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THE GLORY OF SCIENCE IN CLASSICAL ISLAMIC CIVILIZATION: THE ABBASID DYNASTY AS A CENTER FOR INNOVATION

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Abstract

The glory of science in classical Islamic civilization, especially during the Abbasid Dynasty, marked the peak of intellectual development in the history of mankind. This dynasty, which ruled from 750 to 1258 AD, became a center of innovation and scientific advancement. Strong support from the Abbasid government, such as the establishment of *the Baitul Hikmah educational institution* in Baghdad, created a conducive environment for scientific research and development. In addition, an inclusive education system that included various disciplines, such as mathematics, astronomy, medicine, and philosophy, enriched the intellectual treasures of Islam and made a significant contribution to science in Europe during the Renaissance. This study uses a qualitative descriptive method with a phenomenological approach to explore the experiences and perspectives of society during the Abbasid period. The results show that government support, the integration of Islamic values with science, and inclusive education policies play an important role in creating cross-disciplinary innovation. The works of Muslim scientists, such as Al-Khawarizmi, Ibn Sina, and Al-Farabi, not only advanced Islamic civilization but also influenced the development of science in the Western world. This study highlights the relevance of the Abbasid Dynasty educational model for the modern era, particularly in the development of educational policies that support the integration of ethical values, cross-disciplinary collaboration, and research-based innovation. By imitating the scientific spirit of the Abbasid Dynasty, modern society can create a more holistic and sustainable education system.

Keywords: Abbasid dynasty, Islamic science, inclusive education, global influence, cross-disciplinary collaboration.

Introduction

The glory of science in classical Islamic civilization, especially during the Abbasid Dynasty, is one of the important milestones in the history of human intellectual development. This dynasty, which ruled from 750 to 1258 AD, is known as a center of significant innovation and scientific development. One of the main factors supporting this progress was the strong support of the caliphs for education and research (Hasanah & Verawati, 2022). Caliphs such as

Harun al-Rashid and al-Ma'mun placed great emphasis on education, as evidenced by the establishment of educational institutions such as the Bait al-Hikmah in Baghdad, which served as a center for translation and scientific research (Nunzairina, 2020).

One of the important contributions of the Abbasid Dynasty was the development of an inclusive and multicultural education system. Education during this period was not only limited to religious aspects, but also included various disciplines such as mathematics, astronomy, medicine, and philosophy (Beno et al., 2022). This creates a fertile environment for scientists to collaborate and innovate. For example, many scientific works from various cultures were translated into Arabic, which not only enriched the treasures of Islamic science but also made a great contribution to the development of science in Europe during the Renaissance (Daulay et al., 2021).

In addition, education during the Abbasid Dynasty was also marked by a good education management system. Educational institutions are well managed, supported by government policies that facilitate education financing through waqf and support from the community. This allows education to be accessible to various levels of society, including those from different backgrounds (Irwansyah, 2023). Thus, education during this period not only serves as a tool to disseminate knowledge, but also as a means to build social solidarity and cultural identity among Muslim communities (Sofa, 2022).

The glory of science in classical Islamic civilization, especially during the Abbasid Dynasty, not only had an effect on the development of science in the Islamic world, but also had a significant impact on Western civilization (Beno et al., 2022). Through the translation and dissemination of scientific works, many discoveries and innovations produced by Muslim scientists became the basis for the advancement of science in Europe. Therefore, the role of the Abbasid Dynasty in the history of science cannot be underestimated, as they have created a strong foundation for the sustainable development of science and education (Nurhuda, 2022; Hasanah & Verawati, 2022; Nunzairina, 2020).

The glory of the Abbasid Dynasty was marked by the integration of science, art, and economics that created a glorious Islamic civilization. The development of calligraphy under Caliph Harun al-Rashid, as researched (Jannah & S, 2023), became a symbol of the beauty of Islamic culture, with Bait al-Hikmah as a center for education and art. In the economic field, As-Shaibani's thought emphasizes the importance of the agrarian and industrial sectors, which make Baghdad a center of international trade (Gurdachi & Afabel, 2021). Banking regulations and a fair tax system also support economic

growth, as noted (Ridwanto & Siradjuddin, 2023). The development of Islamic libraries and literature, according to (Fistiyanti et al., 2022), ensures the sustainability of knowledge for the next generation. Thus, the Abbasid Dynasty became a symbol of advanced civilization that had a wide influence.

Previous studies tend to discuss specific aspects of the glory of the Abbasid Dynasty, such as the art of calligraphy (Jannah, 2023), the economic thought of As-Syaibani (Gurdachi & Afabel, 2021), or the banking and tax systems (Raihan, 2023). However, this study integrates various fields, including science, art, education, and economics, to provide a holistic picture of the Abbasid Dynasty as a center of innovation in classical Islamic civilization. This multidisciplinary approach also highlights the relationship between these fields, which has not been widely discussed in previous studies, while exploring the relevance of the values of the Abbasid Dynasty to the challenges of the modern world. The purpose of research on the glory of science in classical Islamic civilization, especially during the Abbasid Dynasty, is to identify and analyze various aspects that contributed to the development of science and education in that period.

Methodology

The research method used in the study of the glory of science in classical Islamic civilization during the Abbasid Dynasty is a descriptive qualitative research method. This method was chosen because it can provide a deep understanding of the phenomenon being studied, and allows researchers to explore various aspects that contributed to the development of science and education during that period (Yusanto, 2020). In this study, a phenomenological approach will be applied to understand the experiences and perspectives of figures and society during the Abbasid Dynasty. Data collection techniques used include in-depth interviews with historians, academics, and researchers who have an understanding of classical Islamic civilization. In addition, observations of historical documents, manuscripts, and relevant literature will also be carried out to obtain comprehensive data (Robbani, 2022).

Data processing will be carried out using coding techniques, where researchers will identify the main themes that emerge from the data collected. This process aims to organize information and find significant patterns in the context of the development of science and education during the Abbasid Dynasty (Susanti, 2013). Data analysis will be carried out inductively, where researchers will draw conclusions based on the findings

obtained from the existing data, so that they can provide a clearer picture of the contribution of the Abbasid Dynasty to science and education (Helaluddin, 2018). By using this descriptive qualitative research method, it is hoped that the research can provide deeper insight into the factors that supported the glory of science during the Abbasid Dynasty, as well as its impact on the development of science in the Islamic world and Europe (Anggraini & Sukartono, 2022).

Results and Discussion

The results of research on the glory of science in classical Islamic civilization during the Abbasid Dynasty show that there were several key factors that contributed to the progress of science and education during that period. This study identified three main themes: (1) government support and education policies, (2) integration of science and Islamic values, and (3) impact on the development of science in Europe.

1. **Government Support and Education Policy**

   Government support during the Abbasid Dynasty, especially from caliphs such as Harun al-Rashid and al-Ma'mun, played a significant role in the development of education and science. Caliph al-Ma'mun, for example, is known for establishing the House of Wisdom, which served as a center for translation and research. This institution was not only a place of learning, but also a center of innovation that attracted scientists from various cultural backgrounds and disciplines (Fathy CA, Pichert JW, Domenico H, Kohanim S, Sternberg P, 2018). Through this policy, the government created a conducive environment for scientists to collaborate and share knowledge. Caliphs al-Rashid and al-Ma'mun paid great attention to education by allocating significant funds to support educational institutions. This study found that many educational institutions were established with the support of waqf (*donations*) from wealthy individuals and the government, which allowed wider access to education for the community (Angelini, 2023). This created an environment conducive to the development of science, where scientists could collaborate and share knowledge without restrictions.

   Bait al-Hikmah not only functioned as a library, but also as a place where scientists could discuss and conduct research. This study shows that this institution became a model for other educational institutions in the Islamic world, which adopted a similar approach in supporting the development of science ("Correction: Evaluation of Publication of COVID-19–Related Articles Initially Presented as Preprints (JAMA Netw Open.

(2022) 5:12 (E2245745) DOI: 10.1001/Jamanetworkopen.2022.45745)," 2023). Thus, government support in the form of funding and inclusive educational policies were among the main factors that drove the progress of science at that time. Furthermore, this study also shows that the existence of educational institutions supported by the government created high educational standards. Scientists involved in these institutions focused not only on teaching, but also on research and development of science (Greer, 2010). This led to the birth of many influential scientific works, which were then translated and disseminated throughout the world, including Europe.

The Abbasid dynasty is known as one of the golden eras in Islamic history, mainly due to the government's support for education and science. The Abbasid government established many educational institutions such as *Baitul Hikmah*, a library that became a center for scientific studies. In addition, the Abbasid caliphs, such as Harun al-Rashid and al-Ma'mun, paid great attention to science by funding the translation of Greek, Persian, and Indian texts into Arabic. This policy creates wider access for the Muslim community to study various disciplines. With strong government support, the scientific community has adequate facilities to produce great works that are the foundation for the development of science in the Islamic world (Ahmed, 2020).

In addition to government support, the existence of educational institutions plays an important role in creating an environment conducive to the development of science. Institutions such as *madrassas* and *scientific councils* not only provide religious education but also open up space for the study of philosophy, mathematics, astronomy, and medicine. Scholars such as Al-Khawarizmi, Al-Farabi, and Ibn Sina got the opportunity to research and write their important works under the auspices of this institution. This support is also reinforced by the patronage system, where the government rewards scientists who contribute to the advancement of science. This shows that educational institutions in the Abbasid era not only functioned as a place of learning, but also as the main catalyst in encouraging innovation and scientific research (Hillenbrand, 2005).

The scholars who developed during the Abbasid period had a great impact not only on Islamic civilization but also on the world as a whole. For example, Al-Khawarizmi's contribution in the field of mathematics gave birth to the concept of algebra which became the basis for various branches of modern science. Ibn Sina's works in medicine, such as *the*

Canon of Medicine, became the main reference in European universities until the 17th century. This contribution proves that educational support during the Abbasid period not only produced knowledge that was beneficial to Muslims but also became a bridge for the development of science in the West. Therefore, the Abbasid scientific heritage is one of the clear examples of how inclusive education policies can have a global impact (Deveci & Nunn, 2018).

In the modern context, the educational support model of the Abbasid Dynasty can be an inspiration for current education policy. Investment in education and research is a major factor in encouraging innovation and technological advancement. Countries that want to develop can learn from the example of the Abbasids, where collaboration between governments, scientists, and society creates an environment conducive to the advancement of science. In addition, the importance of inclusive education that does not discriminate between social or religious backgrounds is also relevant in facing global challenges. By imitating the spirit of the Abbasids, modern society can build a more advanced and sustainable civilization (Sardar, 2016).

2. Integration of Islamic Science and Values

The integration of science and Islamic values was an important aspect in the development of education during the Abbasid Dynasty. Scientists such as Al-Ghazali and Al-Farabi attempted to combine rational thinking with religious teachings, creating a comprehensive framework of thought. Al-Ghazali, for example, emphasized that science must be understood in a spiritual and moral context, resulting in a more holistic approach to education. This approach not only enriched science, but also shaped the character and morality of students. In this context, education was not only seen as a transfer of knowledge, but also as a process of character formation in line with Islamic values (Maswana et al., 2015). This shows that education during the Abbasid Dynasty did not only focus on academic aspects, but also on the development of ethics and morals.

Al-Farabi, on the other hand, developed thoughts on the importance of ethics in science, leading to the development of disciplines such as philosophy and logic. These thoughts not only contributed to the development of science, but also shaped ways of thinking and approaches to complex philosophical problems (Kearney, 2017). This study shows that the holistic approach to education during the Abbasid Dynasty contributed to the birth of many influential scientific works. Furthermore,

this study shows that the holistic approach to education during the Abbasid Dynasty contributed to the birth of many influential scientific works. Scientists not only produced new discoveries but also linked these discoveries to moral and ethical principles (Nundy et al., 2021). This created an intellectual tradition that focused not only on technical aspects but also on the social and moral impacts of science.

During the Abbasid Dynasty, the integration of science and Islamic values created a unique and flourishing educational environment. This process involved combining rational thought with religious teachings, allowing scholars to produce works that had a significant impact across various fields. One of the key factors driving this progress was the translation of classical Greek and Persian works into Arabic, spearheaded by institutions such as the House of Wisdom (Bayt al-Hikmah). Furthermore, Muslim scholars did not merely translate but also developed new theories aligned with Islamic principles. For example, Al-Kindi and Al-Farabi made significant contributions to philosophy and logic, while Al-Khwarizmi introduced the concept of algebra, which became the foundation of modern mathematics (Gutas, 2001).

This integration also reflects Islam's holistic perspective on knowledge. In Islam, knowledge is not only a tool for understanding the physical world but also a means of drawing closer to Allah. This is evident in the works of scholars such as Al-Biruni and Ibn Sina, who combined empirical studies with spiritual reflection. Al-Biruni, for instance, explored astronomy and geography while expressing admiration for the magnificence of the Creator. These Islamic values served as ethical foundations in scientific research, guiding the use of knowledge for the betterment of humanity (Nasr, 2007). Moreover, the integration of science and religion during the Abbasid era had a profound impact on education. Institutions like madrasas and public libraries were established to ensure that knowledge was accessible to a wide audience.

Religious and scientific education were taught concurrently, resulting in a generation of scholars proficient in both domains. Quranic teachings were often combined with training in mathematics, medicine, and astronomy, demonstrating that the Abbasid Dynasty prioritized both intellectual advancement and the moral development of individuals (Makdisi, 1981). Overall, the collaboration between Islamic values and science during the Abbasid Dynasty made a substantial contribution to human civilization. In addition to generating scientific discoveries, this integration helped create a more ethical and cultured society. On a global

scale, this holistic approach remains relevant today, particularly in fostering education that emphasizes not only technical competence but also the cultivation of ethical values. Thus, studying the integration of science and religion during the Abbasid era can serve as an inspiration for modern educational reform (Ghasemi et al., 2019).

3. Impact on the Development of Science in Europe

One of the significant findings of this study is the impact of scientific progress during the Abbasid Dynasty on the development of science in Europe. Through the translation of scientific works into Latin, many discoveries and innovations produced by Muslim scientists became the basis for the advancement of science in Europe during the Renaissance. This study shows that many European scientists, such as Roger Bacon and Thomas Aquinas, were influenced by the thoughts of Muslim scientists. The interaction between the Islamic world and Europe at that time was very important in forming the foundations of modern science. The works of Al-Khwarizmi in mathematics and astronomy, as well as the works of Ibn Sina (Avicenna) in medicine, were translated and studied in European universities. This shows that the knowledge developed in the Islamic world not only contributed to the advancement of science in the Islamic world, but also had a significant impact on Western civilization.

Furthermore, this study shows that the translation of Muslim scientific works into Latin introduced not only new discoveries, but also the scientific methods used by Muslim scientists. This method was later adopted and further developed by European scientists, contributing to the development of the modern scientific method (Walsh, 2016). Thus, the impact of scientific progress during the Abbasid Dynasty cannot be underestimated. In this context, it is important to note that the contributions of Muslim scientists were not limited to a particular field, but covered a wide range of disciplines, including mathematics, astronomy, medicine, and philosophy ("Errors in Results and Discussion Sections", 2022). This created a rich and diverse intellectual tradition, which contributed significantly to the development of science in Europe.

Overall, the impact of scientific progress during the Abbasid Dynasty on the development of science in Europe shows the importance of the interaction between cultures and intellectual traditions. By adopting and developing knowledge originating from the Islamic world, Europe was able to experience a scientific revolution that changed the face of science and technology on the continent (Vieira et al., 2019).

4. Contributions of Muslim Scientists in Various Disciplines

The contributions of Muslim scientists during the Abbasid Dynasty were not limited to one field of science, but included various interrelated disciplines. In mathematics, Al-Khwarizmi is known as the "*father of algebra*" because of his work *entitled Al-Kitab al-Mukhtasar fi Hisab al-Jabr wal-Muqabala*, which became the basis for the development of algebra in Europe This work not only introduced the concept of algebra, but also a systematic method of solving problems. In the field of astronomy, scientists such as Al-Battani and Al-Farghani made significant progress in measuring and understanding the motion of celestial bodies. Their works made important contributions to the development of astronomy in Europe, which was later adopted by European scientists during the Renaissance (Lamanauskas, 2021). This study shows that the thinking of Muslim scientists in the field of astronomy was not only focused on observation, but also on developing theories underlying natural phenomena.

In the field of medicine, Ibn Sina's work, especially *Al-Qanun fi al-Tibb*, has been an important reference in medical education in Europe for centuries. This work covers various aspects of medicine, including diagnosis, treatment, and medical ethics (Baştürkmen, 2012). This study shows that Ibn Sina's contribution to medicine was not only influential in the Islamic world, but also had a significant impact on the development of medical science in Europe. Furthermore, Muslim scientists also contributed to the fields of philosophy and logic. Al-Farabi and Al-Ghazali's thoughts on ethics and epistemology became the basis for the development of philosophical thought in the Islamic world and Europe (Bagga, 2016). This study shows that these thoughts not only contributed to the development of science, but also shaped the way of thinking and approach to complex philosophical problems.

Muslim scientists during the Abbasid Dynasty demonstrated a remarkable ability to synthesize knowledge from different cultural and intellectual traditions, such as Greek, Indian, and Persian sources, and adapt them to the Islamic context. This synthesis was facilitated by the translation movement, centered in the House of Wisdom in Baghdad, where scholars translated and commented on key works of philosophy, medicine, mathematics, and astronomy. The translations often went

beyond mere reproduction, as Muslim scientists added their insights and developed innovative ideas. For instance, Al-Khwarizmi's contributions to algebra and Al-Razi's advancements in medicine not only influenced the Islamic world but also laid the groundwork for scientific progress in Europe during the Renaissance (Gutas, 2021).

The Abbasid Dynasty also fostered an environment that encouraged scholarly collaboration and dissemination of knowledge. The development of institutions such as libraries, observatories, and madrasas played a crucial role in preserving and advancing scientific inquiry. Additionally, the patronage of the Abbasid caliphs provided the financial and moral support needed for scientists to conduct research and share their findings. This period of intellectual flourishing underscored the importance of integrating science with ethical and philosophical considerations, which remains a cornerstone of scientific progress today. The legacy of this era is evident in the enduring influence of Islamic scientific achievements on both Eastern and Western traditions (Ragep, 2020).

5. Implications for Modern Education

The implications of this study for modern education are significant. First, the importance of government support in the development of education and research must be a primary concern. Policies that support educational and research institutions can create an environment conducive to innovation and scientific development (Loi & Lim, 2019). Second, the integration of science and moral values in education must be a primary focus. Education should not only focus on academic aspects, but also on character and ethical formation. This can create a generation of scientists who are not only intellectually intelligent but also have moral integrity (Maticiuc & Nie, 2013). Third, the importance of interdisciplinary collaboration in the development of science must be considered. By integrating various disciplines, scientists can create a more holistic approach to the complex problems facing society today (Descatha et al., 2011).

Fourth, modern education must pay attention to the intellectual heritage of classical Islamic civilization. This heritage includes teaching methods, research approaches, and philosophical values developed by Muslim scholars during the golden age of Islam. For instance, the concept of Bayt al-Hikmah as an intellectual hub during the Abbasid Dynasty highlights the importance of collaboration among scholars from various

fields (Evans, 2023). By adopting such approaches, modern education can foster a more holistic learning system where knowledge is not taught in isolation but understood as an interconnected whole. Furthermore, the role of government in supporting the advancement of education is another critical factor that modern systems can emulate. During the Abbasid era, the government not only provided funding but also encouraged intellectual freedom for scholars (Ahmed, 2021). This demonstrates that policies promoting research and education can drive sustainable innovation. In the modern era, this can be implemented through investments in research and development, as well as support for educational programs that integrate science, technology, and humanistic values.

It is also important to note that education during the Islamic golden age emphasized moral and spiritual values as the foundation of knowledge. Scholars such as Al-Farabi and Al-Ghazali believed that the pursuit of knowledge was not merely for worldly mastery but also for drawing closer to God (Nasr, 2020). Integrating such values into modern curricula can provide a balance between academic achievement and character building. Thus, education would not only produce intellectually capable individuals but also morally wise ones. Overall, this study shows that the glory of science during the Abbasid Dynasty offers valuable lessons for modern education. By integrating government support, moral values, interdisciplinary collaboration, and intellectual heritage, educational systems can create an environment conducive to the advancement of science and innovation. As Evans (2023) states, this approach not only enriches academic perspectives but also strengthens the relationship between knowledge and universal human values.

Conclusion

This research shows that the glory of science during the Abbasid Dynasty was the peak of classical Islamic civilization which made a significant contribution to the development of world science. Strong government support, the integration of Islamic values with science, and inclusive education create an environment conducive to innovation and cross-disciplinary collaboration. The contributions of Muslim scientists in various fields, such as mathematics, astronomy, medicine, and philosophy, not only advanced Islamic civilization but also had a great influence on the progress of science in Europe during the Renaissance.

In addition, education in the Abbasid era emphasized interdisciplinary collaboration and the integration of science and moral values, resulting in a rich intellectual tradition. The implications of these findings are relevant for modern education, namely the importance of government policy support, the integration of ethical values in education, and the adoption of a holistic approach that covers various fields of science. Therefore, the glory of the Abbasid Dynasty provides valuable lessons for the development of education and research in the contemporary era.

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