to address the cultivation of students' character and instead focuses only on enhancing their STEM skills, including their positive influence on the scientific process, investigative abilities, and creative thinking (Thuneberg et al., 2018). Furthermore, it fosters the development of their reasoning abilities, critical thinking, originality, creativity, scientific literacy, and problem-solving skills. The implementation of the STEAM method in the teaching and learning process will advocate for the development of literacy skills relevant to the 21st century. This will enable students to effectively tackle the demands of globalization and actively participate in contemporary society (Chung & Li, 2021).

By combining STEM education with the teachings of the Quran, educators can help students see how their studies relate to their beliefs, giving them a sense of purpose and responsibility. This approach not only produces knowledgeable and skilled individuals, but also thoughtful and responsible citizens ready to face the challenges of today's world. Integrating STEM with Quranic teachings offers a more well-rounded approach to education. It bridges modern scientific knowledge with spiritual wisdom, helping students gain a deeper understanding of both. As stated in the Quran:

The Quran encourages exploring the world around us. For example, the verse al-Ankabut:20

Say, O Prophet, "Travel throughout the land and see how He originated the creation, then Allah will bring it into being one more time. Surely Allah is Most Capable of everything."

This promotes curiosity and learning about the natural world. Similarly, STEM education teaches critical thinking and problem-solving, which can be enriched by the moral and ethical guidance found in the Quran.

The Quran places great value on seeking knowledge. For example, the verses al-'Alaq:1 and az-Zumar :9

"Read, O Prophet, in the Name of your Lord Who created"

"Are they better or those who worship 'their Lord' devoutly in the hours of the night, prostrating and standing, fearing the Hereafter and hoping for the mercy of their Lord? Say, O Prophet, "Are those who know equal to those who do not know?" None will be mindful of this except people of reason"

Combining STEM with Quranic teachings encourages students to gain knowledge in both religious and scientific areas, fostering a more balanced, well-rounded education.



The Quran places great value on ethics in science and technology. For example, the verses an-Nisa:36

“Worship Allah alone and associate none with Him. And be kind to parents, relatives, orphans, the poor, near and distant neighbours, close friends, needy travellers, and those bondspeople in your possession. Surely Allah does not like whoever is arrogant, boastful”

The Quran offers a moral compass that can guide how science and technology are used. Principles such as justice, caring for the Earth, and promoting the welfare of humanity can shape responsible scientific practices. By integrating these ethical considerations into STEM education, students can develop a stronger sense of purpose and responsibility in their scientific pursuits.

The Quran places great value on interdisciplinary learning. For example, the verses al-Baqarah:45

“And seek help through patience and prayer. Indeed, it is a burden except for the humble”

Combining STEM with Quranic studies promotes interdisciplinary learning, allowing students to see the connections between different areas of knowledge. This approach helps students appreciate the harmony between science and spirituality, leading to a more balanced and meaningful education.

The Quran places great value on historical contributions. For example, the verse ar-Rum:21

“And one of His signs is that He created for you spouses from among yourselves so that you may find comfort in them. And He has placed between you compassion and mercy. Surely in this are signs for people who reflect”

During the Islamic Golden Age, Muslim scholars made major contributions to science and technology. Figures like Al-Khwarizmi (mathematics), Ibn Sina (medicine), and Al-Haytham (optics) showed how faith and science can go hand in hand. Highlighting these historical achievements can inspire students and demonstrate the compatibility of Islamic teachings with scientific progress. Practical applications in STEM projects and experiments aligned with Quranic values, such as sustainability and environmental conservation, make learning more relevant and impactful. For instance, studying renewable energy sources can be linked to the Quranic principle of stewardship of the Earth.

5. Finding

In this study, several findings were obtained from the literature review, such as the development of the Q-STEM module. This Q-STEM study has been evaluated by researchers from the University of Malaya to ensure that the implementation of the Q-STEM module is suitable for the education system in Malaysia. The development of the Quran-Science, Technology, Engineering, Art, and Mathematics, Q-STEAM module marks an important step forward in blending Islamic values with modern educational practices (Abd Rauf, 2024). This module is designed to deepen students' understanding of STEM subjects while also nurturing their Islamic character and values. Built using a thoughtful research method by Borg and Gall, the Q-STEAM module ensures that it meets both educational and religious standards. To evaluate the module's effectiveness, ten experts in fields like mathematics, STEAM education, Islamic education, and the Indonesian language were brought in. Their feedback was overwhelmingly positive, with content validity scores between 83% and 100% based on research that has been done (Abd Rauf, 2024). The experts stressed the importance of starting lessons by presenting real world problems, which helps create meaningful learning experiences. They also emphasized the need for thought-provoking questions to encourage critical thinking and reinforce previous learning.

The Q-STEAM module is tailored to suit students' developmental needs, making sure that the content is both engaging and easy to follow. It follows the Engineering Design Process (EDP), with each step tied to relevant Quranic verses (Abd Rauf, 2024). This unique approach to project-based learning not only builds students' technical skills but also instils moral and ethical values, embodying the holistic approach of Islamic education. To understand how students responded to the module, a combination of quantitative and qualitative data was collected. The results showed that students, many of whom previously had negative experiences with traditional math education, developed a newfound interest in the Q-STEAM approach. They found the module to be more engaging and meaningful, especially compared to the repetitive drills common in conventional math lessons (Abd Rauf, 2024). The Q-STEAM module is a valuable resource for teacher training, especially in math education. It demonstrates how modern educational approaches can successfully incorporate Quranic teachings, offering a well-rounded and meaningful learning experience. By fostering both intellectual and spiritual growth, the Q-STEAM module opens the door to a new era of education, one that harmoniously integrates Islamic values with contemporary STEM learning (Moslimany & (2024).



The Q-STEM-based learning and teaching system can develop several skills in the culture of learning and have a positive impact on future STEM education, including:

1. Critical Thinking

Combining STEM education with Quranic teachings provides a powerful way to nurture critical thinking in students. This approach goes beyond just learning scientific and technical skills; it also incorporates ethical and spiritual dimensions, creating a well-rounded learning experience. By aligning STEM with the teachings of the Quran, educators can help students develop a stronger sense of purpose and responsibility, encouraging them to use their knowledge in ways that benefit society while adhering to moral principles. In addition, one of the key benefits of this integration is the improvement of students' problem-solving abilities. STEM education already focuses on building critical thinking skills through hands-on, inquiry-based learning. When blended with Quranic perspectives, this method pushes students to reflect on the ethical consequences of their work and consider the wider impact of their solutions. For example, they might explore how technology can address societal issues while upholding Islamic values like justice, compassion, and environmental stewardship. This integration also helps students develop a more balanced view of the world. The Quran encourages the pursuit of knowledge and understanding of nature as a way to appreciate the Creator's wisdom. This aligns with the goals of STEM education, which seeks to explore the complexities of the universe through science. By studying STEM within the context of the Quran, students can see the interconnectedness of all knowledge and gain a deeper sense of curiosity and wonder about the world around them.

Another important outcome is the positive effect on students' engagement and motivation. Bringing Quranic perspectives into STEM makes learning more relevant and meaningful, especially for students from Muslim backgrounds. It connects with their cultural and religious identity, making them more invested in their studies. As a result, they are more likely to engage deeply with the material, ask thoughtful questions, and pursue further studies in STEM fields. This integrated approach also fosters ethical decision-making and responsible innovation. By grounding STEM education in Quranic ethics, students are encouraged to think critically about the moral implications of their work. They learn to consider the potential consequences of scientific and technological advancements and aim for solutions that benefit the greater good. This ethical mindset is crucial in today's fast-changing world, where technology can have widespread effects on society and the environment. Blending STEM education with Quranic teachings creates a comprehensive way to develop critical thinking. It boosts students' problem-solving skills, fosters a balanced worldview, enhances motivation, and promotes ethical decision-making. This holistic educational approach not only prepares students for successful careers in STEM but also equips them with the moral and ethical foundations needed to positively contribute to society.

2. Problem Solving

Problem solving is a critical skill that involves the ability to identify, analyze, and resolve complex and real-world issues effectively. In the context of a Q-STEM-based learning and teaching system, this skill is cultivated through a structured approach that encourages students to engage deeply with problems. Students are taught to break down problems into manageable parts, understand the underlying principles, and apply logical and creative thinking to devise solutions. This process often involves iterative testing and refinement, fostering resilience and adaptability. By working on real-world problems, students learn to navigate uncertainty, make informed decisions, and develop a mindset geared towards continuous improvement. This not only prepares them for academic challenges but also equips them with the tools to tackle professional and personal obstacles in the future. The emphasis on problem-solving in STEM education ensures that students are not just passive recipients of knowledge but active participants in their learning journey, capable of contributing innovative solutions to the world's pressing issues. In the Islamic perspective, problem-solving is deeply rooted in the principles of faith, ethics, and community welfare. Islam encourages the pursuit of knowledge and the application of wisdom to address life's challenges.

The Quran and Hadith provide numerous examples and teachings that emphasize the importance of seeking solutions through patience, prayer, and consultation (*Shura*) (Ar-Raysuni, 2011). Muslims are encouraged to approach problems with a sense of *tawakal* it's a trust in Allah while actively engaging in efforts to find solutions. Problem solving in Islam involves a holistic approach that considers not only the immediate issue but also the broader impact on individuals and society. It promotes the use of reason and intellect (*Aql*) to analyze situations, identify root causes, and develop effective strategies. Ethical considerations are paramount, ensuring that solutions align with Islamic values such as justice, compassion, and honesty. Moreover, the concept of *Ijtihad* (independent reasoning) allows for flexibility and adaptability in addressing new and complex issues. This principle encourages Muslims to use their knowledge and understanding of Islamic teachings to find solutions that are relevant to contemporary challenges. In practice, this means that Muslims are encouraged to seek knowledge from various sources, collaborate with others, and



remain open to diverse perspectives. The emphasis on community and collective well-being ensures that problem solving efforts are not just self-serving but contribute to the greater good. By integrating faith, ethics, and intellect, the Islamic approach to problem solving fosters a balanced and comprehensive method for addressing complex and real world problems.

3. Educational Transformation

Integrating STEM (Science, Technology, Engineering, and Mathematics) with Quranic teachings represents a transformative approach to education, aimed at developing well-rounded individuals who are prepared to tackle the challenges of the modern world. This method goes beyond just building scientific and technical knowledge; it also instills ethical and moral values rooted in Quranic principles. By merging these two areas, educators are aiming to produce not only skilled professionals but also individuals guided by a strong sense of morality and social responsibility. Other than that, this shift in education addresses the increasing need for professionals in science and technology as our global economy becomes more dependent on technological advances. However, technical skills alone aren't enough. Integrating Quranic teachings ensures that students understand the broader ethical implications of their work, fostering individuals who contribute positively to their communities and the world at large. Additionally, this educational model strengthens critical thinking and problem-solving skills, which are crucial in STEM fields. The Quran encourages reflection, inquiry, and the pursuit of knowledge values that align perfectly with the scientific method. By encouraging students to question, explore, and innovate, educators can cultivate a generation that is not only technically proficient but also intellectually curious and morally grounded. This combination is essential for addressing global challenges like climate change, healthcare, and sustainable development.

This approach also seeks to bridge the gap between traditional and modern education. It respects cultural and religious values while embracing modern scientific advancements, offering a comprehensive educational experience that prepares students for the future without compromising their cultural identity. By valuing both scientific knowledge and religious teachings, this model encourages students to draw from both sources of wisdom in their personal and professional lives, fostering a sense of balance and harmony. Ultimately, the goal of this educational transformation is to develop a workforce that is both knowledgeable and morally responsible, capable of driving innovation and progress in STEM-related fields. By combining the strengths of STEM education with the ethical guidance of Quranic teachings, educators are equipping students to succeed in a rapidly evolving world. This holistic approach benefits not only individuals but society as a whole, ensuring that technological advancements are driven by ethical considerations and a commitment to the greater good.

6. Conclusion

Exploring STEM (Science, Technology, Engineering, and Mathematics) through the lens of the Quran provides a unique and well-rounded approach to education. By blending Quranic values with STEM learning, educators can help students develop a deeper understanding of both the natural world and the ethical responsibilities that come with scientific discovery. This method not only sharpens technical skills but also fosters a sense of moral responsibility and spiritual awareness. The contributions of Muslim scholars during the Islamic Golden Age show the power of combining faith and science. Today, educational programs that integrate Quranic teachings with STEM continue this tradition, offering students a balanced, meaningful education. These programs encourage students to see science as a way to appreciate the divine wisdom behind the universe. Ultimately, combining STEM with the Quran helps shape well-rounded individuals who have both the knowledge and the ethical foundation to make a positive impact on society. This holistic approach highlights how Islamic philosophy can still guide us in modern scientific and technological progress, creating a future where faith and reason go hand in hand.

Acknowledgments

The authors thank the Academy of Contemporary Islamic Studies, Universiti Teknologi MARA, for technical support.

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