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Qibla Direction Determination in Historical Mosques: Methodological and Accuracy Assessment at Al-Anwar Grand Mosque, Bandar Lampung

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Abstract

Qibla direction in mosques, historically, was determined using simple methods and traditional tools, resulting in relatively low accuracy. This study aims to analyze the methods and precision of Qibla direction at Jami' Al-Anwar Mosque, Bandar Lampung, using a qualitative field approach supported by modern instruments. The findings indicate that the true Qibla direction is 295° 18′ 25.82″, while the mosque's current orientation measured with a theodolite is 295° 12′ 10″ and with a *mizwala* instrument is 295° 12′ 13.82″. The difference of only 0° 6′ 15.82″ classifies the mosque's Qibla as accurate according to deviation tolerance theory. Contributing factors include the use of an *istiwā'* stick to determine cardinal directions, advances in scientific knowledge, and religious motivations to ensure precision. These results highlight the significance of combining traditional techniques and modern technology to maintain the accuracy of Qibla orientation in historic mosques.

Keywords: *qibla, historical mosque, accuracy, deviation.*

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Penentuan arah kiblat pada masa lalu umumnya dilakukan dengan metode sederhana dan alat tradisional sehingga akurasinya relatif rendah. Penelitian ini bertujuan menganalisis metode dan tingkat ketepatan arah kiblat Masjid Jami' Al-Anwar, Bandar Lampung, menggunakan pendekatan kualitatif lapangan dengan instrumen modern. Hasil pengukuran menunjukkan arah kiblat sebenarnya adalah 295° 18′ 25,82″, sedangkan arah masjid yang terukur dengan theodolit adalah 295° 12′ 10″ dan dengan mizwala 295° 12′ 13,82″. Selisih keduanya hanya 0° 6′ 15,82″, sehingga masjid ini dikategorikan memiliki arah kiblat yang akurat berdasarkan teori toleransi deviasi. Faktor-faktor yang mendukung ketepatan ini meliputi penggunaan tongkat istiwa' untuk menentukan arah mata angin, kemajuan ilmu pengetahuan, serta pendekatan keagamaan yang mendorong akurasi. Temuan ini menegaskan pentingnya integrasi metode tradisional dan teknologi modern dalam pelestarian ketepatan arah kiblat masjid bersejarah.

Kata Kunci: *arah kiblat, masjid bersejarah, akurasi, kemelencengan*.

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A. Introduction

The concepts of direction [1] is of paramount importance in discussions concerning Qibla orientation.[2] Slamet Hambali defines the Qibla direction as a line that points toward the Kaaba in Mecca, representing the shortest distance between the point of calculation and the Kaaba itself. This direction is used by all Muslims when performing their prayers, as they are required to face it.[3] Facing the qibla is a fundamental requirement for the validity of both obligatory and non-obligatory prayers. This necessity highlights the importance for Muslims to ensure that mosques and prayer rooms (*Muṣallā*) are correctly aligned with the qibla, as part of striving for the completeness and correctness of worship.[4]

The determination of the Qibla direction in Indonesia has undergone continuous development in line with the progression of scientific understanding among the Muslim population.[5] Nowadays, determining a mosque's Qibla direction is conducted using advanced modern instruments tested for accuracy, such as GPS, *Istiwā'aini*, *Mizwala*, and Theodolite.[6] Unlike the determination of Qibla direction in modern mosques, ancient mosques—built before the advent of modern technology—typically relied on traditional methods, such as using the *Istiwā'* stick, magnetic compass, Qibla compass, solar shadows, or the reference point of the setting sun. These conventional methods and instruments generally offered low levels of accuracy due to their susceptibility to external factors such as the Earth's gravity.[7] Some mosques even relied on the spiritual gifts (*karāmah*) attributed to revered Islamic saints (*walī*) to determine the Qibla direction.

Al-Anwar Grand Mosque, located in Lampung Province, is the oldest in the region and has been officially designated as a historical structure, as stipulated in Decree No. Wh/2/SK/147/1997 issued by the Regional Office of the Ministry of Religious Affairs of Lampung. The mosque was founded in 1839 CE.[8] The building has been nearly three centuries since the mosque was first established. Remarkably, despite being constructed almost three centuries ago, the mosque exhibits an exact qibla orientation. This data was obtained through calculations using Google Earth and the theodolite instrument. The precision of the qibla direction in the oldest mosque in Lampung raises fundamental questions about the methods employed initially to determine its orientation, especially considering that the tools available at the time were relatively simple.

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[1] Ahmad Izzuddin, *Ilmu Falak Praktis; Metode Hisab-Rukyat Praktis Dan Solusi Permasalahannya* (Semarang: Pustaka Rizki Putra, 2012).

[2] Muhyiddin Khazin, *Kamus Ilmu Falak* (Yogyakarta: Buana Pustaka, 2005).

[3] Slamet Hambali, "Penentuan Awal Waktu Solat Dan Penentuan Arah Kiblat Di Seluruh Dunia" (Semarang: Program Pascasarjana IAIN Walisongo, 2011).

[4] Muhamad Zainal Mawahib, "Metode Pengukuran Arah Kiblat Dengan Segitiga Siku-Siku Dari Bayangan Bulan" (UIN Walisongo Semarang, 2016); Muhammad Nurkhanif, "Problematika Sosio-Historis Arah Kiblat Masjid 'Wali' Baiturrahim Gambiran Kabupaten Pati Jawa Tengah," *Al Qodiri : Jurnal Pendidikan, Sosial Dan Keagamaan* 15, no. 2 (2018): 1–23.

[5] Ahmad Izzuddin, *Fiqih Hisab Rukyah* (Jakarta: Erlangga, 2007).

[6] Ahmad Izzuddin, "Kajian Terhadap Metode-Metode Penentuan Arah Kiblat Dan Akurasinya" (Pascasarjana IAIN Walisongo Semarang, 2011).

[7] A. Jami'l, *Ilmu Falak (Teori Dan Aplikasi)* (Jakarta: Sinar Grafikas Offset, 2009).

[8] M Syaipullah, "Fungsi Dan Peranan Masjid Jami'Al-Anwar Dalam Penyebaran Islam Di Teluk Betung Selatan, Bandar Lampung" (Palembang: UIN Raden Fatah, 2018).

Figure 1. The Qibla Direction of Jami' Al-Anwar Mosque

Initial observations from a literature review indicate that many ancient mosques show signs of Qibla misalignment. Several historical mosques with recorded deviations include the Grand Mosque of Demak.[9] with a deviation of 12°,[10] Kyai Ageng Ngaliman Mosque (Nganjuk, East Java) with 16°, Al-Mubarok Mosque (Nganjuk, East Java)[11] with 14°, Mujahidin Mosque (Sragen, Central Java)[12] with 8°57'0", Bayan Beleq Ancient Mosque (Lombok, West Nusa Tenggara), with 8°39'37", Gunung Pujut Ancient Mosque (Lombok, West Nusa Tenggara)[13] With 20°49'23", and Al-Abror Ancient Mosque (Bandar Lampung, Lampung) with a deviation 10°.[14]

As is widely understood, prayer (*salat*) must be performed while facing the qibla, the Kaaba.[15] However, there are differing scholarly opinions regarding the acceptable tolerance for qibla deviation. In his study 'Typology Jihatul Kaaba on Qibla Direction of Mosques in Semarang', Izzuddin asserts that a mosque's qibla direction is still considered accurate as long as the deviation does not exceed 2° from the proper direction of the Kaaba.[16] In another study entitled 'Tolerance for Qibla Direction Measurement Deviation', Arifin suggests that, for Indonesia, the qibla direction is

[9] Fairuz Sabiq, "Ijtihād In The Qibla Direction Of The Grand Mosque Of Demak," Reseacrh Gate, 2023, https://www.researchgate.net/publication/369857256.

[10] Achmad Jaelani, Anisah Budiwati, and dkk, *Hisab Rukyat Menghadap Kiblat (Fiqh, Aplikasi Praktis, Fatwa Dan Software)* (Semarang: Pustaka Riski Putra, 2012).

[11] Emyllia Fatmawati, "Studi Komparasi Arah Kiblat Dua Masjid Kuno Di Nganjuk Tinjauan Ilmu Falak (Masjid Kyai Ageng Ngaliman Dan Masjid Kanjeng Jimat)" (Universitas Islam Negeri Sunan Ampel, 2023).

[12] Anggun Dwi Oktavia, "Penentuan Dan Akurasi Arah Kiblat Masjid Kuno Di Sragen Dan Respon Masyarakat (Studi Kasus Di Masjid Mujahidin Bulu Boto, Desa Bulu, Kelurahan Karanganyar, Kecamatan Sambungmacan, Kabupaten Sragen)" (Institut Agama Islam Negeri (IAIN) Surakarta, 2020).

[13] Ani Wafiroh, "Akurasi Arah Kiblat Masjid Kuno Bayan Beleq Dan Masjid Kuno Gunung Pujut di Pulau Seribu Masjid," *Nurani* 18, no. 2 (2018): 161–75.

[14] Ariba Khairunnisa and Dian Ika Aryani, "Akurasi Arah Kiblat Masjid Kuno Al-Abror Dengan Metode Rashdul Kiblat Harian," *Journal of Islamic Studies and Humanities* 8, no. 2 (2023): 179–98, https://doi.org/http://dx.doi.org/10.21580/jish.v8i2.18370.

[15] M Ikhtirozun Ni'am, "Arah Kiblat Di Planet Mars M. Ikhtirozun Ni'am," *Al-Marshad: Jurnal Astronomi Islam Dan Ilmu-Ilmu Berkaitan* 2, no. 1 (2020): 19.

[16] Ahmad Izzuddin, "Typology Jihatul Ka"bah on Qibla Direction of Mosque in Semarang," *Ulul Albab: Jurnal Studi Dan Penelitian Hukum Islam* Vol. 4 No., no. 1 (2020): 1–15.

considered acceptable if the deviation falls within the range of +0° 6' 36" to –0° 10' 12" from the qibla azimuth.[17] Similarly, Sudibyo, in his book '*Ketika Nabi Pun Berputar*, states that the permissible deviation for qibla direction in Indonesia is up to 0° 24" at any given location.[18] Based on Izzuddin's tolerance standard, the seven mosques mentioned earlier fall outside the acceptable range of Qibla accuracy.

B. Method

This research employs a qualitative approach, categorized as field research, aiming to explore and analyze real-life phenomena. Utilizing the discipline of Islamic astronomy, the field investigation was conducted intensively to examine the historical background of Qibla determination in 1839 and its relationship to the mosque's current precise Qibla orientation [19] A historical-sociological approach was applied, in which the study uncovers past events and reveals the social dimensions associated with those events.[20] As examined in this study, the precise Qibla orientation of the mosque cannot be separated from the social context in which it was determined. In addition, the research adopts a mathematical approach to ensure that all qibla determination methods are analyzed with careful attention to mathematical aspects and calculations, involving precise measurements using the appropriate instruments.

The primary data sources used in this study consist of information collected directly from sources related to the research problem—namely, original data obtained firsthand.[21] This includes the physical structure of Al-Anwar Grand Mosque, which still stands today as a historical heritage site. Meanwhile, secondary or supporting data were gathered from material and oral sources relevant to the research object.[22] The material sources include written records, photographs, testimonies, and other factual evidence about the mosque. One key secondary source is a document containing the mosque's historical background, *Risalah Masjid Jami' Al-Anwar Telukbetung*, published by the Jami' Al-Anwar Mosque Foundation.

I employs a descriptive analysis technique to illustrate the existing conditions in this study.[23] This approach is used to provide an understanding by describing the historical background of the establishment of Al-Anwar Grand Mosque, the roles of key figures in determining the qibla direction—namely Muhammad Soleh and Abdul Gofar—the methods used for qibla determination during the mosque's construction period, and the expertise possessed by these figures in relation to qibla orientation. In addition to descriptive analysis, the study also applies historical analysis.

[17] Zainul Arifin, "Toleransi Penyimpangan Pengukuran Arah Kiblat," *Elfalaky: Jurnal Ilmu Falak* 2, no. 1 (2018): 73.

[18] Muh. Marufin Sudibyo, *Sang Nabi Pun Berputar* (Solo: Tinta Medina, 2011).

[19] Husaini Usman, *Metodologi Penelitian Sosial* (Jakarta: PT Bumi Aksara, 2006), 5.

[20] Gusma Yulita, "E-Modul Sejarah Indonesia," *Kementrian Pendidikan Dan Kebudayaan Direktorat Jendral Pendidikan Dasar Dan Menengah Direktorat Pembinaan Sekolah Menengah Atas 2019* (tt: Direktorat Pembinaan SMA - Kementerian Pendidikan dan Kebudayaan, 2019).

[21] Sugiyono, *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif, Dan R&D)* (Bandung: CV. Alfabeta, 2017), 137.

[22] M. Dien Madjid and Johan Wahyudi, *Ilmu Sejarah: Sebuah Pengantar* (Jakarta: Prenada Media Group, 2014).

[23] Sanapiah Faisal, *Format-Format Penelitian Sosial* (Jakarta: PT Raja Grafindo Persada, 1989), 258.

Historical analysis involves systematically, objectively, and accurately reconstructing past phenomena to explain present-day conditions.[24]

C. Result and Discussion

1. An Analysis of Qibla Direction Determination Methods and Their Accuracy

Historically, the methods of qibla direction determination in Indonesia have evolved in accordance with the intellectual quality and capacity of the Muslim community. This development is evident in the tools and instruments used over time. In 1839, Muhammad Soleh employed straightforward tools to determine the qibla direction of the mosque. As a skilled sailor, he possessed strong navigational abilities, particularly in using constellations for orientation. He utilized this expertise to establish the qibla direction. The constellations used by Muhammad Soleh included Orion, Ursa Major, Scorpius, and Crux. By utilizing these constellations, Muhammad Soleh determined the qibla direction by first identifying the qibla azimuth degree for the Teluk Betung area. Once the true north was established, the qibla direction could be determined simply by adjusting according to the azimuth angle. However, no historical records have been found that detail the specific calculations Muhammad Soleh used at that time to determine the Qibla azimuth. Until he died in 1885, Muhammad Soleh had a student named Abdul Gofar.

In August 1883, the catastrophic eruption of Mount Krakatoa caused a massive tsunami that destroyed the *surau* building. The structure was leveled to the ground, leaving only debris and remnants of its foundation. In 1888, the mosque was rebuilt as a permanent structure. The figure appointed to determine the Qibla direction during this reconstruction period was Abdul Gofar, a student of Muhammad Soleh. Drawing upon the knowledge he had acquired from Muhammad Soleh, Abdul Gofar employed the same qibla azimuth method. However, he utilized improved instruments to determine the qibla direction. These included a straight rod made of brass and a flat surface constructed from cement, marked with concentric circular lines. Thus, the qibla direction of the mosque was determined with precision using the azimuth method, aided by the *Istiwā'* stick to establish true north.

Based on field data and factual evidence, since its reconstruction in 1888, the mosque has not undergone any changes in its Qibla direction, nor has it ever been re-verified by any external party. Therefore, it can be confirmed that the current qibla orientation of the mosque is the result of the original determination made by Abdul Gofar using the Qibla azimuth method and the aid of an *Istiwā'* stick. This qibla direction has remained unchanged and has never been recalibrated. The measurement results indicate that the Qibla direction of Al-Anwar Grand Mosque aligns precisely with the Kaaba. Through field research, supported by literature review and interviews, it can be concluded that two key figures played significant roles in the historical determination of the Qibla direction of Jami' Al-Anwar Mosque. These figures are Muhammad Soleh and Abdul Gofar. Each of them had distinct characteristics in their approach to qibla determination.

The distinctive feature of Muhammad Soleh's method for determining the qibla direction is his use of celestial constellations. These constellations were utilized to identify the cardinal

[24] Dedi Darwis and Tika Yusiana, "Penggunaan Metode Analisis HIstoris," *Expert - Jurnal Management Sistem Informasi Dan Teknologi* 6, no. 2 (2016): 43.

directions, which are essential in qibla determination—particularly in locating true north. Muhammad Soleh employed one of the aforementioned constellations to establish orientation, although the specific constellation he relied on cannot be identified with certainty. This approach is rooted in Muhammad Soleh being a skilled Bugis sailor. He had journeyed across the seas from Bone, South Sulawesi, to Lampung. With his extensive knowledge of celestial navigation and his training in Islamic astronomy acquired while studying in Mecca, he combined both disciplines to determine direction. Once true north had been accurately established, Muhammad Soleh calculated the qibla azimuth to identify the correct orientation toward the Kaaba.

The distinguishing characteristic of Abdul Gofar's method for determining the qibla direction lies in his modification of the technique previously employed by his teacher, Muhammad Soleh. As a direct student of Muhammad Soleh, Abdul Gofar acquired firsthand knowledge regarding qibla orientation. Both figures shared a common approach: they relied on true north as a reference point and calculated the qibla azimuth. However, what sets Abdul Gofar apart is his use of sunlight as a tool to determine cardinal directions. In 1888, Abdul Gofar designed a qibla direction-measuring instrument. The device consisted of a vertically upright rod made of brass and a flat base made of cement. Abdul Gofar emphasized the importance of ensuring that the surface was leveled and that the rod stood perpendicular to the plane. The true north was determined during daylight—specifically, one hour before and one hour after solar noon—when the sun was at its brightest. By observing the initial point of the shadow before noon and connecting it with the final point of the shadow after noon, the true east–west line could be established. A line was drawn at a 90-degree angle from the east–west axis to determine true north. Once all cardinal directions were identified, the qibla azimuth could be calculated and aligned accordingly to determine the precise Qibla direction.

The table below facilitates the identification of similarities and differences in the qibla direction determination methods employed by the two figures. The differing methods used by the two figures to determine true north did not affect the accuracy of the resulting direction. However, determining true north using sunlight allows for easier and more precise observation than star constellations.

Table 1. Comparison of qibla direction determination methods

Aspect	Muhammad Soleh	Abdul Gofar
Time Period	Circa 1839	Circa 1888
Background	Skilled Bugis sailor with knowledge of Ilmu Falak (Islamic astronomy)	Student of Muhammad Soleh; trained directly in Qibla determination
Main Method	Celestial navigation using star constellations	Modified azimuth method with solar observation
Primary Tool	Naked-eye observation of constellations	Brass vertical rod and a cement base with circular markings
Reference Used	Star constellations (e.g., Orion, Ursa Major, Scorpius, Crux)	Sun shadow method (before and after solar noon)

True North Determination	Inferred through constellations	Calculated by observing shadow movement to establish East–West, then constructing a 90° angle
Azimuth Calculation	Yes, but the method of calculation is undocumented	Yes, with precise calculation after determining true north
Scientific Influence	Astronomy and maritime navigation	A combination of Ilmu Falak, mathematics, and empirical solar measurements
Precision Level	Considered high for the period, but lacks written documentation	High precision; confirmed by modern instruments (e.g., Google Earth, Theodolite)
Legacy	Initial Qibla orientation of the mosque	Final and lasting Qibla orientation of the rebuilt mosque (still in use today without recalibration)

Pre-research data regarding the accuracy of the qibla direction of Al-Anwar Grand Mosque was obtained through measurements using the Google Earth application. It was found that the mosque's qibla direction did not show any deviation. However, the precise azimuth value of the mosque at that time remained unknown. Therefore, the author conducted a Qibla accuracy assessment to determine the exact precision of the mosque's qibla orientation. The evaluation used the qibla azimuth method with two instruments: the *Mizwala* qibla finder and a theodolite. The use of both instruments served to compare traditional and contemporary measurement methods.

The qibla azimuth method uses data from the Ministry of Religious Affairs of the Republic of Indonesia, specifically sourced from the book *Ephemeris 2024*. The ephemeris data obtained from this book were used in the calculations of the qibla azimuth method and in using both the *Mizwala* qibla finder and the theodolite, which are widely recognized for their accuracy. The measurement using a theodolite instrument was conducted on May 10, 2024, at 2:30 PM (GMT+7), resulting in a value of 295° 12’ 10”. The deviation between the actual Qibla direction and the current orientation of the mosque was found to be only 0° 6’ 15.82”. Meanwhile, the measurement using the *Mizwala* instrument was carried out on May 2, 2024, at 11:20 AM (GMT+7), producing a result of 295° 12’ 13.82”, with a deviation of only 0° 6’ 10” from the mosque’s current qibla direction.

Both instruments produced an insignificant difference, with discrepancies only at the second level. Therefore, I selected the theodolite measurement as the reference. This decision is based on the theodolite offering a higher degree of measurement precision, reaching the level of arc seconds, whereas Mizwala's precision is limited to arc minutes. The Qibla direction of Al-Anwar Grand Mosque deviates by only 0° 6' 15.82", placing it within the "accurate." This assessment is based on the theory of permissible qibla deviation proposed by scholars of Islamic astronomy. According to Arifin, a mosque in Indonesia is still considered to have an accurate qibla direction if its deviation does not exceed +0° 6' 36" or -0° 10' 12". This means that if the true qibla azimuth of Al-Anwar Grand Mosque is 295° 18' 25.82" from true north, then the acceptable range of deviation falls between 295° 8' 13.82" and 295° 25' 1.82". Therefore, based on Arifin's theory, the qibla direction of Al-Anwar Grand Mosque qualifies as accurate.

Meanwhile, based on the theory proposed by Izzuddin, the Qibla direction of a mosque is still considered acceptable as long as it does not deviate more than 2° from the direction of the Kaaba. This statement means that if the true Qibla azimuth of Al-Anwar Grand Mosque is 295° 18' 25.82" from true north, then the acceptable range of deviation would be between 294° 18' 25.82" and 296° 18' 25.82". In the case of Al-Anwar Grand Mosque, which has a deviation of only 0° 6' 15.82", the qibla direction is clearly categorized as highly accurate. Sudibyo also proposed a theory on qibla direction deviation tolerance. He argues that for Indonesia, the deviation in qibla direction that can still be tolerated is relatively uniform (homogeneous) across all locations, amounting to 0° 24'. This theory is based on a circular area with the Kaaba as the center and a radius of 45 kilometers, in which all coordinates along the perimeter represent points with acceptable qibla deviation. According to this theory, the acceptable range for the qibla direction of Al-Anwar Grand Mosque would lie between 295° 8' 25.82" and 295° 30' 25.82". Meanwhile, Anisah Budiwati and Saiful Aziz suggest that the tolerance for qibla direction deviation in mosques can be accepted within approximately six arcminutes.

The theories proposed by the scholars of Islamic astronomy are based on calculations of the qibla azimuth and the degree of allowable deviation within the geographical boundaries of the city of Mecca. Scholars determine the acceptable deviation threshold according to their foundational assumptions and methodologies. To accurately determine whether Al-Anwar Grand Mosque is oriented adequately toward the Kaaba in Mecca, it is essential to calculate the azimuthal boundaries of Mecca based on its geographical coordinates.

Table 2. Qibla Deviation Tolerance Theories

Theory	Deviation Tolerance	Qibla Azimuth	Acceptable Azimuth Range
Zainul Arifin	0°6’36” and -0°10’12”	295° 18’ 25.82”	295o 8’ 13,82” up to 295o 25’ 1,82”
Ahmad Izzuddin	2°	295° 18’ 25.82”	294° 18’ 25,82” up to 296° 18’ 25,82”
Muh. Marufin Sudibyo	0° 24’	295° 18’ 25.82”	295° 8’ 25,82” up to 295° 30’ 25,82”.
Anisah Budiwati dan Saiful Aziz	0°6’00”	295° 18’ 25.82”	295° 12’ 25,82” up to 295° 24’ 25,82”.

According to the opinions of the four primary Islamic schools of thought (madhhabs), some scholars consider it sufficient to face the *Kaaba's jihah* (general direction). Imam Abu Hanifa, the scholars of the Maliki school, and most Hanbali scholars hold this view. On the other hand, Imam al-Shafi'i emphasized the obligation to perform *ijtihād* (independent reasoning) in determining the precise direction of the qibla. Based on these scholarly perspectives, I adopts the broader geographical area of Mecca as the basis for assessing the accuracy of the qibla direction of Al-Anwar Grand Mosque. Therefore, facing the Kaaba—specifically the physical structure itself, the larger complex of Masjid al-Haram, or even the broader region of Mecca—can all be deemed valid, depending on the scope adopted.

This aligns with a hadith narrated by Imam al-Bayhaqī from Abū Hurairah. This hadith can mean that the proper qibla direction, as commanded by Allah, is the precise orientation facing the Kaaba, located within al-Masjid al-Haram. This direction is extended to encompass the broader region where al-Masjid al-Haram is situated—the city of Mecca—which serves as the qibla for all Muslims worldwide.[25] The city of Mecca can serve as the qibla for people residing far from the Kaaba and outside the city's boundaries. To determine the angular range of the Qibla direction facing Mecca, the author has taken the northernmost and southernmost coordinate points of Mecca, as illustrated in the following image:

Figure 2. Map of Mecca City

Based on these boundary points, I calculated the qibla azimuth when facing both the northernmost and southernmost coordinates of the city of Mecca. Subsequently, the difference between these two points' azimuths and the mosque's qibla azimuth was calculated. The results are as follows:

Table 3. Mecca City Boundary Coordinates and Qibla Azimuth Calculation

Location	Latitude & Longitude	Azimuth	Difference from Kaaba Azimuth
Kaaba (Center)	21° 25’ 21.17” N 39° 49’ 34.56” E	295° 18’ 25.82”	0°
Southern Boundary	21° 18’ 59.06” N 39° 48’ 45.31” E	295° 11’ 38,83”	0° 6’ 46,99”
Northern Boundary	21° 28’2.00” N 39° 48’5.00” E	295° 20’ 49,04”	0° 2’ 23,22”

Source: Google Earth

Based on the data above, it can be concluded that facing the southernmost point of Mecca (21° 18′ 59.06″ N, 39° 48′ 45.31″ E) results in a qibla angle (southern azimuth boundary) of 295° 11′ 38.83″. Meanwhile, facing the northernmost point of Mecca (21° 28′ 2.00″ N, 39° 48′ 5.00″ E) yields

[25] Ahmad Izzuddin, “Metode Penentuan Arah Kiblat Dan Akurasinya,” in *(Annual International Conference on Islamic Studies)AISIS XII*, 2010, 759–60.

a qibla angle (northern azimuth boundary) of 295° 20′ 49.04″. The azimuth difference between the center point of the Kaaba and the northern and southern boundaries of Mecca indicates that the angular coverage from the Kaaba's center to the northernmost point of Mecca is 0° 2′ 23.22″, while the angular distance to the southernmost point is 0° 6′ 46.99″. The calculations show that the angular deviations from the Kaaba to the north and south of Mecca fall within the arcminute scale. Therefore, for a mosque to be directed toward the city of Mecca, the qibla coverage angle of Al-Anwar Grand Mosque should at least range from 0° 6′ 46.99″ southward to 0° 2′ 23.22″ northward from the center of the Kaaba.

Based on the data above, the deviation of the qibla direction of Al-Anwar Grand Mosque from the true Qibla azimuth is only 0° 6′ 15.82″ toward the south. This minimal deviation does not place the mosque's orientation outside the boundaries of the city of Mecca. Therefore, it is evident that the mosque's qibla direction can be categorized as highly accurate.

2. Interplay Between Historical Scientific Knowledge and Qibla Orientation Accuracy

Based on my analysis regarding the issue of qibla orientation at Al-Anwar Grand Mosque, it is proven that the mosque's qibla direction aligns with modern scientific precision. The remarkable accuracy—reaching the level of arc minutes—raises critical questions about how such precision could have been achieved in an era lacking modern astronomical tools and trigonometric calculations. I identify several historical factors that may have contributed to the accurate determination of the mosque's Qibla direction:

a) The method of determining cardinal directions using the *istiwā'* stick has been empirically proven to be accurate.

The qibla direction currently used by the Al-Anwar Grand Mosque is the same as that determined in 1888 during its reconstruction following the eruption of Mount Krakatau. At that time, the qibla direction was established by an individual named Abdul Gofar. The determination employed the azimuth qibla method, aided by identifying true north using the *istiwā'* stick. Previous studies on the azimuth qibla method have demonstrated that determining direction with the *istiwā'* stick is a precise and empirically validated technique.

A study conducted by Ila Nurmila regarding using the qibla azimuth method found that it is highly accurate, provided that reliable data and appropriate instruments support it.[26] Furthermore, Ila emphasizes that the accuracy of this method heavily depends on the user's precision. A study conducted by Saitul Mahtir, published in a journal by UIN Alauddin, states that determining the qibla direction using the *istiwā* stick and the shadow of the sun is highly accurate for communities aiming to build mosques, prayer rooms, or dig graves. In its application for qibla determination, the *istiwā stick* functions as an auxiliary angle to identify the solar azimuth and subsequently the qibla direction. The working principle of the *istiwā* stick follows the same concept as the *mizwala*, which involves determining the solar azimuth and then calculating the qibla azimuth for a specific location. Anisah Budiwati

[26] Ila Nurmila, "Metode Azimuth Kiblat Dan Rashdul Kiblat Dalam Penentuan Arah Kiblat," *Istinbath | Jurnal Penelitian Hukum Islam* 15 No. 2, no. 2 (2017): 191, https://doi.org/10.36667/istinbath.v15i2.26.

highlights the advantages of the *istiwā* stick, particularly in terms of practicality, as it can be used without the need for advanced technology. Muslim communities can use this tool anywhere without concerns regarding its accuracy.[27]

b) The Science Development and Instruments Used in Qibla Determination in the 1800s

The work of David A. King discusses the use of natural methods, commonly referred to as folk astronomy, in determining the qibla direction. This approach involves observing natural phenomena such as sunrise and sunset positions, the movement of star constellations, the apparent motion of the sun, and the solar culmination points known as the summer and winter solstices. These observational techniques were already known and practiced by earlier communities, particularly in pre-modern Islamic societies. One country noted for applying this method extensively is Yemen, where traditional qibla determination was often based on empirical celestial observation rather than mathematical calculation. In 1888 CE, the people of Lampung had not yet been introduced to trigonometric calculations, as most Indonesians were still in the early stages of learning about Islam. In regions such as Teluk Betung, ancestral belief systems remained dominant among the population. The spread of Islam was still in its formative phase, and as a result, knowledge of *ʿilm al-falak*—particularly the science of qibla determination—was not yet widely known or understood by the general public.

In Indonesia, the development of *ʿilm al-falak* (Islamic astronomy) began in the late 19th century. This period was marked by the return of young scholars from their extended studies in Mecca. From that point onward, *ʿilm al-falak* began to take root and grow across the archipelago. These returning scholars brought with them not only knowledge of Qur'anic exegesis (*tafsīr*), Hadith, jurisprudence (*fiqh*), and Sufism (*taṣawwuf*), but also manuscripts and teachings on Islamic astronomy that they had acquired during their time in Mecca. They subsequently disseminated this knowledge to their students in Indonesia, thus laying the foundation for the local development of astronomical sciences within Islamic educational circles.[28]

Several key figures have played a significant role in developing *ʿilm al-falak* (Islamic astronomy) in Indonesia. One such figure is Ahmad Dahlan as-Simirani, who authored a foundational treatise on Islamic astronomy entitled *Tażkiratul Ikhwān fī Baʿḍi Tawārīkh wa al-Aʿmāl al-Falakiyyah bi Semarang*. The manuscript was completed on 28 Jumādā al-Ākhirah 1321 AH, corresponding to September 21, 1903 CE. This work represents one of the earliest documented efforts to formalize and contextualize astronomical knowledge within the Indonesian Islamic scholarly tradition. The *Tażkiratul Ikhwān* manuscript includes calculations of *ijtimāʿ* (conjunction) and eclipses using the reference point (*mabdaʾ*) of the city of Semarang (Longitude = 110°24′). Meanwhile, in Jakarta, Habib Usman contributed to the teaching of *ʿilm al-falak* by composing a book entitled *Iqāẓ al-Niyām fīmā Yataʿallaqu bi al-Adillah wa al-Ṣiyām*, which was printed in 1321 AH / 1903 CE by al-

[27] Anisah Budiwati, "Tongkat Istiwa', Global Positioning System (GPS) Dan Google Earth Untuk Menentukan Titik Koordinat BUmi Dan Aplikasinya Dalam Penentuan Arah Kiblat," *Al-Ahkam* 26, no. 1 (2019): 70.

[28] Alimuddin, "Sejarah Perkembangan Ilmu Falak," *Al Daulah : Jurnal Hukum Pidana Dan Ketatanegaraan* 2, no. 2 (2013): 181–94.

Mubarakah Press in Batavia. In Sumatra, Islamic astronomy was pioneered by notable scholars such as Tahir Djalaluddin, through his influential work *Pati Kiraan*, and Djamil Djambek, with his publication *Almanak Jamiliyah*.

The global development of *'ilm al-falak* (Islamic astronomy) is documented in David A. King's work *Islamic Astronomy and Geography*, which notes that instruments such as the astrolabe and horizontal sundial were not fully developed until the 12th and 14th centuries CE. Among the regions contributing significantly to this advancement, Iran stood out as a center of astronomical research. Iranian scholars produced sophisticated astrolabe back-plates designed for multiple locations to determine solar altitude and local Qibla directions. These instruments were adaptable to various longitudes, allowing them to be used across a wide geographic range in the Islamic world.[29]

In his book, David A. King explains that from the 9th to the 14th centuries CE, Qibla direction calculations were still based on relatively simple trigonometric approaches. During this period, accurate qibla orientations were generally limited to regions geographically close to the Arabian Peninsula. Specifically, only areas located between latitudes 10° and 50°, and with longitudinal differences from Mecca ranging between 10° and 60°, could reliably determine the qibla direction. These qibla tables were calculated by the prominent Islamic astronomer Shams al-Dīn al-Khalīlī, who played a significant role in the early development of Islamic astronomical tables.[30]

The development of *'ilm al-falak* (Islamic astronomy) in Indonesia in 1888 CE was still in its early stages. At that time, only a few treatises on Islamic astronomy had been written by local scholars, and most Islamic astronomical texts were composed in the early 20th century. Thus, the use of the qibla azimuth method with the assistance of an *istiwā* stick by Abdul Gofar in 1888 can be considered a significant innovation for its time. According to my perspective, the method employed in qibla determination during that period was a direct result of his studies under his teacher, Muhammad Soleh, which Abdul Gofar later modified by constructing a simple instrument as a vertical stick.

Determining the Qibla direction at the Al-Anwar Grand Mosque was, in essence, a relatively simple process. The measurement began with identifying the cardinal directions. Once the general orientation was established, the direction toward the Kaaba could be indicated—provided that the qibla azimuth had already been known. However, achieving precision down to arcseconds would have been extremely difficult, given that the development of Islamic Astronomy in Teluk Betung at that time had not yet reached a modern stage. According to the author's analysis, the qibla orientation of the Al-Anwar Grand Mosque in 1888 was likely accompanied by elements of the supernatural, specifically *karāmah* (divinely bestowed spiritual insight). This conclusion is based on the limited scientific knowledge and instruments available for qibla determination during that period.

c) The Scientific and Religious Knowledge Possessed by Muhammad Soleh and Abdul Gofar

At that time, due to the general public's lack of knowledge, the responsibility for determining the qibla direction of the mosque was entrusted entirely to individuals

[29] David A. King, *Islamic Astronomy and Geography* (New York: Ashgate Publishing, 2012).
[30] King.

perceived as possessing superior capabilities and spiritual closeness to Allah. In the early phase of the mosque's construction, Muhammad Soleh was appointed as the figure responsible for determining the qibla direction of the Al-Anwar Grand Mosque. This decision was based on the community's belief that Muhammad Soleh possessed the requisite knowledge for qibla determination and a higher degree of spiritual insight than the surrounding population.

If we trace the historical development, after the death of the Prophet Muhammad, when his companions began to travel beyond Mecca to spread Islam, the determination of the qibla direction became a significant issue. They engaged in *ijtihād* (independent reasoning) by referring to the positions of stars—particularly the northern celestial bodies—visible in the Arabian skies. Among these, Polaris (the North Star) was identified as the primary reference point, as it is the only star that consistently points directly toward the Earth's north. The direction was determined by drawing an imaginary line connecting the body of the Ursa Major constellation with the tip of the tail of the Ursa Minor constellation. Using this celestial orientation, the companions exercised *ijtihād* to determine the direction of the *Kaʿbah* in their prayers.[31]

Muhammad Soleh, as a skilled sailor, possessed advanced expertise in reading star maps and determining cardinal directions—skills that reflect his proficiency in celestial navigation. His ability to interpret the positions of stars and utilize them for orientation at sea demonstrates a strong command of navigational knowledge, which he likely integrated into religious practices such as qibla determination.[32] The term navigation is generally associated with maritime and aviation contexts, as the study of navigation involves recording and interpreting the Earth's physical surface and learning how to use directional tools and instruments. The existence of conventional navigation systems can be traced back to early human knowledge in utilizing natural celestial bodies—such as the moon, stars, and the sun—not only to tell time and aid in navigation and agriculture, but also to fulfill religious obligations and uphold belief systems embedded in traditional societies.[33]

The use of star constellations for determining the qibla direction was highly plausible in the case of Muhammad Soleh, given his background as a sailor who regularly relied on celestial constellations as navigational guides at sea. Drawing upon the knowledge he acquired during his studies in Egypt as a young man[34], Muhammad Soleh integrated Islamic astronomy with his navigational expertise. According to my perspective, the constellation used by Muhammad Soleh was Orion. This constellation was likely chosen due to its ease of identification, primarily through its three aligned stars—Mintaka, Alnilam, and Alnitak. These stars are notably bright and easily distinguishable in the night sky, making them reliable reference points. The alignment of these three stars generally points toward the

[31] Izzuddin, "Kajian Terhadap Metode-Metode Penentuan Arah Kiblat Dan Akurasinya."

[32] Muhammad Candra Syahputra, *Napaktilas Jejak Islam Lampung*, ed. Oktaviani, Kedua (Yogyakarta: CV. Global Press, 2017).

[33] Ubaidillah, Masriah Samsudin, "Penggunaan Navigasi Bintang Di Alam Bebas Pada Malam Hari Dalam Penentuan Arah Kiblat," *Mahkamah: Jurnal Kajian Hukum Islam* 4 No 1, no. 1 (2019): 65–77.

[34] Syahputra, *Napaktilas Jejak Islam Lampung*.

west. As a result, the qibla direction determined by Muhammad Soleh could achieve a considerable degree of accuracy.

In his later years, Muhammad Soleh mentored a student named Abdul Gofar, who learned all aspects of Islamic astronomy from him. At that time, no formal educational institutions had been established in Lampung.[35] Knowledge was transmitted orally, passed down through experienced elders, respected figures, and scholarly gatherings (*majelis*). Abdul Gofar had the opportunity to study under Muhammad Soleh before his death. In 1888, following the passing of his teacher, Abdul Gofar was entrusted with the responsibility of determining the qibla direction. He employed the same method as his predecessor—the qibla azimuth method—but modified the determination of cardinal directions. Specifically, he developed an instrument resembling the *istiwā* stick, made of brass and installed on a flat cement surface. This modified *istiwā'* instrument proved highly accurate, as later studies have confirmed the precision of qibla determination using this method.

3. Intersections of Faith, Intuition, and the Quest for Scientific Knowledge

According to Clifford Geertz, as explained by Shonhaji, religion is a system of symbols that establishes powerful, pervasive, and long-lasting moods and motivations in people; it is, fundamentally, a cultural system. This very nature of religion allows communities to accept and internalize elements perceived as supernatural, sacred, or as manifestations of *karāmah* (divine favor). These beliefs are upheld and legitimized within the framework of religious experience and cultural tradition, often regarded as sacred truths by the community.[36] The society during the time of Muhammad Soleh and Abdul Gofar believed that individuals responsible for determining the Qibla direction relied on their knowledge and *karāmah*—divine grace or spiritual endowment—bestowed upon them. The trust placed by religious scholars and the broader community in such figures gave rise to a mythos surrounding their ability to orient the qibla. Over time, this myth evolved into a widely accepted narrative, ultimately regarded by the community as an absolute truth.

The practice of determining the qibla direction through *karāmah* (divinely gifted spiritual insight) by prominent Islamic scholars and saints is not unfamiliar within the Islamic tradition. A well-known example is the Qibla orientation of the Grand Mosque of Demak, attributed to Sunan Kalijaga. According to popular belief, Sunan Kalijaga possessed a form of *maʿrifatullāh*—a deep, intuitive knowledge of God—that enabled him to determine the direction of the qibla through spiritual means. This spiritual authority is enshrined in the myth that he stood among the people, raising his right hand symbolically toward the Kaaba in Mecca while his left hand, unmoving, pointed to the *mustaka* (ornamental finial) of the Grand Mosque of Demak—thus establishing its sacred orientation.

Similarly, the determination of the Qibla direction for the Baiturrahim Mosque in Gambiran is also believed to be inseparable from the spiritual influence (*karāmah*) of Sunan Kalijaga. It is said

[35] Bukri et al., *Sejarah Daerah Lampung* (Bandar Lampung: Departemen Pendidikan dan Kebudayaan Kantor Wilayah Provinsi Lampung, 1998).

[36] Zainal Abidin bin Syamsuddin, *Fakta Baru Walisongo (Telaah Kritis Ajaran, Dakwah Dan Sejarah Walisongo)* (Jakarta: Pustaka Imam Bonjol, 2018).

that when he erected the four central pillars (as the main structural axis of the mosque), they were already aligned with the qibla. This act mirrors his role in the orientation of the Grand Mosque of Demak, reinforcing the narrative that spiritual authority and intuitive insight were instrumental in establishing sacred spatial order in early Javanese Islamic architecture.

The method of qibla determination described above does not significantly differ from the approach Muhammad Soleh and Abdul Gofar took. Both figures determined the direction of the qibla without mathematical calculations, as Islamic astronomy during that period was still in its formative stages. Based on a review of relevant literature and interviews conducted with key informants, no evidence was found indicating either individual's use of mathematical computations. The qibla was determined solely through observational techniques involving constellations and using the *istiwā'* stick (a vertical gnomon). From this, the author concludes that elements of *karāmah* (spiritual charisma or divine favor) may have also played a role in the Qibla orientation of the Al-Anwar Grand Mosque.

From the standpoint of Islamic cosmology and traditional religious sciences, the method employed by Abdul Gofar is understood as a practical application of qibla orientation, wherein the sun serves as the primary directional reference. The direction of the qibla is deduced through the observation of solar shadows. Nevertheless, the precision claimed—purportedly accurate to the level of minutes—cannot be corroborated through scientific analysis, due to the absence of documented calculations or empirical data from the period in question. When this approach is juxtaposed with the Qibla determination of the Al-Anwar Grand Mosque, it becomes evident that the methodology used by both Muhammad Soleh and Abdul Gofar constitutes a synthesis of empirical reasoning and religious intuition. This fusion reflects a form of epistemological integration wherein sacred tradition and natural observation converge in the pursuit of truth—eventually giving rise to a localized narrative that borders on myth.[37]

D. Conclusion

This study provides a methodological and accuracy assessment of the qibla direction at Al-Anwar Grand Mosque, Bandar Lampung. The theodolite measurement conducted on May 10, 2024, at 14:30 WIB resulted in an azimuth of 295° 12′ 10″, while the *mizwala* measurement on May 2, 2024, at 11:20 WIB yielded 295° 12′ 13.82″. Both measurements indicate a deviation of only 0° 6′ 15.82″ to the south from the true Qibla direction, which falls within the accepted tolerance range (≤ 0° 6′ 46.99″ southward and ≤ 0° 2′ 23.22″ northward). These findings confirm that the mosque remains accurately aligned toward the Kaaba. The historical process of its orientation highlights the integration of Islamic astronomy and maritime navigation by Muhammad Soleh, later continued by Abdul Gofar during the mosque's reconstruction post-Krakatau eruption. The combination of empirical science and spiritual insight demonstrates how religious, scientific, and intuitive approaches collectively contributed to the precise Qibla alignment of this historic mosque.

[37] Muhtar Lathif, *Orientasi Arah Pemahaman Filsafat Ilmu* (Jakarta: Predana Media Group, 2014).

BIBLIOGRAPHY

Alimuddin. "Sejarah Perkembangan Ilmu Falak." *Al Daulah : Jurnal Hukum Pidana Dan Ketatanegaraan* 2, no. 2 (2013): 181–94.

Arifin, Zainul. "Toleransi Penyimpangan Pengukuran Arah Kiblat." *Elfalaky: Jurnal Ilmu Falak* 2, no. 1 (2018): 73.

Budiwati, Anisah. "Tongkat Istiwa', Global Positioning System (GPS) Dan Google Earth Untuk Menentukan Titik Koordinat BUmi Dan Aplikasinya Dalam Penentuan Arah Kiblat." *Al-Ahkam* 26, no. 1 (2019): 70.

Bukri, Husin Sayuti, Soepangat, and Sukiji. *Sejarah Daerah Lampung*. Bandar Lampung: Departemen Pendidikan dan Kebudayaan Kantor Wilayah Provinsi Lampung, 1998.

Darwis, Dedi, and Tika Yusiana. "Penggunaan Metode Analisis HIstoris." *Expert - Jurnal Management Sistem Informasi Dan Teknologi* 6, no. 2 (2016): 43.

Faisal, Sanapiah. *Format-Format Penelitian Sosial*. Jakarta: PT Raja Grafindo Persada, 1989.

Fatmawati, Emyllia. "Studi Komparasi Arah Kiblat Dua Masjid Kuno Di Nganjuk Tinjauan Ilmu Falak (Masjid Kyai Ageng Ngaliman Dan Masjid Kanjeng Jimat)." Universitas Islam Negeri Sunan Ampel, 2023.

Hambali, Slamet. "Penentuan Awal Waktu Solat Dan Penentuan Arah Kiblat Di Seluruh Dunia." Semarang: Program Pascasarjana IAIN Walisongo, 2011.

Izzuddin, Ahmad. *Fiqih Hisab Rukyah*. Jakarta: Erlangga, 2007.

———. *Ilmu Falak Praktis; Metode Hisab-Rukyat Praktis Dan Solusi Permasalahannya*. Semarang: Pustaka Rizki Putra, 2012.

———. "Kajian Terhadap Metode-Metode Penentuan Arah Kiblat Dan Akurasinya." Pascasarjana IAIN Walisongo Semarang, 2011.

———. "Metode Penentuan Arah Kiblat Dan Akurasinya." In *(Annual International Conference on Islamic Studies)AISIS XII*, 759–60, 2010.

———. "Typology Jihatul Ka"bah on Qibla Direction of Mosque in Semarang." *Ulul Albab: Jurnal Studi Dan Penelitian Hukum Islam* Vol. 4 No., no. 1 (2020): 1–15.

Jaelani, Achmad, Anisah Budiwati, and dkk. *Hisab Rukyat Menghadap Kiblat (Fiqh, Aplikasi Praktis, Fatwa Dan Software)*. Semarang: Pustaka Riski Putra, 2012.

Jamil, A. *Ilmu Falak (Teori Dan Aplikasi)*. Jakarta: Sinar Grafikas Offset, 2009.

Khairunnisa, Ariba, and Dian Ika Aryani. "Akurasi Arah Kiblat Masjid Kuno Al-Abror Dengan Metode Rashdul Kiblat Harian." *Journal of Islamic Studies and Humanities* 8, no. 2 (2023): 179–98. https://doi.org/http://dx.doi.org/10.21580/jish.v8i2.18370.

Khazin, Muhyiddin. *Kamus Ilmu Falak*. Yogyakarta: Buana Pustaka, 2005.

King, David A. *Islamic Astronomy and Geography*. New York: Ashgate Publishing, 2012.

Lathif, Muhtar. *Orientasi Arah Pemahaman Filsafat Ilmu*. Jakarta: Predana Media Group, 2014.

Madjid, M. Dien, and Johan Wahyudi. *Ilmu Sejarah: Sebuah Pengantar*. Jakarta: Prenada Media Group, 2014.

Mawahib, Muhamad Zainal. "Metode Pengukuran Arah Kiblat Dengan Segitiga Siku-Siku Dari Bayangan Bulan." UIN Walisongo Semarang, 2016.

Muh. Marufin Sudibyo. *Sang Nabi Pun Berputar*. Solo: Tinta Medina, 2011.

Muhammad Nurkhanif. "Problematika Sosio-Historis Arah Kiblat Masjid 'Wali' Baiturrahim Gambiran Kabupaten Pati Jawa Tengah." *Al Qodiri : Jurnal Pendidikan, Sosial Dan Keagamaan* 15, no. 2 (2018): 1–23.

Ni'am, M Ikhtirozun. "Arah Kiblat Di Planet Mars M. Ikhtirozun Ni'am." *Al-Marshad: Jurnal Astronomi Islam Dan Ilmu-Ilmu Berkaitan* 2, no. 1 (2020): 19.

Nurmila, Ila. "Metode Azimuth Kiblat Dan Rashdul Kiblat Dalam Penentuan Arah Kiblat." *Istinbath | Jurnal Penelitian Hukum Islam* 15 No. 2, no. 2 (2017): 191. https://doi.org/10.36667/istinbath.v15i2.26.

Oktavia, Anggun Dwi. "Penentuan Dan Akurasi Arah Kiblat Masjid Kuno Di Sragen Dan Respon Masyarakat (Studi Kasus Di Masjid Mujahidin Bulu Boto, Desa Bulu, Kelurahan Karanganyar, Kecamatan Sambungmacan, Kabupaten Sragen)." Institut Agama Islam Negeri (IAIN) Surakarta, 2020.

Sabiq, Fairuz. "Ijtihad In The Qibla Direction Of The Grand Mosque Of Demak." Reseacrh Gate, 2023.

Samsudin, Ubaidillah, Masriah. "Penggunaan Navigasi Bintang Di Alam Bebas Pada Malam Hari Dalam Penentuan Arah Kiblat." *Mahkamah: Jurnal Kajian Hukum Islam* 4 No 1, no. 1 (2019): 65–77.

Sugiyono. *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif, Dan R&D)*. Bandung: CV. Alfabeta, 2017.

Syahputra, Muhammad Candra. *Napaktilas Jejak Islam Lampung*. Edited by Oktaviani. Kedua. Yogyakarta: CV. Global Press, 2017.

Syaipullah, M. "Fungsi Dan Peranan Masjid Jami'Al-Anwar Dalam Penyebaran Islam Di Teluk Betung Selatan, Bandar Lampung." Palembang: UIN Raden Fatah, 2018.

Syamsuddin, Zainal Abidin bin. *Fakta Baru Walisongo (Telaah Kritis Ajaran, Dakwah Dan Sejarah Walisongo)*. Jakarta: Pustaka Imam Bonjol, 2018.

Usman, Husaini. *Metodologi Penelitian Sosial*. Jakarta: PT Bumi Aksara, 2006.

Wafiroh, Ani. "Akurasi Arah Kiblat Masjid Kuno Bayan Beleq Dan Masjid Kuno Gunung Pujut Di Pulau Seribu Masjid." *Nurani* 18, no. 2 (2018): 161–75.

Yulita, Gusma. "E-Modul Sejarah Indonesia." *Kementrian Pendidikan Dan Kebudayaan Direktorat Jendral Pendidikan Dasar Dan Menengah Direktorat Pembinaan Sekolah Menengah Atas 2019*. tt: Direktorat Pembinaan SMA - Kementerian Pendidikan dan Kebudayaan, 2019.

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