

Assistance to the Baiturrahman Mosque Prosperity Council and Miftahul Ulum in Qibla Measurement

¹Maman Surahman, ²Fahmi Fatwa Rosyadi Satria Hamdani

^{1,2}Faculty of Sharia, Universitas Islam Bandung

* Corresponding email: fatwa19@unisba.ac.id

Abstract— The mosque building, which is in the alley, sometimes escapes the monitoring of the accuracy of the Qibla direction. The difficulty of getting the sun's shadow directly into the mosque is one of the factors so that the instrument used to measure the Qibla only uses makeshift tools or only follows the location of the land used for the building. Such as Baiturrahman and Miftahul Ulum mosques in the Tamansari Village, with the position of building in an alley. The purpose of this PKM activity is to assist the Mosque Prosperity Council (DKM) in verifying the Qibla direction of their mosque so that Muslims can pray towards the Qibla with the help of an accurate tool. This mentoring activity uses a participatory action research approach so that DKM can utilize the sun qibla and mizwandroid instruments in aligning the Qibla direction of the mosque. The results of the mentoring activities at the Baiturrahman Mosque and Miftahul Ulum Mosque, namely the correction of the prayer rows conducted by the DKM of the mosque and the service team, where the difference in Qibla direction deviation is 8 degrees and 5 degrees, respectively. In addition, DKM and the service team have made corrections to the prayers' rows at the imam's place and the first row in each mosque by attaching Qibla direction stickers as a benchmark for the direction of the rows.

Index Terms— Assistance, Mosque Prosperity Council, Qibla Direction, Sun Qibla, Mizwandroid

1. INTRODUCTION

The community service team actively conducts mosque-based community empowerment and

Manuscript received October 9, 2001 (Write the date on which you submitted your paper for review.) This work was supported in part by the U.S. Department of Commerce under Grant BS123456 (sponsor and financial support acknowledgment goes here). Paper titles should be written in uppercase and lowercase letters, not all uppercase. Avoid writing long formulas with subscripts in the title; short formulas that identify the elements are fine (e.g., "Nd-Fe-B"). Do not write "(Invited)" in the title. Full names of authors are preferred in the author field, but are not required. Put a space between authors' initials.

F. A. Author is with the National Institute of Standards and Technology, Boulder, CO 80305 USA (e-mail: author@boulder.nist.gov).

S. B. Author, Jr., was with Rice University, Houston, TX 77005 USA. He is now with the Department of Physics, Colorado State University, Fort Collins, CO 80523 USA (e-mail: author@lamar.colostate.edu).

T. C. Author is with the Electrical Engineering Department, University of Colorado, Boulder, CO 80309 USA, on leave from the National Research Institute for Metals, Tsukuba, Japan (e-mail: author@nrim.go.jp).

assistance, exploring so many potentials in providing the best service for God's guests. They provide mosque-based aid related to the Baitul Mal wa Tamwil strategy in empowering the people's economy [1]. Other things empower mosque based MSMEs through the rose gold program [2].

The empowerment and mentoring activities aim to focus on the economic development of the mosque so that it can be more independent and more flexible in providing the best service. Other service teams have also conducted empowerment related to mosque-based Islamic philanthropy to develop da'wah media, studies, information, education, and social activities [3]. Besides that, there is mosque-based empowerment with various empowerment models, such as 1) spiritual, which includes tahsin of the Koran, worship practices, and rote quarantine; 2) intellectuals, including talent interest training, information, and technology insights, and intelligent control in the implementation of activities; 3) economics which includes entrepreneurship training, facilitating cooperation between foundations and government and private agencies; 4) social which includes cultivating an attitude of mutual care and cooperation [4].

The community services team also makes the mosque the center of civilization in Cilendek Village, West Bogor [5]. The life of people in urban areas can be more potential by increasing their understanding of the importance of religious education from an early age, healthy life behavior, utilizing potential according to their respective areas of expertise, to maintaining the environment with greening activities.

The mentoring activities conducted by the Unisba Syariah Faculty service team were also included in the mosque-based community service section. The focus of the mentoring activities comes from the previous research results in the Tamansari Village regarding the potential for deviations from the Qibla direction of mosques and prayer rooms in the alley. Based on research and the training results activities conducted on 24 DKM administrators in the Tamansari sub-district, they never verified the Qibla direction using tools with high accuracies, such as theodolite or other instruments that use the sun's shadow.[6], [7]

Based on previous research results and discussions with training participants, DKM administrators expressed their willingness to participate in mentoring activities in correcting the Qibla direction of their mosques, including the Baiturrahman mosque and the Miftahul Ulum mosque. Therefore, the service team responded in the form of mentoring activities to verify the Qibla direction of the mosque.

Mentoring activities conducted by the service team, in line with the plan for the Community Potential Empowerment Program in Unisba, empower community potential explored deeper, become wiser, and understand the existing phenomena. The estuary formulated by the service team in this activity was that the DKM administrators could verify the direction of the prayer halls of their respective mosques by using the sun qibla and mizwandroid instruments and assisted by theodolite, mizwala, and Qibla triangle to strengthen the results obtained regarding Qibla azimuth.

The Baiturrahman and Miftahul Ulum mosques are in Tamansari Village, bordering Babakan Ciamis Village to the south, Lebak Siliwangi Village to the north, Citarum Village to the east, Cipaganti Village to the west. The following administrative restrictions from google maps:

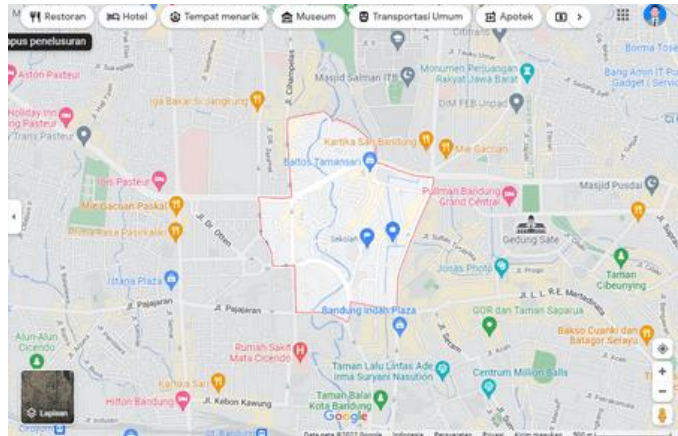


Fig. 1. Tamansari Village Administrative Boundaries (Source: Google Maps)

Partner problems collected by the service team, namely difficulties in obtaining tools used to measure Qibla direction. In addition, the knowledge to make accurate qibla direction measurements also needs to be improved, incredibly when the location of the mosque's prayer rows is challenging to get direct sunlight. Therefore, the service team made problem formulations in knowledge and skills:

1. In science, education related to measuring the Qibla direction of mosques in the alley, using suitable instruments, and implementing the results of measurements on changes in prayer rows, needs to be conveyed to DKM.
2. As for the skills sector, the service team invites DKM to be able to use the sun qibla and mizwandroid applications as instruments in measuring the Qibla direction of each of their mosques.

2. Method

Activities conducted in solving partner problems or needs include involving Mosque Prosperity Council (DKM) members in the form of assistance.

The service team conducted direct assistance in measuring the Qibla direction at the Baiturrahman and the Miftahul Ulum mosque, involving a unit measuring the Qibla direction from the Albiruni Observatory, Faculty of Sharia, Universitas Islam Bandung. Some instruments used in mentoring activities are smartphones' sun qibla and mizwandroid applications. The service team added mizwala and theodolite instruments to evaluate or compare the measurement results achieved and to assist in implementing changes in the direction of the prayer rows [8], [9]. Other supporting tools were also prepared, such as a 1-meter metal ruler, tape measure, permanent marker, laser, mattress thread, scissors, and Qibla stickers. The output target of this mentoring activity is the implementation of the measurement results by changing the prayer halls of the Baiturrahman and Miftahul Ulum mosques in the Tamansari sub-district by the service team and their respective DKM.

Education about the importance of determining the Qibla direction of the mosque's prayer rows is carried out before, during, and after the PKM activities. Education about the use of appropriate instruments will significantly determine the results achieved in obtaining Qibla's direction. How is the model for measuring the prayer rows in open fields, mosques in alleys, mosques in multi-story buildings, to mosques in basements also being conveyed to the DKM.[10], [11]

2.1 The Approach Methods Offered to Solve the Community Service Partners' Problems

The service team uses a participatory action research (PAR) approach with several stages: [12]

1. Identify emerging partner problems based on field data
2. Selection of assistance locations
3. The mentoring processes
4. Decomposition of mentoring problems along with strategic steps
5. Analysis of the results of mentoring activities

The PAR approach makes it easy for the service team to conduct PKM activities. Identification of partner problems at the beginning of PKM activities provides an overview of activities in the field. The service team conducted the mentoring process in the Tamansari Village at the Baiturrahman and Miftahul Ulum Mosques.

The instruments used in the mentoring activities are sun qibla and mizwandroid, supported by other equipment such as a theodolite, mizwala, suunto compass, 60 cm iron ruler, tape measure, scissors, and mattress thread. Before starting measurement activities, the service team gives directions to understand the Qibla direction verification, its urgency, practical techniques, and its implementation in society.

2.2 Partners' Participation

DKM Baiturrahman and Miftahul Ulum Mosque, as partners in PKM activities, also participate, especially in assisting in measuring the Qibla direction. Submission of ideas and ideas, as well as information about the history of measuring the Qibla direction from each mosque, is conveyed in such detail that it helps the service team collect the data needed in PKM activities.

2.3 Expertise Required in Solving Partner Problems / Partner Needs

Lecturer of Falak Science (Fahmi Fatwa RSH as chair of PKM) and Lecturer of Islamic Law (Maman Surahman., Lc., M.Ag.) conducted the PKM program for the Assistance of the Mosque Prosperity Council in Tamansari Village using sun qibla, and mizwandroid. The PKM team has experience assisting community activities, especially in Islamic law. One of them focuses on the science of Falak, and one of the focuses of his learning studies is on the Qibla direction. Other team members focus on the history of the Qibla direction from the time of the Prophet to the present with an Islamic historical approach, so they can provide strong confidence in aligning the Qibla direction.

The mentoring material includes five papers each team member and resource person will present. At the same time, students attend each training and mentoring considering the educational background and experience of the team.

3. Discussion

The service team held a pre-implementation meeting before plunging into the service location at the Baiturrahman Mosque and the Miftahul Ulum Mosque, which are in the Tamansari Village. The distance between the place and the campus is pretty close, and it only takes about twenty minutes.

The service team conducts the Qibla direction procedure by communicating beforehand before measuring at the destination location, usually to get the right time for measurement. In addition, the service team also needs to adjust to the weather conditions at the measurement time, considering that sunlight is the primary standard for obtaining accurate results in measuring the Qibla direction of a location.



Fig. 2. Measuring the Qibla direction of the Baiturrahman Mosque with DKM

Measurements at the Baiturrahman mosque were conducted around nine in the morning, with sunlight entering the second floor. The service team then took advantage of the incoming sunlight to get the true north by using the sun qibla, then used Sun Qibla to get the latitude and longitude of the mosque, the Sun's azimuth, the clock measurement, and the Qibla direction.

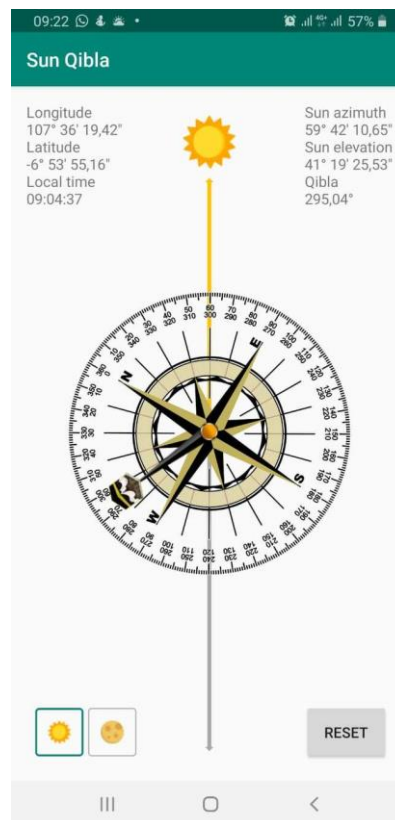


Fig. 3. Latitude and longitude data of the Baiturrahman Mosque with Sun Qibla

Based on data obtained from the sun qibla application, the position of the Baiturrahman Mosque is at $107^{\circ}36'19.42''$ East Longitude and $6^{\circ}53'55.16''$ South Latitude. When the measurement time shows 09.04 WIB, the azimuth position of the Sun is $59^{\circ}42'10.65''$ with a Qibla direction value of $295^{\circ}2'24''$. It can then obtain the results of the Qibla direction by pointing the smartphone at the position of the Sun aligned with the part of the perpendicular object's shadow,

then pressing the Go button.

After getting the results of the Qibla direction using the sun qibla application, the service team used mizwandroid to see the approximate direction of the Qibla direction. Afterward, the service team gives a sign to pull the mattress threads prepared beforehand. In the measurements conducted at the Baiturrahman Mosque, the service team used an additional instrument, namely the mizwala, to get the direction of the north wall of the mosque. The goal is to create a Qibla triangle implemented on the first floor's north wall of the mosque.



Fig. 4. Drawing the Qibla direction line using a mattress thread



Fig. 5. Qibla triangle making

The service team used the Qibla triangle to measure the Qibla direction of the prayer hall on the first floor, which aligned with the north wall of the mosque. The choice of the mosque's north wall is due to the mosque's shape, which tends to be trapezoidal, with the building following the position of the available land.

Measurements continued to the first floor, then where the priest prayed. DKM Baiturrahman participated in the agenda and, at the same time, put a Qibla direction sticker and add the prayer rows line using a permanent marker.



Fig. 6. Qibla direction marking at the place of the Imam of the Baiturrahman Mosque

Another mosque, Miftahul Ulum, is still close to the previous one. The mosque location is in an alley, which is at position $107^{\circ}36'17.34''$ East Longitude and $6^{\circ}53'52.12''$ South Latitude. The Sun azimuth at the time of measurement at 10.43 WIB is $36^{\circ}15'45.70''$, with the Qibla direction from a location of $295^{\circ}2'24''$.

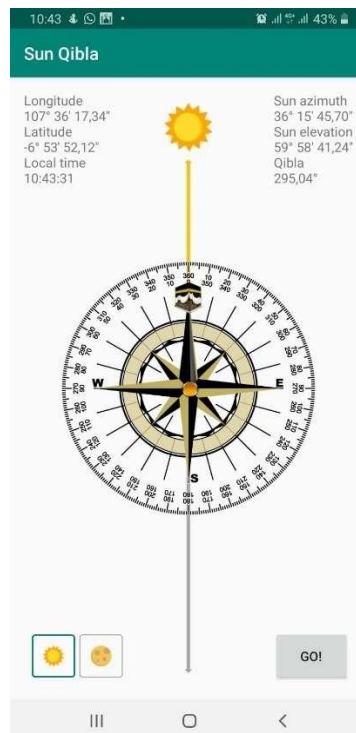


Fig. 7. Latitude, longitude, Sun azimuth data, and Qibla direction of the Miftahul Ulum Mosque with the sun qibla application

Unlike the previous mosques, the service team measures the Qibla direction on the Miftahul Ulum mosque roof. The service team did this because it was difficult to get sunlight from various sides of the mosque's walls. The height of buildings on the sides and back of the mosque gives the

impact that the sun cannot enter directly into the mosque.

Although the measurement model differs from the Baiturrahman mosque, the instruments used are not much different. The service team added a theodolite instrument in the mosque to assist in making the resulting Qibla direction line, then made a Qibla triangle parallel to the western wall of the mosque building.



Fig. 8. The condition of the sky at the time before the measurement at the Miftahul Ulum Mosque

Measuring in this mosque took quite a long time because the sun was blocked for several hours by cloudy clouds. However, when they got the opportunity to measure, the team immediately conducted their respective tasks.

Measuring the Qibla direction begins with using the sun qibla to get the location of latitude, longitude, solar azimuth, and Qibla azimuth. After the calculation, the team made a straight-line using mattress thread. Afterward, the team used mizwandroid to get the Qibla direction, mizwala, and theodolite to make the Qibla direction line, which ends towards the north wall of the mosque, then makes a Qibla triangle.

After obtaining the Qibla triangle from the measurement results on the top floor/third floor of the mosque building, the team with DKM headed to the second floor to measure the direction of the prayers. Measurements are no longer using instruments such as the sun qibla, mizwandroid, theodolite, and others, but using the Qibla triangle, permanent markers, and an iron ruler to make the prayer lines.



Fig. 9. The process of measuring the prayers' rows on the second floor of the Miftahussalam mosque

The prayer row measurement continues to the first floor, where the imam's position and the congregation's first row are. The instrument used at this time was the Qibla triangle with the help of a ruler and permanent marker to make lines. At the end of the measurement, the team affixed a

Qibla direction sticker to indicate the Qibla direction.



Fig. 10. Qibla direction line on the second floor

Based on the results of this PKM activity, the service team hopes that other service teams can contribute to various mosque-based scientific fields, targeting mosques in Tamansari Village, which tend to rarely get attention from the service team because of their location in an alley.

4. Conclusion

Based on the results of the service team's presentation in the previous chapter, the conclusions resulting from this PKM activity are:

1. The DKM who took part in measuring the Qibla direction of the prayer rows received education regarding the techniques and procedures for measuring the Qibla direction for mosques in the alley. They can provide an understanding regarding the application of the results of measuring the direction of the Qibla rows and the instruments required for each measured mosque location. As for the results of the corrections by the service team and DKM towards the direction of the prayer rows at the Baiturrahman Mosque and Miftahul Ulum Mosque, namely that there is a deviation between the prayer rows and the Qibla direction, where the difference in Qibla direction deviation is 8 degrees and 5 degrees, respectively.
2. Another result of this PKM activity is that the DKM can measure the Qibla direction of each mosque, using the help of instruments such as sun qibla and mizwandroid. In addition, the DKM and the service team checked with the help of other tools such as a theodolite, mizwala, Suunto compass, tape measure, and mattress thread. Then put Qibla direction stickers on the imam's row and the first prayer rows of the mosque as a benchmark for the direction of the prayer group after being verified together.

REFERENCES

- [1] P. Pandapotan and A. Soemitra, “Studi Literature Strategi BMT Dalam Pemberdayaan Ekonomi Ummat Berbasis Masjid,” *El-Mal: Jurnal Kajian Ekonomi & Bisnis Islam*, vol. 3, no. 3, pp. 584–598, Feb. 2022, doi: 10.47467/ELMAL.V3I3.941.
- [2] A. Muttalib and I. Siwi, “Pemberdayaan UMKM berbasis Masjid Melalui Program Mawar Emas di Kota Mataram,” *Jurnal Econetica: Jurnal Ilmu Sosial, Ekonomi, dan Bisnis*, vol. 3, no. 1, pp. 19–26, May 2021, doi: 10.0602/ECONETICA.V3I1.99.
- [3] R. J. Sholikah, “Pemberdayaan Melalui Filantropi Islam Berbasis Masjid,” *Jurnal Inovasi Penelitian*, vol. 3, no. 1, pp. 4281–4288, Jun. 2022, doi: 10.47492/JIP.V3I1.1543.
- [4] M. Mahmuda, “IMPLEMENTASI PROGRAM PEMBERDAYAAN YATIM BERBASIS MASJID,” *Al-Hikmah: Jurnal Dakwah dan Ilmu Komunikasi*, vol. 8, no. 1, pp. 1–15, Jun. 2021, doi: 10.15548/AL-HIKMAH.V8I1.2850.
- [5] Wartono, Arijulmanan, H. Andani, and A. Fauzi, “PEMBERDAYAAN MASYARAKAT PERKOTAAN BERBASIS MASJID DI KELURAHAN CILENDEK BARAT KECAMATAN BOGOR BARAT KOTA BOGOR,” *Khidmatul Ummah: Jurnal Pengabdian Kepada Masyarakat*, vol. 2, no. 01, pp. 37–51, Jul. 2021, doi: 10.30868/KHIDMATUL.V2I01.1474.
- [6] F. F. R. S. Hamdani, I. M. Wijayanti, M. Yunus, and I. Y. Silviany, “Analysis of the Empowerment of the Mosque Prosperity Council in Determining of the Qibla,” *Proceedings of the 4th Social and Humanities Research Symposium (SoRes 2021)*, vol. 658, pp. 487–489, Apr. 2022, doi: 10.2991/ASSEHR.K.220407.099.
- [7] F. F. R. S. Hamdani, “Verifikasi dan Pemetaan Arah Kiblat Bangunan Masjid dan Musola,” *Hayula: Indonesian Journal of Multidisciplinary Islamic Studies*, vol. 4, no. 2, pp. 245–262, Jul. 2020, doi: 10.21009/004.2.06.
- [8] F. F. R. S. Hamdani, R. Fawzi, and R. G. Syahid, “Pendampingan Pengukuran Arah Kiblat Masjid di Rancabango Garut,” *Dimas: Jurnal Pemikiran Agama untuk Pemberdayaan*, vol. 18, no. 1, p. 19, Oct. 2018, doi: 10.21580/dms.2018.181.2911.
- [9] H. Hosen and G. Ghafiruddin, “Akurasi Arah Kiblat Masjid di Wilayah Kecamatan Pademawu Kabupaten Pamekasan dengan Metode Mizwala Qibla Finder,” *AL-IHKAM: Jurnal Hukum & Pranata Sosial*, vol. 13, no. 2, p. 364, Dec. 2018, doi: 10.19105/al-ihkam.v13i2.1837.
- [10] R. Kouider and J. Ivashko, “Study Methodology of the Architectural Periodization of Algerian Mosques and the Ritual Role of Elements (Mihrab, Minbar, Qibla, Bath for Ablution) in the Islamic Worship Service,” *Środowisko Mieszkaniowe*, vol. 22, pp. 28–36, 2018, doi: 10.4467/25438700sm.18.025.8706.
- [11] V. İlçi, İ. M. Ozulu, E. Arslan, and R. M. Alkan, “Investigation on the accuracy of existing qibla directions of the mosques from different periods: A case study in Çorum city, Turkey,” *Tehnicky Vjesnik*, vol. 25, no. 6, pp. 1642–1649, Dec. 2018, doi: 10.17559/TV-20170226111205.
- [12] Moh. Ansori, A. Afandi, R. D. Fitriyah, and H. Farisia, *Pendekatan-Pendekatan Dalam University-Community Engagement*. 2021.