*Proceedings of The 2nd International Conference on Science and Islamic Studies*
*ISSN: 3024-9058 (Online - Elektronik)*
*Volume: 2, 2024*
*Publisher: Program Pascasarjana, UIN Alauddin Makassar*

# STRENGTHENING THE INTERCONNECTION OF SCIENCE, ISLAMIC CIVILIZATION, AND GLOBAL TRANSFORMATION

**Hani Amer Musa[1], Muslimin H. Kara[2], Nasrullah Bin Sapa[3], & Sabbar Dahham Sabbar[4]**

[1,2,3,4]Pascasarjana UIN Alauddin Makassar, Indonesia
Correspondence email: hani.amer.al@gmail.com

## ABSTRACT

This article investigates the dynamic interconnection between the scientific heritage of Islamic civilization and contemporary global transformation, emphasizing the role of science education and cultural awareness. The Islamic Golden Age not only preserved but also advanced scientific knowledge in fields such as mathematics, astronomy, and medicine, creating a legacy that continues to inspire modern intellectual discourse. This study explores how awareness of this heritage (Awareness of Islamic Scientific heritage, AIS) influences present-day attitudes toward science (Attitude toward Science, ATS) and their collective impact on support for global engagement and transformation (SGE). A mixed approach combining conceptual literature review and empirical demonstration was employed. The empirical part utilized a synthetic dataset (n = 300) designed to simulate survey responses, thereby illustrating the methodological framework. Statistical analyses included descriptive statistics, correlation tests, and multivariate regression with robust standard errors. The findings indicate that both AIS (coef ≈ 0.278, $p < 0.001$) and ATS (coef ≈ 0.433, $p < 0.001$) significantly and positively predict SGE, with the model explaining approximately 34.6% of the variance ($R^2 \approx 0.346$). These results suggest that acknowledging the contributions of Islamic civilization to global science can enhance the legitimacy and acceptance of modern scientific practices within Muslim societies, ultimately fostering innovation, intercultural dialogue, and participation in global scientific networks. The paper concludes by discussing implications for curriculum development, science policy, and cultural initiatives, while also highlighting the need for future research using real-world representative data to validate these findings.

**Keywords:** Islamic civilization; scientific heritage; attitude toward science; global transformation; education policy; innovation.

## 1. INTRODUCTION

Islamic civilization played a central role in preserving, developing, and transmitting scientific knowledge during the Middle Ages. Scholars such as Al-Biruni, Ibn Sina, and Al-Razi contributed extensively to astronomy, medicine, mathematics, chemistry, and philosophy, laying intellectual foundations that later influenced the European Renaissance. This period, commonly referred to as the Islamic Golden Age, was characterized by a flourishing of scientific inquiry, translation movements, and the establishment of renowned institutions such as the House of Wisdom in Baghdad. Through these institutions, classical works of Greek, Persian, and Indian scholars were not only preserved but also critically examined, expanded, and enriched with original contributions from Muslim scientists.

Revisiting this heritage today is not merely an exercise in historical nostalgia but a strategic necessity in the context of modern global transformation. The 21st century is defined by rapid technological change, scientific innovation, and interconnectedness across nations. For Muslim societies, acknowledging and re-engaging with their scientific past offers both cultural legitimacy and motivational grounding to pursue modern scientific development. By highlighting the continuity between past achievements and present challenges, Islamic civilization provides a narrative that bridges the relationship between religion and science, countering the misconception of inherent incompatibility.

Furthermore, renewed recognition of Islamic scientific contributions can help Muslim societies overcome epistemological dilemmas often faced in integrating secular sciences with religious worldviews. It reinforces the idea that the pursuit of knowledge is deeply rooted in Islamic tradition, thereby reducing resistance toward science education and fostering openness to innovation. This perspective is particularly vital in the age of globalization, where competitiveness, sustainability, and knowledge-based economies are the cornerstones of development.

In addition, revisiting the legacy of Islamic civilization can contribute to intercultural dialogue and global cooperation. By presenting Islamic heritage as an integral component of world civilization rather than a localized achievement, it situates Muslim societies as active contributors to universal progress. Such recognition not only boosts internal confidence but also enhances external perceptions, promoting inclusivity and mutual respect in international relations.

Therefore, understanding the interconnection between Islamic civilization, science, and global transformation is critical for both scholars and policymakers. It creates opportunities to design educational curricula that integrate historical legacies, to formulate policies that strengthen scientific engagement, and to develop cultural initiatives that highlight the shared roots of human knowledge. Ultimately, this interconnection provides a framework for rethinking the role of Muslim societies in contemporary global transformations, ensuring that their historical legacy becomes a source of empowerment rather than marginalization.

## Literature Review

1. Scientific Heritage of Islamic Civilization

The Islamic Golden Age, spanning roughly from the 8th to the 14th century, was marked by remarkable achievements in science, philosophy, medicine, mathematics, and engineering. Central to this era was the translation movement, which systematically rendered works of Greek, Persian, and Indian scholars into Arabic. Institutions such as the Bayt al-Hikmah (House of Wisdom) in Baghdad served as intellectual hubs where scholars not only preserved but also critiqued and expanded upon earlier knowledge. Figures like Al-Khwarizmi, the "father of algebra," and Ibn al-Haytham, the pioneer of optics, made original contributions that reshaped the trajectory of scientific progress. This scientific heritage did not remain confined to the Islamic world; through Andalusia, Sicily, and the Crusades, much of this knowledge was transmitted to Europe. The preservation and advancement of this body of knowledge provided the intellectual foundation for the European Renaissance, highlighting Islamic civilization's critical role in the history of global science.

2. Integration of Science and Islamic Perspective

In contemporary contexts, efforts to reconcile religious and secular sciences reflect an ongoing dialogue within Islamic education and epistemology. Many universities and Islamic institutions are revisiting the relationship between naqli (revealed knowledge) and aqli (rational knowledge) to create an integrated framework that bridges tradition and modernity. For example, the development of "Islamization of knowledge" initiatives aims to harmonize modern scientific disciplines with Islamic ethical values. This integration seeks to counter perceptions that science is inherently secular or disconnected from spirituality. Instead, it emphasizes that the pursuit of scientific inquiry has always been an integral part of Islamic intellectual tradition, grounded in the Qur'anic imperative to seek knowledge ('ilm). By embedding science education within a faith-based framework, Muslim societies can foster greater acceptance of modern scientific practices, encourage innovation, and enhance participation in global research networks.

3. Science, Modernity, and Challenges

Despite this rich historical legacy, Muslim-majority societies today face structural and institutional challenges that hinder scientific productivity and global competitiveness. Issues such as inadequate research funding, underdeveloped scientific infrastructure, and brain drain of talented researchers remain persistent. Furthermore, epistemological debates within some circles—concerning the compatibility of Western scientific paradigms with Islamic worldviews—create additional obstacles to advancing research. Nevertheless, recognition of the Islamic scientific heritage provides a pathway toward legitimizing renewed scientific endeavors. By reasserting that science and inquiry are embedded in Islamic tradition, these societies can address internal skepticism and external misperceptions. This recognition not only strengthens cultural confidence but also provides a foundation for policy reform and investment in education and research. Ultimately, overcoming these challenges requires combining structural reforms with a revitalization of the intellectual spirit of the Islamic Golden Age, positioning Muslim societies to contribute meaningfully to modern global scientific transformations.

## 2. METHODS

### Research Design

This study adopted a cross-sectional survey design using a synthetic dataset to demonstrate the relationship between historical awareness of Islamic science, attitudes toward modern science, and support for global engagement. The design was chosen to illustrate the statistical methodology in a way that parallels how an empirical study would be structured if conducted with real-world respondents. Although synthetic, the dataset was generated to simulate realistic patterns in human responses.

### Sample and Participants

The sample consisted of n = 300 synthetic respondents, constructed to reflect variation in age, educational background, and orientations toward science and Islamic heritage. Respondents were distributed across age ranges and education levels to approximate demographic diversity that might be expected in an actual Muslim-majority population. Because the dataset is synthetic, the results are intended as a methodological demonstration rather than empirical generalization.

### Variables and Measures

1. Awareness of Islamic Scientific Heritage (AIS): A 5-point Likert-type variable measuring the extent to which respondents are aware of the historical contributions of Islamic civilization to science.
2. Attitude toward Science (ATS): A 5-point Likert-type variable reflecting general openness, positivity, and acceptance toward modern scientific inquiry.
3. Support for Global Engagement (SGE): A 5-point Likert-type variable assessing willingness to participate in global scientific, cultural, and technological transformation.
4. Innovation Orientation (IOS): A 5-point Likert-type variable indicating readiness to adopt new ideas and engage in innovative practices.
5. Control Variables: Age (continuous, in years) and education level (categorical: high school, undergraduate, postgraduate, doctoral).

### Data Analysis Procedures

The analysis proceeded in several stages:

1. Descriptive Statistics were computed to examine distributions, central tendencies, and variability of all study variables.
2. Reliability Analysis was performed using Cronbach's alpha on pseudo-scales to assess internal consistency, ensuring that items measuring similar constructs demonstrated acceptable reliability.
3. Correlation Analysis employed Pearson correlation coefficients to test the strength and direction of bivariate relationships among AIS, ATS, IOS, and SGE.
4. Regression Analysis applied Ordinary Least Squares (OLS) regression to evaluate the predictive influence of AIS and ATS on SGE, with IOS, age, and education included as controls. Robust standard errors (HC3) were used to account for

potential heteroscedasticity, thereby improving the reliability of the inferential statistics.

**Ethical Considerations**

Because the dataset was synthetic and did not involve human subjects, no ethical risks were present. However, the methodological framework was designed in accordance with standard ethical practices, including confidentiality, informed consent (hypothetically, if data were real), and the responsible reporting of results.

**Limitations of Methodology**

It is important to note that this dataset was not collected from actual respondents but was generated for demonstration purposes. Thus, the findings illustrate possible relationships rather than providing empirical evidence. Future studies should apply this framework to real-world data, employing validated scales and representative sampling strategies to ensure external validity.

## 3. RESULTS

Descriptive Statistics

Table 1 summarizes the descriptive statistics of the study variables. Mean values for AIS (M = 3.42), ATS (M = 3.65), SGE (M = 3.71), and IOS (M = 3.59) were all above the midpoint of 3, suggesting moderately positive responses. Standard deviations ranged from 0.88 to 1.02, indicating reasonable variability across participants. Age had a broader spread (M = 29.4, SD = 8.2), spanning from 18 to 55 years. Overall, variables were approximately normally distributed around their scale midpoints.

Table 1. Descriptive Statistics

| Variable | Mean | SD | Min | Max |
|---|---|---|---|---|
| AIS | 3.42 | 1.02 | 1 | 5 |
| ATS | 3.65 | 0.95 | 1 | 5 |
| SGE | 3.71 | 0.88 | 1 | 5 |
| IOS | 3.59 | 0.97 | 1 | 5 |
| Age | 29.4 | 8.2 | 18 | 55 |

**Reliability Analysis**

Reliability analysis (Table 2) showed excellent internal consistency for the pseudo-scales. Cronbach's alpha for AIS was 0.985, while ATS was 0.978, both exceeding the conventional threshold of 0.70. This suggests that the items measuring these constructs were internally coherent, even though the dataset was synthetic.

Table 2. Reliability Coefficients

| Scale | Cronbach's Alpha |
|---|---|
| AIS | 0.985 |
| ATS | 0.978 |

### Correlation Analysis

Pearson's correlations (Table 3) indicated significant positive relationships among the main variables. AIS correlated positively with ATS (r = 0.521) and SGE (r = 0.446). ATS was strongly correlated with SGE (r = 0.592), suggesting that positive attitudes toward science are closely tied to support for global engagement. IOS also showed moderate positive correlations with AIS, ATS, and SGE, highlighting its complementary role.

Table 3. Correlation Matrix

| Variable | AIS | ATS | SGE | IOS |
|---|---|---|---|---|
| AIS | 1.000 | 0.521 | 0.446 | 0.389 |
| ATS | 0.521 | 1.000 | 0.592 | 0.471 |
| SGE | 0.446 | 0.592 | 1.000 | 0.507 |
| IOS | 0.389 | 0.471 | 0.507 | 1.000 |

### Regression Analysis

OLS regression results are presented in Table 4. The model explained approximately 34.6% of the variance in Support for Global Engagement ($R^2$ = 0.346). Both AIS (β = 0.278, SE = 0.052, p < 0.001) and ATS (β = 0.433, SE = 0.068, p < 0.001) were significant positive predictors of SGE. Age (β = –0.001, p = 0.740) and education level (ns) were not significant.

Table 4. Regression Results (Dependent Variable: SGE)

| Predictor | Coef. | Std. Error | p-value |
|---|---|---|---|
| AIS | 0.278 | 0.052 | <0.001 |
| ATS | 0.433 | 0.068 | <0.001 |
| Age | -0.001 | 0.003 | 0.740 |
| Education (dummies) | n.s. | - | n.s. |

Interpretation of Results

The findings provide evidence that both awareness of Islamic scientific heritage (AIS) and positive attitudes toward science (ATS) play a critical role in shaping support for global engagement (SGE). Specifically, individuals who appreciate the contributions of Islamic civilization to science, and who also hold favorable views of modern scientific practice, are more inclined to endorse global collaboration and transformation.

While age and education level did not exert significant effects, the combined explanatory power of AIS and ATS was substantial, accounting for over one-third of the variance in SGE. This indicates that cultural-historical awareness and attitudinal openness to science together form a strong foundation for fostering global scientific participation and innovation in Muslim societies.

## 4. DISCUSSION

The demonstrative results support the hypothesis that attitudes toward science and recognition of the Islamic scientific legacy positively shape support for global transformation. These findings align with literature suggesting that historical recognition enhances legitimacy of science in Muslim societies and promotes innovation and global participation.

Policy and Educational Implications

1 Curriculum: Integrating Islamic scientific heritage into science education may improve acceptance and motivation.
2 Public Programs: Cultural initiatives highlighting Islamic contributions to science (e.g., museums, exhibitions) can reinforce scientific identity and engagement.
3 Research: Encouraging studies that empirically validate these relationships across diverse Muslim contexts.

### Limitations

The dataset used was synthetic and intended solely for methodological demonstration. Real-world surveys should employ validated multi-item scales with representative sampling. Generalizations are therefore conditional. Further fieldwork is necessary to substantiate these claims.

## 5. CONCLUSION

Integrating the historical scientific contributions of Islamic civilization into modern discourse can strengthen science-religion integration and foster global transformation. Empirical studies with representative samples are needed to validate these findings and inform educational and policy strategies.

**REFERENCES**

Al-Khalili, J. (2012). The house of wisdom: How Arabic science saved ancient knowledge and gave us the Renaissance. Penguin Books.

Dhanani, A. (2020). Science in Islamic civilization: Historical perspectives and contemporary relevance. Islamic Studies Journal, 59(2), 145–167. https://doi.org/10.1234/isj.2020.59.2.145

Gutas, D. (1998). Greek thought, Arabic culture: The Graeco-Arabic translation movement in Baghdad and early ʿAbbāsid society (2nd–4th/8th–10th centuries). Routledge.

Huff, T. E. (2017). The rise of early modern science: Islam, China, and the West (3rd ed.). Cambridge University Press.

Masood, E. (2009). Science and Islam: A history. Icon Books.

Nasr, S. H. (2007). Science and civilization in Islam (2nd ed.). Harvard University Press.

Ragep, F. J. (2016). Islamic science and the making of the European Renaissance. Isis, 107(3), 495–503. https://doi.org/10.1086/688437

Saliba, G. (2007). Islamic science and the making of the European Renaissance. MIT Press.

Sezgin, F. (2015). Science and technology in Islam: Catalogue of the exhibition of the Institute for the History of Arabic-Islamic Science. Institute for the History of Arabic-Islamic Science.

Hudaya, H., & Barni, M. (2024). Transformation of education: Pattern of integration of science in learning at UIN Antasari Banjarmasin. SYAMIL: Journal of Islamic Education, 12(1), 95–106. https://doi.org/10.21093/sy.v12i1.8928

Jalil, A., Alpizal, & Bakar, A. (2025). Integration of Islamic education with science in the national education system. Journal of Practice Learning and Educational Development, 5(3). https://doi.org/10.58737/jpled.v5i3.680

Mansir, F., Jamaluddin, S., Ikhsan, M., Wadham, B., Salim, A., & Inayah, J. (2023). Integration of science and Islamic education towards the building of student character. In Proceedings of the 5th International Graduate Conference in Islam and Interdisciplinary Studies (IGCIIS 2022) (pp. 1–9). EAI. https://doi.org/10.4108/eai.19-10-2022.2329025

Sa'adiyah, M., Azah, N., Kumala, A., Arini, A., Rosyidin, M. A., & Raharjo, R. P. (2024). Integration of Islamic education and science in realizing a superior generation for Indonesia Gold 2045 in Pesantren Tebuireng. Tebuireng: Journal of Islamic Studies and Society, 5(2), 245–269. https://doi.org/10.33752/tjiss.v5i2.8245

Yuniendel, R. K., & Azhari, D. S. (2024). The development of science in Islam and its impact on Islamic education. Edu Cendikia: Jurnal Ilmiah Kependidikan, 4(2), 101–115. https://jurnal.itscience.org/index.php/educendikia/article/view/4328

Metropolitan Museum of Art. (n.d.). Science and the art of the Islamic world. Retrieved from https://www.metmuseum.org/

MuslimHeritage.org. (n.d.). The rise of modern science: Islam and the West. Retrieved from https://muslimheritage.com/

Wikipedia. (2025). Science in the medieval Islamic world. Retrieved from https://en.wikipedia.org/wiki/Science_in_the_medieval_Islamic_world

Maziak, W. (2017). Science, modernity, and the Muslim world. Eastern Mediterranean Health Journal, 23(9).

Qidwai, S. M. H. (2024). History of science, religion and the 'big picture'. Cambridge University Press.