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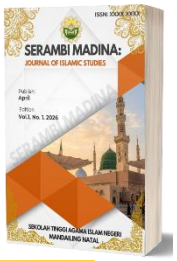

Islamic Thought: The Evolution of Science and Technology from Al-Khawarizmi to Abdus Salam

ORIGINAL ARTICLE OPEN ACCES

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Abstract

This study aims to trace the evolution of Islamic thought in science and technology from the classical era to the present day. To prove the continuity between classical and modern thought, this study uses a descriptive qualitative method, which provides an overview of the development of science and technology from the classical era of al-Khawarizmi to the modern era of Abdus Salam through literature review or library research. The results of this study show that there has been continuity from the classical period to the present, with Aljabbar and al-Khawarizmi making significant contributions to science. This study concludes that the development of science and technology has been continuously influenced by the Islamic world, rather than being exclusively the result of the West. However, there are several things that Muslims must pay attention to in order to maintain their intellectual quality.

Keywords: Evolusion; Science; Technology; Khawarizmi; Abdus Salam

Abstrak

Penelitian ini bertujuan untuk menelusuri evolusi pemikiran Islam dalam sains dan teknologi mulai dari era klasik hingga masa kini. Untuk membuktikan adanya kesinambungan antara pemikiran-pemikiran yang ada di masa klasik hingga modern . Penelitian ini menggunakan metode kualitatif deskriptif, yatu memberikan gambaran mengenai perkembangan sains dan teknologi dimulai pada zaman klasik yaitu al-Khawarizmi hingga zaman modern pada masa Abdus Salam melalui kajian literatur atau library research. Hasil penelitian ini menunjukkan bahwa ada kesinambungan yang terjadi selama periode klasik hingga saat ini, khususnya

Aljabbar, al-Khawarizmi berkontribusi besar terhadap sains. Penelitian ini berkesimpulan bahwa dalam perkembangan sains dan teknologi ada kontribusi secara berkesinambungan dari dunia Islam, bukan hasil eksklusif dari Bara. Namun, ada beberapa hal yang harus diperhatikan umat Islam supaya kualitasintelektuanya tetap terjaga.

Kata Kunci: Kata kunci: Evolusi; Sains; Teknologi; Khawarizmi; Abdus Salam

INTRODUCTION

In the midst of the modern era marked by technological advances and scientific innovation, the contributions of Muslims in this field are often overlooked (Indra, 2009). This phenomenon has led to the assumption that the Islamic world has not played an active role in the development of global science. In fact, history records that during the golden age of Islam, Muslims were pioneers in various branches of science, such as mathematics, astronomy, medicine, and optics. Unfortunately, the lack of appreciation for these contributions has created a huge gap in the understanding of the history of civilization, both among Muslims and the international community. Historical facts show that Muslim thinkers such as Al-Khwarizmi, Ibn Sina, and Ibn Haytham laid important foundations for modern science. The concept of algebra developed by Al-Khwarizmi became central to mathematics, while Abdus Salam's research in theoretical physics made a major contribution to the theory of electromagnetic forces. This intellectual legacy proves that Islamic thought was not only relevant in the past, but also continues to have an impact today. However, the continuity of this contribution requires more attention to maintain its sustainability (Elfianita, n.d.).

Previous studies have reviewed the contributions of classical Muslim figures to the development of science, such as (Mulyadi, 2018), (Dillon Perkasa et al., 2021), (Ahmadi Muslim, 2009). However, studies linking the contributions of classical Muslim scientists to contemporary figures such as Al-Khwarizmi and Abdus Salam are still minimal. In addition, most studies focus on the past without highlighting the relevance of Islamic science in the modern context.

This study aims to trace the evolution of Islamic thought in science and technology, from the classical era to the present. The urgency of this study lies in the need to fill the gap in scientific literature regarding the continuity of Muslim scientists' contributions to scientific progress. Furthermore, this research aims to inspire the younger generation of Muslims to continue to play an active role in the development of global science, as their predecessors did. Thus, this article is expected to strengthen the intellectual identity of Muslims in the landscape of world civilization.

LITERATURE REVIEW

His full name was Abdullah Muhammad bin Musa al-Khawarizmi, born in Khawarizmi, a region in the province of Khurasan, now known as Uzbekistan, in 164 AH (780 AD). He died in Baghdad, Iraq in 232 AH (847 AD), and in other literature it is mentioned that he died in 235 AH (850 AD) (Gaudah, 2012).

Abdussalam was born on January 29, 1926, in Jhang, Lahore, Pakistan. When he was awarded the Nobel Prize in Physics at the Karolinska Institute in Sweden, he began his speech with the basmalah. Until the day he died, Pakistan's best son received no less than 39 honorary doctorates. These included the University of Islamabad (1979), the University of Trieste (1979), the University of Edinburgh (1971), and prestigious universities in Russia, Peru, India, Belgium, Poland, Jordan, Sweden, Venezuela, Turkey, the Philippines, and China. He also became an honorary member of the National Academies of Sciences of 35 countries in America, Europe, Africa, and Asia.(Ahmadi Muslim, 2009)

Evolution in the Big Indonesian Dictionary means change (growth, development) gradually and slowly (little by little)(kemendikbud, 2023). Meanwhile, thought is a way, process, or method of thinking: a problem that requires a solution. Islam is the religion brought by the Prophet Muhammad in accordance with the rules contained in the Qur'an.(kemendikbud, 2023). Islamic thought is the activity of Muslims in searching for origins, cause and effect relationships, and reflections on a form of existence. The sources of Islamic thought are the Qur'an and the Sunnah.

RESEARCH METHOD

This study uses a descriptive qualitative method, which provides an overview of the development of science and technology starting from the classical era of al-Khawarizmi to the modern era of Abdus Salam through literature review or library research. Various types of literature related to this discussion were sought, referring not only to the original book but also to several studies that are directly or indirectly related to this study. This study conducted a comprehensive analysis of the existing literature, thereby obtaining comprehensive conclusions regarding the research being studied.

RESULT AND DISCUSSION

Contributions of Classical Muslim Figures to Science

Al-Khawarizmi is one example of a scientist in the classical period who made a significant contribution to the fields of knowledge and science. Very little information about Al-Khawarizmi's life is available. Due to his high popularity during

his lifetime and after his death, his name has been immortalized in various writings depending on who wrote it, where, and how (Mulyadi, 2018). As quoted by Rahmanita from Mehdi Nakosteen, Al-Khawarizmi was one of the Muslim scientists and leading figures who made a huge contribution to the development of science, technology, and art. This includes his thoughts and developments, as well as improvements to existing scientific knowledge. Among these are the works of Greek and Indian scientists, which were compiled into a systematic body of knowledge (Rahmanita, 2023).

Al-Khawarizmi was part of bait al-hikmah (a library during the Abbasid Dynasty), an institution used as a place for research and development of science. He succeeded in joining the institution because of his intelligence (Gaudah, 2012). According to Mulyadi, quoting Ibn al-Nadīm, there are few stories about al-Khwārizmī, except that he devoted himself to almost all of his work from 813 to 833 AD. As a lecturer, he devoted himself to the School of Honor founded by the Abbasid Caliph al-Ma'mun when Persia had embraced Islam. At that time, Baghdad was the center of world science and trade, becoming a place visited by traders and scientists from China and India. It was here that al-Khwārizmī studied natural sciences and mathematics, including the translation of Sanskrit and Greek manuscripts (Mulyadi, 2018). The field of mathematics itself originated from Babylonian and Egyptian cultures, as well as from India and Persia. Mathematics was later accepted by Greek philosophers and scientists. The role of Muslims was to preserve and develop it through research and experimentation.(Muhtar, 2014)

The branches of science he developed in mathematics, such as the concepts of zero, algebra, and trigonometry, were applied in astronomy to study the movements of the sun, moon, and surrounding planets.

1. The Creator of Algebra and Algorithms, which Form the Basis of Modern Computer Science.

   Al-Khawarizmi was part of bait al-hikmah (a library during the Abbasid Dynasty), an institution used as a place for research and development of science. He succeeded in joining the institution because of his intelligence (Gaudah, 2012). According to Mulyadi, quoting Ibn al-Nadīm, there are few stories about al-Khwārizmī, except that he devoted himself to almost all of his work from 813 to 833 AD. As a lecturer, he devoted himself to the School of Honor founded by the Abbasid Caliph al-Ma'mun when Persia had embraced Islam. At that time, Baghdad was the center of world science and trade, becoming a place visited by traders and scientists from China and India. It was here that al-Khwārizmī studied natural sciences and mathematics, including learning Sanskrit and Greek

manuscripts (Mulyadi, 2018). The field of mathematics itself originated from Babylonian and Egyptian cultures, as well as from India and Persia. Mathematics was later accepted by Greek philosophers and scientists. The role of Muslims was to preserve and develop it through research and experimentation.(Muhtar, 2014) As quoted by Rahmanita from Poeradisastra, algebra was successfully introduced through his work entitled al-Jabar wa al-Muqabala (known in Europe as algebra). This book was translated into Latin with the title Liber Argoritum. Through this book, the concept of Arabic numerals and the decimal system was introduced to Europeans. Algebra was developed from the writings of Diophantes (250 BC), a Greek scientist, which at that time was still vague. Al-Khawarizmi then corrected the errors in it and developed it further. This is why Al-Khawarizmi is referred to as the father of algebra (Rahmanita, 2023).

Through algebra, Al-Khawarizmi created and laid the foundations of modern mathematics. His success in solving some of the complex problems in inheritance law then established the principles and rules that later became a separate science from architecture and mathematics.(Muhtar, 2014). Al-Khawarizmi was the first person to use the term "algebra," a science that is still known by that name today. Europeans adopted this name. Even today, the name Al-Jabar is known by its Arabic name throughout Europe. According to Ramdan(Mulyadi, 2018), Aljabar wal Muqabalah is a major reference book that has had a huge influence, especially in the study of equations and their solutions. In his introduction, al-Khawarizmi explains that he was commissioned to write the book by Caliph al-Makmun. The book was then translated into Latin by Gerald De Cramona. Initially, the entire manuscript was distributed in Arabic, then translated into English in London in 1851 AD. The translation also reached India and the formula was also translated in Europe, making the practice of arithmetic popular under the name alguarismo. The term was then translated back into Arabic as Allugharitma, which was actually based on Al-Khawarizmi.

Al-Khwārizmī's second greatest work was on arithmetic, but the original text has been lost. However, it can still be found in Latin. Al-Khawarizmi's writing in Arabic is titled al-Jam'a wa al-tafrīq bi-hisāb al-Hind. Adelard of Bath translated the book in the 12th century and successfully translated the astronomical tables. (dixit algorizmi or algoritmi de numero Indorum). Al-Khwārizmi's work was one of his scientific contributions in introducing Arabic numerals based on the Arabic-Hindu number system that developed in Indian society and the Western world.(Mulyadi, 2018)

2. The writing of astronomical tables used in calculating prayer times and the direction of the qibla.

   Astronomy is specifically understood as a science that studies celestial objects and other phenomena such as the movements of the earth, moon, sun, and other planets scattered throughout space and their interrelationships. In interpreting these phenomena in space, experts put forward concepts and theories with strong arguments, following and reinforcing the prevailing geocentric theory.

   In astronomy, he wrote a book entitled Zīj al-Sindhind. This book is the third greatest work based on Indian astronomical methods. In this book, there are astronomical tables consisting of 37 symbols with astronomical calendar calculations and 116 tables with calendar data, astronomical data, and astrological data. This book was written in Arabic in 820 AD, but is now considered lost. Spanish astronomers such as Maslama al-Majrīṭī used it in Latin. Finally, Adelard of Bath (January 26, 1126) translated the book into English, and it can be found in the Bibliothèque Publique (Cartes), the Bibliothèque Mazarine (Paris), the Bibliotheca Nacional (Madrid), and the Bodleian Library (Oxford). This book contains tables detailing the movements of the sun, moon, and five other planets that we know today. Therefore, this book became a turning point in the development of Islamic astronomy.(Mulyadi, 2018), and it was used as the main reference for determining prayer times.

   In terms of astronomy, al-Khawarizmi only supplemented the shortcomings of previously discovered models, such as the size of the Earth, the distance between the Earth and the Sun, and other geocentric theories.

The Revival of Islamic Thought in Contemporary Science

Abdus Salam was born in the Islamic country of Pakistan on January 29, 1926, when Pakistan was still under British colonial rule. He completed his primary and secondary education in Pakistan. He completed his higher education (master's and doctorate) in the United Kingdom. In fact, he obtained his Doctor of Philosophy (PhD) in theoretical physics from the Cavendish Laboratory, University of Cambridge, United Kingdom at the age of 26. He received many awards for his achievements in physics. From 1957 to 1982, he received honorary doctorates from 18 different universities for his services to science(Alwi & Amril, 2024)

Among Abdus Salam's achievements are:

1. The role of the first Muslim scientist to win the Nobel Prize in Physics (1979)

   The Nobel Prize is a series of annual international awards given in a number of categories by Scandinavian committees in recognition of cultural and scientific development. Swedish chemist Alfred Nobel established these awards in 1895. The

Nobel Prize has been awarded to 881 people, 12 or 1.4% of whom are Muslim.(Wikipedia, 2024) Very few Muslim scientists have received this award.

He was the first Pakistani Muslim to win a Nobel Prize. He was also the first and only Pakistani scientist to be awarded this prize. He was a member of the worldwide Ahmadiyya Muslim Community, which the Pakistani government declared non-Muslim in a 1974 constitutional amendment.

The Nobel Prize in Physics was awarded in 1979 to Sheldon Lee Glashow and Steven Weinberg for their contributions to the unification of the weak and electromagnetic interactions between elementary particles, including, inter alia, the prediction of the weak neutral current.(Wikipedia, 2024)

2. Efforts to demonstrate the harmony between Islam and modern science.

Science and religion are two entities that complement each other in human life. With both of them, civilization was finally built. Religion not only makes humans faithful, but also builds humans who are ethical, moral, and civilized as a way of life for humans. Meanwhile, science, with all its progress and achievements, has made the world advanced with several brilliant discoveries. In reality, science and religion have never coexisted harmoniously.(Alwi & Amril, 2024)

What the Islamic world needs most right now is an education system called Interdisciplinary Sciences in Islam. The integration of knowledge or the Islamization of knowledge is one of the ways to achieve this. It is time to change the old integrative paradigm with a new education system that focuses its curriculum on the integration of wahtyu and science. Therefore, a form of thinking and behavior (akhlaq) that is integrated and holistic is needed in society. This is because, fundamentally, in Islam there is no separation between ad-din and al-ilm..

The Relevance of Islamic Science in the Modern Context

Classical Islamic scholarship is a legacy that must be preserved by Muslims, because every thought originates from the solid thinking of human beings. There is a continuous connection between classical and contemporary scholarship. This proves that between classical and contemporary Islamic scholarship, there are contributions, including:

1. **The role of algorithm-based technology (the legacy of Al-Khawarizmi) in the digital age.**

The practical application of algebra in computer science is in cryptography. Cryptography is the art of securing digital information, and algebraic concepts such as modular arithmetic and finite fields are the basis of encryption techniques. An

example is the RSA encryption algorithm, which is widely used for secure data transmission. RSA relies on algebraic operations involving large prime numbers to encrypt and decrypt messages, protecting sensitive information from prying eyes in our interconnected digital landscape. In essence, algebra empowers computer scientists to develop algorithms that make our digital experience efficient and secure. Meanwhile, in the field of astronomy, it has been used by astronomers to determine calendars, both Hijri and Gregorian. Not only that, they also use the movement of the sun, moon, and earth as a reference to predict eclipses.

2. The importance of the spirit of integrating science and religion to address the challenges of the modern world.

Integration is a system that undergoes blending to become a complete whole. Integration comes from the English word "integration," which means perfection or wholeness. In terms of terminology, integration is the act of creating a whole and uniting certain elements. Religion is a set of rules for living that are in accordance with reason and thought, brought by the chosen messenger of Allah SWT, our beloved Prophet Muhammad SAW. The word science comes from the words science, scienta, scine, which mean to know. In other words, science is logos, joint, or knowledge. Science can be defined as knowledge that aims to seek truth based on facts or natural phenomena (Fita Sari et al., 2024).

According to Amin Abdullah, the meeting between religion and social sciences must be placed in two dimensions, namely normativity and historicity. The normative aspect emphasizes revelatory teachings in the form of religious texts, while the historical aspect lies in understanding and how groups of people interpret the religious rules they have chosen, which then become their daily activities. However, the normative and historical aspects often run unevenly (Alwi & Amril, 2024)

The relevance of the integration of religion and science in the context of modern life is a very important and interesting topic to discuss. Here are some of the relevant aspects of the integration of religion and science in the modern era:(No et al., 2024)

a. Overcoming Multidimensional Crises

   The multidimensional crises facing the modern world cover various aspects: ecological, social, economic, and spiritual. The integration of religion and science is considered a potential approach to overcoming these crises because of its ability to provide a more holistic perspective.

   Thinkers emphasize that the environmental crisis cannot be solved by technical solutions alone, but requires a change in perspective and behavior rooted in spiritual values. The wisdom of religious traditions about harmony with nature

needs to be combined with modern scientific knowledge to produce sustainable development.

b. Bridging the Value Gap

Modernity has brought rapid technological and scientific progress, but often this progress has not been matched by commensurate development in values and ethics. As a result, a gap has emerged between the technical capacity of modern humans and their moral and spiritual maturity. The integration of religion and science is seen as one approach to bridging this gap.

In an effort to bridge the value gap, the integration of religion and science is not intended to create a 'scientific religion' or 'theological science', but rather to build a dialogical-dialectical relationship between the two. The goal is to give birth to a civilization that is materially advanced as well as morally and spiritually noble; a civilization that masters nature but does not exploit it, develops technology without falling into technocracy, and achieves prosperity without sacrificing wisdom.

c. Addressing Contemporary Issues

Science and religion play complementary roles in addressing various contemporary issues. The relevance of both lies in their respective abilities to provide comprehensive perspectives and solutions to complex challenges in the modern era.

Science, with its empirical methods, provides a deep understanding of natural and social phenomena and develops technologies to solve practical problems. On the other hand, religion offers moral guidance, ethics, and existential meaning that form the basis for decision-making and action.

d. The role of Islamic-based education in producing new scientists.

Islamic-based education has great potential to produce new scientists who are not only intellectually superior but also have strong moral and spiritual integrity. Some of the advantages of developing Islamic-based education are that it will produce a new generation of scientists who are not only competent in their fields but also have a grand vision to create a more advanced, just, and sustainable civilization.

In order to continue contributing to world civilization, Muslims should remember:

a. How the legacy of classical and contemporary Islamic scientists can inspire the younger Muslim generation.

There are several guidelines in religion that educate Muslims to continue seeking knowledge. This is so that there is no intellectual void, which causes many people to forget that Muslims were once glorious during their golden age.

b. The importance of developing a culture of innovation and research in the Islamic world

Rulers are the determining factor in the flourishing of science in society. Science lost its vitality and power when Islamic society began to decline. However, when a place has rulers who still support science, knowledge will continue to flourish. But when the opposite happens, intellectual decline will be felt (Alwi & Amril, 2024). Although basically the backwardness faced by Muslims was due to colonization by European nations, followed by discrimination in the pursuit of knowledge.

CONCLUSION

The journey of Islamic thought from classical times to the present day, from Al-Khawarizmi to Abdussalam, provides a clear picture that the Islamic intellectual tradition has made a significant contribution to world civilization. Al-Khawarizmi, with his algebra, laid the foundations for modern mathematics, and Abdussalam, with his Nobel Prize in Physics, showed that Muslims can still thrive in an era where they have fallen far behind in the development of science.This study is limited to discussing evolution and how both classical and contemporary scientists have contributed to science and technology. This study has not discussed other aspects, leaving it wide open for other researchers to discuss from different perspectives.

REFERENCES

Ahmadi Muslim. (2009). *Abdussalam: Fisikawan Pertama Penerima hadiah Nobel*. Islamreligius. https://islamireligius.blogspot.com/2009/11/dunia-merugi-karena-abdus-salam-hanya.html

Alwi, N. S., & Amril, M. (2024). Integrasi Agama dan Sains dalam Perspektif M. Amin Abdullah. *Ghiroh, Jurnal Ilmiah Pendidikan Agama Islam*, *03 No. 01*(4), 473–482.

Dillon Perkasa, A., Faohan, M. L., Dewi, K., Inti Aulia, G., & Fajrusallam, H. (2021). Penemuan Muhammad Bin Musa Al Khawarizmi. *Jurnal Soshum Insentif*, *4*(2), 130–136. https://doi.org/10.36787/jsi.v4i2.610

Elfianita, F. D. (n.d.). Analisis Kritis atas Pemikiran Pervez Hoodboy tentang Islamisasi Ilmu Pengetahuan. *Academia.Edu*, *2*(2), 1–9. https://www.academia.edu/download/100723987/Fajar_Deny_Analisis_Kritis_at

as_Pemikiran_Pervez_Hoodboy_tentang_Islamisasi_Ilmu_Pengetahuan.pdf

Fita Sari, M., Sultan Syarif Kasim, N., & Eva Dewi, R. (2024). Integrasi Agama Dan Sains Dalam Perspektif Ziauddin Sardar. *Jurnal Sains Student Research*, *2*(3), 352–361. https://doi.org/10.61722/jssr.v2i3.1395

Gaudah, M. G. (2012). *147 Ilmuwan Terkemuka dalam Sejarah Islam*. pustaka al-Kautsar.

Indra, H. (2009). Pandangan Islam Tentang Ilmu Pengetahuan dan Refleksinya terhadap Aktivitas Pendidikan Sains Di Dunia Muslim. *Miqot*, *33*(2), 245–260.

kemendikbud. (2023). *Kamus besar Bahasa Indonesia*. Badan Pengembangan an Pembinaan Bahasa. https://kbbi.kemdikbud.go.id/entri/evolusi

Muhtar, F. (2014). Abu Abdullah Ibn Musa Al-Khawarizmi (Pelopor Matematika dalam Islam). *Beta*, *Vol. 7*(No. 2), 82–97.

Mulyadi, A. (2018). Pemikiran Al-Khawarizmi dalam Meletakkan Dasar Pengembangan Ilmu Astronomi Islam. *International Journal Ihya' 'Ulum Al-Din*, *20*(1), 63–86. https://doi.org/10.21580/ihya.20.1.2782

No, V., September, J., Az-zahra, F., & Silbi, S. J. (2024). *Integrasi Agama Dan Sains Dalam Kehidupan Modern*. *2*(1), 68–74.

Rahmanita, F. D. N. muhammad F. R. (2023). Ulumuddin : Jurnal Ilmu-ilmu Keislaman. *Al-Khawarizmi Serta Kontribusinya Untuk Perkembangan Sains Modern*, *13*, 297–312.

Wikipedia. (2024). *Daftar Penerima Nobel Muslim*. Wikipedia. https://id.wikipedia.org/wiki/Daftar_penerima_Nobel_Muslim

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