

Perception of Earth's Rotation and Revolution: A Comparative Study of Islamic Studies and Muslim Geography Students, Kashim Ibrahim University, Maiduguri, Borno State

By

Kyari Bakari

Department of Geography

Abba Alhaji Bukar

Department of Islamic Studies

Mohammed Ali Bukar

Department of Geography

&

Dauda Muhammad

Department of Islamic Studies

Kashim Ibrahim University, Maiduguri

Abstract

This study was a comparative analysis on the perception of rotation and revolution of the Earth between Muslim Students from Geography Department and those from Islamic Studies, Kashim Ibrahim University, Maiduguri, Borno State. The study was aimed at determining if there was any significant difference on the perception of rotation and revolution of the Earth between students of the two departments as a result of variation in their disciplines. 108 students (54 from each departments) were randomly selected and administered structured questionnaire. Null and alternative hypotheses were formulated for the study. The results gave a calculated χ^2 value of 4.96 which was bigger than the table value of 3.841. The null hypothesis was, therefore, rejected and the alternative hypothesis which stated that there was a significant difference on the perception of rotation and revolution of the Earth between students of the two departments was accepted. The result showed that Muslim geography students' acceptance of concept of rotation and revolution of the Earth was higher than those from Islamic studies leading to a statistically significantly difference on the perception. This underscores the need to integrate geography and religion. The study, therefore, recommended that knowledge of geography, particularly related to rotation and revolution of the Earth, is very vital for students and scholars of Islamic studies in understanding and interpreting verses or phenomena related to the rotation and revolution of the Earth.

Keywords: Perception, Geography, Qur'an, Axil, Rotation, Orbital, Revolution, Phenomenological Language

Introduction

A comparative analysis on the perception of rotation and revolution of the Earth between students of geography and Islamic studies reveals a fundamental academic divergence in methodological approach to natural phenomenon. Geography students rely primarily on empirical observation and physical law while students of Islamic studies rely on historical, theological and textual interpretations. Generally, while both groups affirm the reality of rotation and revolution of the Earth, there are still grey areas with conflicting view-points that need to be addressed.

To keep conflicting viewpoints in check, interpretations are aligned through appropriate strategies of integration which tend to generate non-conflicting perspective. According to Afrizah & Novitri (2024) through integration of religious and scientific perspectives, a comprehensive understanding of the Earth's rotation and revolution can complement each other to enrich our insight of the intricate nature of the universe. Similarly, Ali and Musfiroh (2024) are of the opinion that Islamic views are taught to develop science and technology while maintaining balance and harmony with nature. In this context, the Islamic view teaches that knowledge and understanding of natural phenomenon must be based on objective scientific methods.

The rotation and revolution of the Earth are considered as scientifically irrefutable physical phenomena, validated through centuries of direct evidence. Knowledge of these movements is quantitative, derived from observable facts such as the star aberration, Coriolis Effect, stellar parallax, the analysis of Foucault's pendulum, and high-precision satellite measurements. These motions are not subjects of debate but established constants which are required for understanding climate patterns, time zones, ocean currents, and orbital mechanics (Afrizah, & Novitri, 2024).

The overall perspective within **Islamic Studies**, while largely aligned with the scientific consensus in the modern era, view these phenomena through the lens of scriptural authority and historical tradition. However, for thorough comprehension of natural phenomena, particularly related to astronomy, students in this field need to study the extensive legacy of the Islamic Golden Age, where polymaths like Al-Biruni (973 – 1050) and Ibn Yunus (950 – 1009) were instrumental in refining calculations for both Earth's circumference and its precise movements – knowledge essential for determining prayer times and the direction of the *Qibla* (Anchassi, 2022; Suliyanah, 2020, and Saad, 2024).

Generally in Nigeria, and particularly in Borno state, resurgence of religious fundamentalism and dissenting voice has sparked tensions, as dogmatic viewpoints clash with evidence-based science leading to years of violent conflict and stagnation in development. Members of such violent groups are notorious in openly preaching against Western education by misinterpreting the Qur'an to back up their claim that Islam and the science, particularly of geography, are parallel. To such groups, any interpretation that does not fit into their perception should be rejected and termed 'forbidden' (Kassim & Nwankpa 2019 & Duodu, 2009).

The above situation underscores the fact that science of geography and Islamic religion need to be integrated. Through the process of integration, textual references that deal with natural phenomena could be interpreted better. This is what necessitated the authors to conduct a comparative analysis on the perception of rotation and revolution of the Earth between Islamic studies and Muslim geography students from Kashim Ibrahim University, Maiduguri, Borno state.

Literature Review

The Rotation and Revolution of the Earth

Earth's Movement and Ancient Geographic Thought

Historically, 2200 years ago and beyond, ancient Greek thinkers like Philolaus (c. 470 – 385 BC) and Hicetas (c. 400 – 335 BC), were among the first to suggest that the Earth rotated on its axis, with a semi-heliocentric concept but they failed to give a comprehensive picture of

their model. Hence, their suggestions were not accepted (Toomer, 2016). Similarly, it was reported that in ancient India, the astronomer Aryabhata as early as 499 AD suggested that the Earth rotated on its axis daily. His opinion was also rejected (Lindberg, 2007). Therefore, according to Ofomata (2001) and Riebeek (2009), one common belief among ancient thinkers like Socrates, Plato, Aristotle and Ptolemy among others about the Earth, was that it stood immobile in the centre of the universe.

Earth's Movement and Geographic Thought in the Medieval Period

However, after establishing the fact that the Earth is spherical, for about 1600 years or throughout the medieval period (200 – 1500 AD), it was believed that the Earth was stationary and was at the centre of the solar system while the other planets including the Sun revolve around it. This viewpoint is referred to as the geocentric model which was also supported then by thinkers like Aristotle and Ptolemy among others (Riebeek, 2009).

The apparent movement of the Sun which is an everyday experience tend to erroneously suggest the geocentric model, cited above, more especially in an era when science and technology was limited. Therefore, many Islamic scholars of the Golden Age such as Al-Kindi (c. 801 – 873), Razi (c.865 – 935), Ibn Taymiyya (1263 – 1328), and Al-Suyuti (1445 – 1505) believed in the geocentric model because it was the popular opinion then (Anchassi, 2022; Ali & Musfiroh, 2024).

However, in the 10th century, some Muslim astronomers accepted that the Earth rotates around its axis. According to al-Biruni, a Muslim astronomer al-Siizi in around 1020 AD had invented an astrolabe called al-zuraqi based on the idea believed by some of his contemporaries that the motion we see of the stars in the sky is due to Earth's movement and not to that of the stars or sky (Young, 2006). The notion among major Islamic polymaths, predating the European Renaissance, was firmly in favor of a spherical, moving Earth. Some Islamic scholars used Greek, Indian, and Persian sources, refined them, and integrated them into a distinct Islamic scientific tradition. For example, Al-Biruni used skills acquired through astronomy in his native Khwarezm from his foster father, the distinguished astronomer and mathematician, Abu Nasr Mansur but later expanded his knowledge by studying Greek and Indian astronomical traditions to accurately determine the Qibla (direction of prayer) and prayer times with sophisticated spherical trigonometry and an understanding of the Earth's sphericity and the relative movements of the celestial sphere. He also calculated the Earth's circumference with impressive accuracy and extensively discussed its axial rotation (Sparavigna, 2013).

According to Ali & Musfiroh (2024) the same geocentric model was earlier held as correct and preached by recent renowned Islamic scholars such as Bin Baaz (1912 – 1999), Al-Albani (1914 – 1999) and Ibn Uthaymin (1929 – 2001) who were influenced by the writings of Islamic scholars of the Medieval Age. However, they changed their views when Prince Salman Al-Saud, an astronaut, became the first Arab, the first Muslim and the first member of a royal family to journey into space in 1985 on NASA's Space Shuttle Discovery representing the Arab Satellite Communication Organization (ARABSAT) where he also conducted some experiments (Lawton & Moody, 1986). Mark (2008) maintained that, Salman Al-Saud told Bin Baz, the former Grand Mufti of Saudi Arabia that he saw the Earth rotated from space which made the scholars to accept the fact. Currently, KSA Directory (2023) reported that in the 2023 – 2024 academic session, Saudi introduces Earth and Space Science into secondary school education to teach concepts from basic astronomy to advanced topics aiming at fostering interest and qualitative competition in the space sector as the Saudis seek to regain their position in astronomy and space explorations.

Earth's Movement and Modern Scientific Consensus

The Earth moves in two ways – axial **rotation and orbital revolution**. **The former is the spinning of the Earth on its axis from west to east in 24 hours and the latter is the movement of the Earth on its ecliptic plane**, orbiting round the Sun in $365\frac{1}{4}$ days which is referred to as the heliocentric model (Ali & Musfiroh, 2024). The geocentric model which lasted for about 1600 years was challenged with remarkable success by Copernicus in 1543 by proposing the heliocentric one which placed the Sun at the centre of the solar system with the Earth and other planets orbiting it. Earlier in history, Aristarchus had proposed a heliocentric model in the third century BC without successfully depending it. In the 16th century, however, Copernicus presented a full discussion of a heliocentric model of the universe (Riebeek, 2009). About a century later, in the 17th century Galileo Galilei using a telescope provided key observational evidence by observing the phases of Venus which could only happen if Venus orbited the Sun, and the moons of Jupiter which showed that not all celestial bodies revolved around the Earth. At about the same time, Kepler published a series of laws that describe the orbits of the planets around the Sun. Finally, in 1687, Newton put the final nail in the coffin for the Aristotelian geocentric view of the universe (Riebeek, 2009). However, it was in the 19th century that invention of Foucault pendulum provided direct, observable proof of Earth's rotation (Sommeria, 2017). The effects of axial rotation include day and night, differences in time zone, sunset and sunrise, apparent movement of the Sun, tides, deflection of wind and ocean currents while that of revolution include seasons, change in the altitude of the midday Sun and year (Ali & Musfiroh, 2024). From the foregoing statements, it can be seen clearly that that science is characterized by constant change or progress. In other words, science is dynamic. This dynamism also extends to Islam as expressed by Lipton, (2018) in the book "Rethinking Ibn Arabi" where it was stated that the Qur'an contains multiple layers of meaning that unfold with advancement in human knowledge through interpretive evolution where the original Arabic text remains the same. Similarly, research publications by Young (2006), Suliyanah (2020), Firdaus & Sinensis (2017), Ali & Musfiroh (2024) and Saad (2024) have suggested that verses of the Qur'an clearly show that there is no conflict with modern science especially in the perspective related to astronomy.

As there is an evident gap in studies conducted to compare perception of Earth's rotation and revolution between students of scientific and religious disciplines in Nigerian universities, this study, therefore, compared the perception of Muslim Geography Students (MGS) with that of Islamic Studies (ISS) in the Kashim Ibrahim University, Maiduguri, Borno state to analyse the root causes of conflicts in interpretation in order to provide a complementary perspective aimed at systematically preventing and addressing underlying issues rather than just treating symptoms through palliative treatment.

Material and Methods

This study was conducted at Kashim Ibrahim University, Maiduguri, Borno state. Primary data were collected using structured questionnaire administered to 108 sampled students randomly selected from the 300 and 400 levels of the departments of Islamic Studies and Geography (with 54 respondents from each). The information generated from the questionnaire included gender, age, current course level and whether they had studied geography at secondary school level. The research question for the study was: (i) Do you agree that the Earth moves by rotating on its axis and revolving on its orbit around the Sun? The use of a single research question, for this study, is validated and ensured reliable by Missanin and Hinderlite (1991). They are also of the opinion that the sampled population should be more than 50 so that chi-square test would be used without resorting to Fishers' exact test. Inasmuch as all the students are Muslims, any

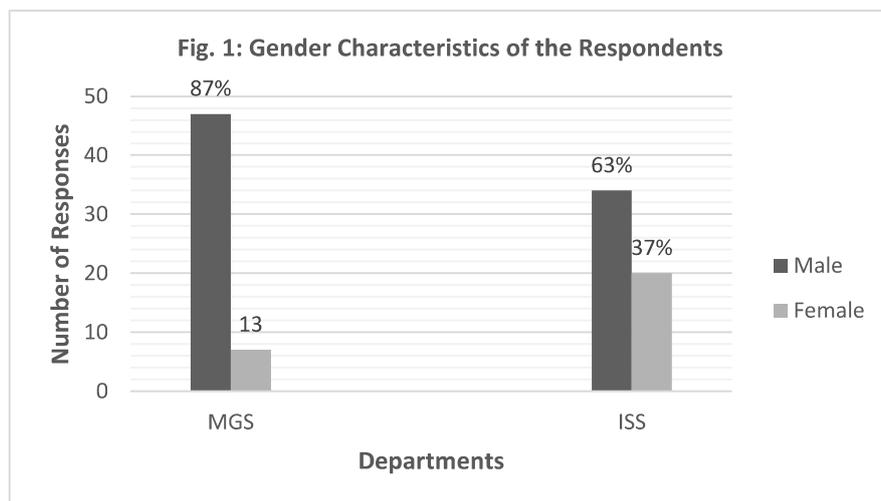
statistically significant difference in their perception could be as a result of an advantage that one group has above the other. In other words, the knowledge of rotation and revolution is an added advantage to the geography students. The two groups (departments) were the independent variable (categorical) while responses of either 'yes' or 'no' on the questionnaire were the dependent variable (outcome variable). As the data were in form of frequency counts with mutually exclusive options of 'yes' or 'no', chi-square (χ^2) which is a non-parametric statistical test was used to analyse the data using 1 *df* at 0.05 level of significance. Null and alternative hypotheses were formulated for the test. The study also employed textual criticism by analyzing contents from Islamic sources, particularly Qur'anic verses, which contain concepts related to geographical phenomena through re-reading. Excel (Spreadsheet) was used in calculating the expected outcomes and the p-value as well as in plotting the chart.

Results and Discussion

The Demographic Characteristics

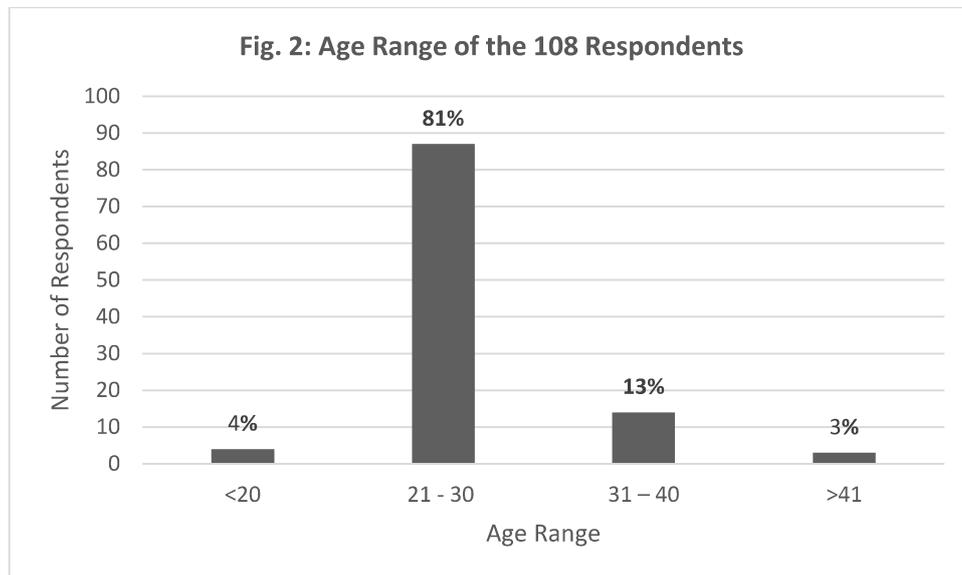
All the 108 sampled respondents are Muslims. Therefore, it is expected that geography students having integrated Islam with science of geography would have a better perception regarding the shape of the Earth.

The gender of the 108 respondents sampled shows that only 13% of the respondents from Department of Geography are female while the remaining 87% are males. An indication that males generally dominant in courses that has to do with fieldwork activities. Moreover, such field studies often give students better opportunity to understand the concept of rotation and revolution of the Earth through simple demonstrations during fieldwork more especially where variations in time zones are pronounced. In the Department of Islamic Studies, about 37% are females while the remaining 63% are males. In the two departments combined, the gender proportion was 75% males against 25% females (Fig. 1). This is indicative of situation in the Borno state where more males are enrolled in schools than females



The age range of the respondents also varies. Majority of the respondents (81%) are within the age range of 21 – 30 years. 13% were within the range of 31 – 40 years. 4% were less than 20 years and 3% were above 41 years of age (Fig. 2). This is reflective of the Nigerian tertiary institution where the majority of the students are in early adulthood which is a period characterized by pursuing aspiration, trying new things in life to establish a career and the desire to form a family. The implication is that as the majority of the respondents (94%) were

above 20 years, it is expected that they would have a better perception on rotation and revolution of the Earth due to changes in physical capabilities, cognitive function and accumulated life experience (Baldy, 2023; also Jelinek (2024).



The Formulated Hypotheses

The following null and alternative hypotheses were formulated for the study:

H₀: There is no significant difference on the perception of rotation and revolution of the Earth between Muslim geography students and Islamic studies students from the Kashim Ibrahim University Maiduguri, Borno state.

H₁: There is a significant difference on the perception of rotation and revolution of the Earth between Muslim geography students and Islamic studies students from the Kashim Ibrahim University Maiduguri, Borno state.

The Observed frequency (O) is derived from the responses of the 108 students while Expected Outcomes (E) were computed using Excel (Spreadsheet) and presented in table 1 and Fig. 3 below.

Table 1: Do you agree that the Earth rotates on its axis and revolves round the Sun?

Variables	Agree		Disagree		Total O	Agree	disagree
	O	E	O	E		%	%
Muslim Geography Students	52	48.5	2	5.5	54	96	4
Islamic Studies Students	45	48.5	9	5.5	54	83	17
Total	95		13		108		

$$df = (C - 1) (R - 1) = 1$$

Expected outcome (E) = (Row total x Column total)/Grand total

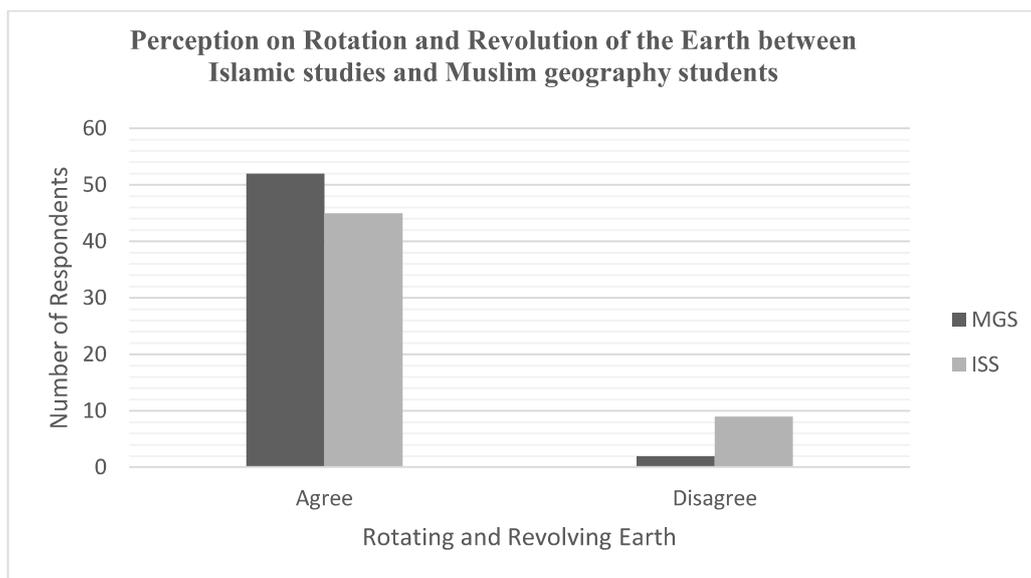
$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

E

χ^2 of 1 *df* at 0.005 alpha level of significance is 3.841. The calculated value obtained is 4.96 which is bigger than the table or critical value (3.841). The null hypothesis is therefore rejected and the alternative hypothesis which stated that: there is a significant difference on the perception of rotation and revolution of the Earth between Islamic studies and Muslim geography students from the Kashim Ibrahim University Maiduguri, Borno state is accepted. The result of the p-value calculated is 0.025945 which is less than the 0.05 alpha or significance level. This implies that the observed relationship or difference between the perceptions of the students from the two departments is not due to randomness as there is statistical evidence to support the alternative hypothesis showing variation in their perception regarding rotation and revolution of the Earth.

Discussion of the Results

The result shows a significance difference on perception of rotation and revolution of the Earth round the Sun between the students of geography and that of Islamic studies. Almost all Muslim geography students (96%) agree that the Earth rotates on its axis and revolves round the Sun with only two respondent (4%) disagreeing. Similarly, the majority of Islamic studies students (83%) agree with the concept while 17% disagree which is significant enough to make a difference statistically (Fig. 3). Generally, the majority of the respondents believe the concept of rotation and revolution of the Earth.



Majority of geography students (96%) agreed with the concept of rotation and revolution of the Earth because of their curricular mandate as many geographical processes and concepts are laid upon that foundation while 83% of students from Islamic department agreed with the concept with the remaining 17% disagreeing which accounted for the rejection of the null hypothesis as shown by the chi-square test. Many renowned Islamic scholars of contemporary time, even in Saudi Arabia, shared the same views of a motionless Earth but had to retract their position on account of empirical evidence as cited earlier. This shows that the concept of rotation and revolution is complementary with the Qur'an as recent studies cited earlier by Ali & Musfiroh (2024) and others above have shown.

Qur'anic verses like chapters 13: 2, 7:54, 16:12, 21:33, 31:29, 35:13, 36:38-40 and 39:5 among others explicitly state that the Sun and the moon move on their orbits but the movement of the Earth is not directly stated which makes students to believe that the Earth does not move.

However, there is no any verse in the Qur'an that says that the Earth is not in motion. Islamic scholars have not in any way forbidden the pursuit of knowledge that will through light on such issues contrary to some ideological claim as reported by Duodu (2009) and Kassim & Nwankpa (2019). Therefore, Earth's movement is subject to further scientific inquiry and analysis of a verse or two that will be presented here conclusively.

The multilayered nature of the Qur'an makes it dynamic. The words and phrases hinting at a rotating and revolving Earth are not explicitly stated. This is because natural phenomena can only be understood better through empirical evidence or reasoning, not through text, as the "signs" or "evidences" in nature are better understood by "people of reasoning" as stated in chapter 2, verse 164. This underscores the fact that reasoning is a tool of inquiry and scientific method.

The verses on rotation and revolution of the Earth used phenomenological language. This is because, we cannot feel the Earth moving as we, and everything around us, are travelling at the same constant speed as the planet without change in acceleration or deceleration. The Earth's smooth, consistent rotation and revolution, without bumps, feel like stillness because there is no relative change for our senses to detect. The movement which creates day and night (24 hours) and a year (12 months) are fixed from time immemorial. The verses mentioned above clearly say the Sun and the moon are moving on their orbits but are silent on the motion of the Earth. For example, Chapter 36, verses 38 – 40 mention the movement of the Sun, the moon and that of the night and day. However, Qur'an verse 33, chapter 22 is a concise summary of the three verses which would be analysed here.

Al-Hilali & Khan (1978) translates it as "And He it is, who has created the night and the day, and the Sun and the moon, each in an orbit floating (22:33)." A reader can easily conclude from the above translation that only the Sun and the moon are moving because there is no mention of the Earth in the verse. The same chapter and verse (22:33) translated by Ali (1938) reads: "It is He, who created the night and the day, and the sun and the moon: *all (celestial bodies) swim along, each on its rounded course*". The transliteration of the clause in italic above is "kullun fi falakin yasbahuun." The word "kullun" in the verse is a plural noun meaning three or more objects that is why Ali included the celestial bodies which are not mentioned in the verse and parenthesized them. A scholar with knowledge of geography or astronomy will perceive the above verse better as they will integrate the text (called *naql* in Arabic) with reasoning or scientific (*aql*). Taking all things (text and reason) critically into consideration, an alternative translation will be: "And He is the One, who created the night and the day (the Earth), and the Sun and the moon, all (the three) move on their orbits." One may ask, where does the Earth in parenthesis come from as it is not mentioned in the verse? The Earth is included into the translation because night and day are not objects but phenomena without having an orbit. Nobody is doubting that night and day are phenomena wrapped upon the Earth. Therefore, their orbit is that of the Earth.

In addition, the word 'yasbahuun' in the above transliteration is a term for moving or swimming; it is a plural verb for three or more objects but for only three in this context with night and day standing for the planet Earth along with the Sun and the moon as clearly stated. If only the Sun and moon are moving on their orbits excluding the Earth, the verb would have been 'yasbahani' a dual verb for only two objects. These are facts that cannot be comprehended without science. So, if one looks at the Earth, one does not see or feel its rotation nor its revolution but through closer observation and measurement, the Earth is proven to be rotating and revolving. Therefore, the Qur'anic verses have similar import. When ones read the verses, he finds the phenomenological language that describes our everyday experience which reads

clearly that the Sun and the moon are running on their orbits; then when one reads with reasoning and close observation or as scientific knowledge unfolds, one sees the verses implicitly stating the rotation and revolution of the Earth, as well, without any conflict. There is a similarity between how rotation and revolution presents itself to us through everyday experience (phenomenological language) and after scientific research or observation with how the Qur'an presents it to us after reading and re-reading.

In addition, Chapter 18: 25, states, "And they stayed in their cave for three hundred years, and added nine" supports the rotation and revolution of the Earth. Renowned Islamic exegesis like Ibn Kathir, and Al-Jalalain have supported the interpretation that 300 years mentioned above refers to solar years, and if 9 is added it becomes 309 lunar years. In the Islamic lunar calendar there are 354 days in a year and mathematically 300 solar years is equivalent to 309 lunar years, that is, $365\frac{1}{4} \times 300/354$. This is because, the moon revolves round the Earth once every month. By the time the moon revolves for 12 times around the Earth (12 months), the Earth will complete one revolution around the Sun which makes a solar year. Rotation and revolution of the Earth round the Sun, and the revolution of the moon round the Earth determine the number of months in a year. The fact that the Qur'an has stated, in chapter 9 verse 36, that the number of months in the reckoning of God are twelve (12) is a clear approval of the concepts of rotation and revolution of the Earth. Therefore, the knowledge of astronomy or geography is complementary in understanding Qur'anic verses related to rotation and revolution and other phenomena related to the concepts.

Conclusion

The study has shown that there is a statistically significant difference on perception of the concept of rotation and revolution of the Earth between students of Islamic studies and Muslim geography students at the Kashim Ibrahim University, Maiduguri, Borno state as a result of their sub-sociocultural environment despite largely sharing the same physical and non-physical environments.

The study has also demonstrated that, despite the statistically perceptual variations between students of the two departments, the Qur'anic verses align with scientific evidence when critically examined as a result of their multilayered nature changing in meaning with time without any change in the manuscript.

Finally, the study recommended that fostering true integration between Geography and Islamic Studies entails moving beyond simple coexistence to active collaboration through curriculum harmonization and development, addressing misconceptions through open forums or seminars, collaborative research projects, co-teaching models for lecturers from geography department to help in explaining verses that are related to natural phenomena and establishing institutional support in tertiary schools and tsangaya systems through providing centre for science and faith integration.

References

- Afrizah, T. & Novitri, D. (2024). Physics and Islam's view on the Earth Spinning. *Journal of Science and Religion Integration*. Vol. 1. No.1. September 2024. <http://jsri.misikatulanwar.com>
- Al-Hilali, M. T. & Khan, M. M. (1978). *Explanatory English Translation of the Meaning of the Qur'an*. 2nd Edition. Ankara, Turkey. Hilal Publishing House.
- Ali, A. Y. (1938). *The Holy Qur'an, Text, Translation and Commentary*. Dar Al Arabia Publishing. Damascus, Syria.
- Ali, Z. M. & Musfiroh, E. (2024). Astronomy in Qur'an: comparative study of Geocentric and Heliocentric Models. *Darul Hikmah Journal of Hadits and Tafsir*. Vol. 10, No. 2, 2024. P.ISSN:2442-6520.
- Anchassi, Omar (2022). "Against Ptolemy? Cosmography in Early Kalām". *Journal of the American Oriental Society*. 142 (4): 861, n. 72. doi:10.7817/jaos.142.4.2022.ar033. ISSN 2169-2289.
- Baldy, E. (2023). Children's representation of the Earth at the end of elementary school. The role of spherical and geographical information carried by the globe. *Review of science, Mathematics and ICT education*. 17(2), 5-25. <http://doi.org/10.26220/rev.4479>
- Duodu, C. (2009) Mohammed Yusuf's final days Thursday 6 August, 2009: *The Guardian, online 2009*. Transcripts of the interview of Mohammed Yusuf with the security officer at Maiduguri, Borno state.
- Firdaus, T., & Sinensis, R. (2017). Revolutionary Theory Paradigm Debate: Sun or Earth as the Center of the Solar System. Titian Ilmu: *Multi Science Scientific Journal*, 9(1).
- Jelinek, J. A. (2024). Concept of the Earth's shape in students 10-15 years old. *Review of science, Mathematics and ICT education*. 18(1), 53-75. <http://doi.org/10.26220/rev.4958>
- Kassim, A. & Nwankpa, M. (2019). *This is our creed and method of proclamation*. The Boko Haram Doctrine. Lagos, Quida Books.
- KSA Directory (2023). The teaching of Earth and Space sciences approved for the secondary school. *Saudi Education Ministry*. 01 January 2023. Retrieved from <http://www.ksa.directory> on 18th December 2025.
- Lawton & Moody, 1986). The Prince in Space. *Saudi Aramco World*. 37 (1). Archived from the Original on 7 May, 2012.
- Lindberg, D. C. (2007). "Science before the Greeks". *The Beginnings of Western Science*. Chicago: University of Chicago Press. pp. 1–20. ISBN 978-0-226-48205-7
- Lipton, G. A. (2018). *Rethinking Ibn Arabi*. New York: Oxford University Press.
- Mark, W. (2008). *Prophets and Princes: Saudi Arabi from Muhammad to the Present*. John Wiley & Sons. P. 196. ISBN 978-0-470-18257-4

- Missanin, J. R. & Hinderlite, C. F. (1991). *Fundamentals of statistics for psychology students*. New York: Herper Collins.
- Ofomata, G. E. k. (2001). *Geographic Thought*. Enugu: Jamoe Enterprises (Nigeria).
- Riebeek, H. (2009). Planetary Motion: The History of of an Idea that launched the Scientific Revolution. *NASA Earth Observatory*. <http://observatory.nasa.gov>).
- Saad, B. (2024). Earth rotates on itself, the revelation of the Qur'an more than 1400 years ago. *Emirati Journal of Space and Astronomy Sciences*. EJAS, Issue 2, vol 1. Link: <http://www.emiratisscholar.com/eaerth/rotates-on-itself-the-revelation-of-the-Qur'an-more-than-1400-years-ago>
- Sommeria, J. (2017). "Foucault and the rotation of the Earth" *Science in the making. The Comptes rendus de l'Academic des sciences throughout history*. 18 (9): 520 – 525. Doi:10.1016/j.crhy.2017.11.003. ISSN 1631-0705
- Sparavigna, A. C. 2013. The Sciences of Al-Biruni. *International Journal of Sciences*. Vol. 2, Issue 12. Doi: 10.18483/ijSci.364 retrieved on 24 November 2025 from <https://www.ijsciences.com>
- Suliyannah, U. J. (2020). The Sun about Heliocentric Theory in Science Perspective and the Qur'an al-Maraghi. *Al-Hayat Journal of Islamic Education*. Vol. 4, Issue 2, July – December 2020.
- Toomer, G. J. (2016). Hicetas. *Oxford Research Encyclopaedia*. <http://doi.org.10.1093/acrefore/970199381135.013.3086>
- Young, M. J. L., ed. (2 November 2006). *Religion, Learning and Science in the 'Abbasid Period*. Cambridge University Press. p. 413. ISBN 978-0-521-02887-5.