

LITERACY ON THE UNIFIED GLOBAL HIJRI CALENDAR AND BASIC HISAB TRAINING AT A MUHAMMADIYAH ISLAMIC BOARDING SCHOOL

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Abstract: This community engagement program aimed to strengthen literacy on the Unified Global Hijri Calendar (*Kalender Hijriah Global Tunggal, KHGT*) and basic operational hisab skills among members of a Muhammadiyah Islamic boarding school community in Makassar. The program was designed in response to the partner community's need to understand the fiqh foundations, the Muhammadiyah tarjih methodology, astronomical arguments, and the practical use of official calendar information in religious and institutional life. The engagement employed Participatory Action Research (PAR) combined with a service-learning orientation through four phases: joint needs diagnosis, collaborative program planning, KHGT literacy and basic hisab training, and reflection-evaluation for follow-up planning. Thirty participants took part in the activity, consisting of students, teachers/ *ustaz*, mentors, and members of the *pesantren* community. Data were collected through participatory observation, documentation, participant feedback, and pre-test and post-test instruments based on KHGT literacy indicators. The results indicate a substantial descriptive improvement. The participants' mean score increased from 49.3 in the pre-test to 89.3 in the post-test, representing a 40-point increase and an N-gain of 0.79, which falls into the high category. All participants obtained a minimum post-test score of 75, and 73.3% achieved scores of 85 or higher. Beyond cognitive improvement, the program generated direct outputs for the partner institution, including KHGT literacy materials, worksheets for practicing calendar interpretation, and an internal cadre-development plan. These findings suggest that *pesantren*-based KHGT literacy can serve as a community capacity-building strategy that enables religious communities to understand the global Islamic calendar in a scientific, sharia-based, practical, and sustainable manner.

Keywords: KHGT, *Pesantren*, Hisab, Literacy, Community Engagement

Introduction

A calendar is not merely a scientific instrument for calculating time; it is also a socio-religious infrastructure that regulates worship, education, administration, and

communal life. In Islam, the Hijri calendar occupies a central position because it is directly connected to the determination of Ramadan, Eid al-Fitr, Eid al-Adha, the Day of Arafah, and other institutional religious agendas. Previous studies on calendars and lunar visibility criteria show that systems of time reckoning are simultaneously technical, cultural, and social instruments.¹ Yet Muslim communities continue to experience diversity in lunar calendar systems, resulting in differences in the determination of the beginning of lunar months, particularly when rukyat, hisab, and matlak are interpreted differently by various regions and religious authorities.

The idea of a global Hijri calendar based on hisab hakiki has developed since the first half of the twentieth century and gained further support through several international forums, including the 2016 International Conference on the Unification of the Islamic Calendar in Turkey. In Indonesia, Muhammadiyah has developed the Unified Global Hijri Calendar (*Kalender Hijriah Global Tunggal, KHGT*) as a form of tajdid in Islamic astronomy and calendar studies. The official KHGT portal of Muhammadiyah explains that this calendar is calculated by the Majelis Tarjih dan Tajdid of Muhammadiyah, applies contemporary hisab hakiki, and provides a Global Calendar Parameter Fulfilment Map, date conversion tools, and prayer-time information that can be used practically by Muhammadiyah members and the wider public.²

One of the sharia foundations frequently associated with the Islamic calendar is *QS. al-Baqarah*: 189, which positions the crescent moon as a marker of time for human beings and pilgrimage. This verse indicates that the Islamic calendar has public, social, and religious functions. From the KHGT perspective, the phrase “*linnās*” is understood as an indication that the Islamic calendar should ideally be widely usable

¹ H R Randau and O Medinskaya, “Chinese Festivals: Knowing the Roots,” in *Management for Professionals*, vol. Part F310 (Vallendar, Germany: Springer Nature, 2015), 221–23, https://doi.org/10.1007/978-3-319-07677-5_44; Muhamad Syazwan Faid et al., “Assessment and Review of Modern Lunar Crescent Visibility Criterion,” *Icarus* 412 (2024): 115970, <https://doi.org/https://doi.org/10.1016/j.icarus.2024.115970>; M Liu, J Ping, and Q Wang, “Study on Lunar Calendar,” in *2024 4th URSI Atlantic Radio Science Meeting, AT-RASC 2024* (Beijing Orient Institute Of Measurement And Test, Beijing, 100086, China: Institute of Electrical and Electronics Engineers Inc., 2024), <https://doi.org/10.46620/URSIATRASC24/TOQS2440>.

² Majelis Tarjih dan Tajdid PP Muhammadiyah, “Kalender Hijriah Global Tunggal,” Majelis Tarjih dan Tajdid PP Muhammadiyah, 2026, <https://khgt.muhammadiyah.or.id>.

and should provide temporal certainty for the ummah. At the same time, contemporary astronomical hisab enables the positions of the moon and the sun to be calculated with precision, allowing a predictive calendar to be prepared well before religious observances take place.

However, the implementation of KHGT cannot rely solely on organizational decisions or conceptual explanations at the leadership level. The most important challenge lies in public literacy, particularly the community's ability to understand the fiqh basis, astronomical reasoning, technical terminology, and the use of calendar information in daily religious practice. The Muhammadiyah Islamic boarding school in Makassar is therefore a strategic partner because it functions as a center of religious education, cadre formation, and scientific learning. Students, teachers, and mentors in the *pesantren* have the potential to become literacy agents who can explain KHGT to the wider community in a scientific, courteous, and proportionate manner.

Initial observation and communication with the partner institution indicated that the *pesantren's* needs were not limited to the introduction of KHGT terminology. The partner also required practical strengthening in reading the calendar, understanding beginning-of-month parameters, distinguishing local and global calendar systems, and explaining basic hisab arguments in simple language to the *pesantren* community. For this reason, the program was designed as a *pesantren*-based KHGT literacy and basic hisab training program rather than a one-way socialization activity.

Recent scholarship suggests that disputes over the Hijri calendar in Indonesia should not be framed only as technical disagreements over lunar visibility or calculation. They also involve religious authority, institutional identity, and community acceptance. Studies of Indonesian Islamic calendar discourse show that different calendar regimes among Muhammadiyah, Nahdlatul Ulama, and other Islamic organizations are embedded in distinctive epistemological, legal, and organizational traditions.³ Accordingly, KHGT literacy at the *pesantren* level becomes important

³ Susiknan Azhari, "Gagasan Menyatukan Umat Islam Indonesia Melalui Kalender Islam," *AHKAM: Jurnal Ilmu Syariah* 15, no. 2 (July 20, 2015): 249–58, <https://doi.org/10.15408/ajis.v15i2.2869>; Ahmad Adib Rofuiddin and Ahmad Luqman Hakim, "NGOs Contestation on Islamic Hijri Calendar in Urban

because it translates organizational decisions and astronomical criteria into a language that can be understood, negotiated, and used by grassroots religious actors.

This article contributes to the development of a *pesantren*-based community engagement model by integrating KHGT literacy, basic hisab training, learning evaluation, and community sustainability strategies. The program aimed to improve participants' literacy regarding KHGT, introduce basic skills for reading calendar information and hisab parameters, and strengthen the *pesantren*'s role as a grassroots center of Islamic education.

Theoretical Framework

The Unified Global Hijri Calendar is an Islamic calendar system oriented toward the global unification of Hijri dates. Conceptually, KHGT regards the earth as a single matlak and uses contemporary hisab hakiki as the basis for calculating the beginning of lunar months. According to the official KHGT portal, its parameters refer to the Turkey 2016 criteria, namely the fulfilment of a minimum elongation of eight degrees and a minimum crescent altitude of five degrees in a specified region before the designated universal time limit.⁴

As a religious-scientific innovation, KHGT contains not only technical astronomical dimensions but also fiqh, maqasid, institutional, and social dimensions. Earlier studies have shown that the unification of the Islamic calendar faces epistemological, jurisprudential, religious-authority, and social-acceptance challenges.⁵

Muslim Society Indonesia: From Authority to Identity,” *Akademika: Jurnal Pemikiran Islam* 27, no. 2 (November 25, 2022): 171–82, <https://doi.org/10.32332/akademika.v27i2.5357>; Ahmad Musonnif, “Islamic Law and Science in NU-Muhammadiyah’s Lunar Calendar Determination,” *Al-Hilal: Journal of Islamic Astronomy* 6, no. 2 (October 31, 2024): 199–220, <https://doi.org/10.21580/al-hilal.2024.6.2.23995>; Marwadi Marwadi, “Renewing the Thoughts of the Hijri Calendar of Muhammadiyah, Nahdlatul Ulama and Persatuan Islam and Its Implications for Realization of National Hijri Calendar,” *Al-Manahij: Jurnal Kajian Hukum Islam* 15, no. 1 (June 14, 2021): 19–36, <https://doi.org/10.24090/mnh.v15i1.4870>.

⁴ Majelis Tarjih dan Tajdid PP Muhammadiyah, “Kalender Hijriah Global Tunggal.”

⁵ Susiknan Azhari, “Global Islamic Calendar Challenge in Era Industrial Revolution 4.0; [CABARAN KALENDAR ISLAM GLOBAL DI ERA REVOLUSI INDUSTRI 4.0],” *Jurnal Fiqh* 18, no. 1 (2021): 119 – 136–119 – 136, <https://doi.org/10.22452/fiqh.vol18no1.4>; Marwadi Marwadi, Rina Heriyanti, and Farah Nuril Izza, “The Fiqh of Hisab-Ru’ya in the Twentieth Century Indonesia: Study on the Thoughts of Hamka, Hasbi Ash-Shiddieqy, and Moenawar Chalil about the Unification of Hijri Calendar,” *Al-Manahij: Jurnal Kajian Hukum Islam* 17, no. 1 (April 2023): 13–26, <https://doi.org/10.24090/mnh.v17i1.7902>; Abdul Rivai Poli et al., “The Existence of a Unified Global

Therefore, KHGT implementation requires an educational approach capable of translating the technical language of Islamic astronomy into forms of understanding that are accessible to community members.

Pesantren hold a strategic position as spaces for the formation of religious knowledge, attitudes, and community leadership. In the Muhammadiyah context, *pesantren* function not only as educational institutions but also as nodes of cadre development, da'wah, and Islamic intellectual renewal. KHGT literacy in *pesantren* is important because students and teachers can become intermediaries between organizational religious decisions and grassroots community understanding.

From the perspective of Islamic legal philosophy, the effort to unify the Hijri calendar can be positioned within *maslahah*- and *maqasid*-oriented reasoning because it seeks public certainty in worship, education, and Muslim social organization. Anwar argues that a unified Islamic calendar is not merely a technical project but also a legal-philosophical issue involving the relationship between *ru'yat*, *hisab*, and the purposes of Islamic law. This argument is strengthened by studies comparing the Turkey 2016 global criterion and the new MABIMS criteria, which show that calendar unification requires both *fiqh* legitimacy and empirically defensible astronomical parameters.⁶ Therefore, KHGT literacy requires a pedagogical bridge between *sharia* reasoning, astronomical calculation, and community practice.

Community engagement in *pesantren* must take into account community characteristics, knowledge relations, local authority, and internal sustainability. Effective training does not end with the transfer of material; it should also produce participants' ability to read, explain, and use new knowledge in accordance with the institutional context of the *pesantren*.

Hijri Calendar from the Perspective of Islamic Law (Fiqh)," *Jurnal Ilmiah Mizani: Wacana Hukum, Ekonomi Dan Keagamaan* 13, no. 1 (April 29, 2026): 169, <https://doi.org/10.29300/mzn.v13i1.9173>.

⁶ Syamsul Anwar, "Unified Islamic Calendar in the Perspective of Islamic Legal Philosophy," *Al-Jami'ah: Journal of Islamic Studies* 54, no. 1 (June 25, 2016): 203–47, <https://doi.org/10.14421/ajis.2016.541.203-247>; Nursodik Nursodik, "Kajian Kriteria Hisab Global Turki Dan Usulan Kriteria Baru MABIMS Dengan Menggunakan Algoritma Jean Meeus," *Al-Ahkam* 18, no. 1 (October 10, 2018): 119–40, <https://doi.org/10.21580/ahkam.2018.18.1.2353>; Mohammad Sh. Odeh, "New Criterion for Lunar Crescent Visibility," *Experimental Astronomy* 18, no. 1–3 (December 29, 2004): 39–64, <https://doi.org/10.1007/s10686-005-9002-5>.

Diffusion of innovation theory explains that the acceptance of a new idea develops through the stages of knowledge, persuasion, decision, implementation, and confirmation.⁷ KHGT can be understood as a religious-scientific innovation requiring introduction, rational understanding, acceptance, and practical use. Therefore, KHGT literacy activities should be designed not merely as lectures but as learning experiences that allow participants to discuss, practice, and reflect on its benefits.

Participatory Action Research (PAR) emphasizes community participation in identifying problems, designing actions, implementing interventions, reflecting on results, and formulating follow-up plans.⁸ This approach is highly relevant for community service because it treats partners not as passive recipients of programs but as subjects who help define needs and determine the direction of sustainability.

Service learning complements PAR by connecting the academic knowledge of the engagement team with the real needs of the community. In this program, service learning was embodied through the application of Islamic astronomy, tarjih methodology, and calendar education to address the literacy needs of the *pesantren*. The principle of community-engaged research requires that program benefits do not return only to academics but also generate outputs that can be directly used by the partner community.⁹

Method

This program used Participatory Action Research (PAR) with a service-learning approach. PAR was selected because KHGT literacy and basic hisab training required partner involvement from the stage of need identification to the reflection

⁷ Xun Zhu, "Diffusion of Innovations Model," in *The International Encyclopedia of Health Communication* (University of North Dakota, United States: Wiley, 2022), 1–5, <https://doi.org/10.1002/9781119678816.iehc0770>; Ping Yu, "Diffusion of Innovation Theory," in *Implementation Science* (London, University of Wollongong, Australia: Routledge, 2022), 59–61, <https://doi.org/10.4324/9781003109945-16>.

⁸ Fran Baum, Colin MacDougall, and Danielle Smith, "Participatory Action Research," *Journal of Epidemiology & Community Health* 60, no. 10 (October 1, 2006): 854–57, <https://doi.org/10.1136/jech.2004.028662>; Margaret Cargo and Shawna L. Mercer, "The Value and Challenges of Participatory Research: Strengthening Its Practice," *Annual Review of Public Health* 29, no. 1 (April 1, 2008): 325–50, <https://doi.org/10.1146/annurev.publhealth.29.091307.083824>.

⁹ Lloyd Michener et al., "Aligning the Goals of Community-Engaged Research," *Academic Medicine* 87, no. 3 (March 2012): 285–91, <https://doi.org/10.1097/ACM.0b013e3182441680>.

and follow-up stage. Service learning was used to connect the engagement team's academic expertise in Islamic astronomy, fiqh, and community education with the practical needs of the Muhammadiyah Islamic boarding school in Makassar. This orientation is consistent with community-service practices that emphasize technical training, community learning, and capacity strengthening in local institutions.¹⁰

The program was implemented in four phases. The first phase was partner-needs diagnosis through initial observation and communication with the *pesantren*. The second phase was collaborative planning, which included the preparation of materials, schedules, and evaluation instruments. The third phase was educational action, consisting of KHGT socialization, discussion of fiqh and tarjih methodology, and basic hisab practice. The fourth phase was reflection and evaluation to assess program achievement and formulate sustainability strategies.

The program was conducted at a Muhammadiyah Islamic boarding school in Makassar in 2026. The preparation phase included needs observation, technical coordination, and material development. The main implementation phase was conducted through face-to-face activities consisting of a pre-test, material presentation, discussion, practice in reading calendar information, and a post-test. Monitoring and reflection were conducted after the main activity to examine participants' responses and follow-up needs.

The program involved 30 participants from the *pesantren* community, including students, teachers/ustaz, mentors, and members of the *pesantren* management. The inclusion of diverse participant groups was important so that the program outcomes would not remain at the level of individual learning but could potentially be integrated into the *pesantren's* religious-literacy activities.

¹⁰ Sri Hartanto et al., "Pemasangan Dan Pelatihan Penggunaan Jam Digital Penunjuk Waktu Shlat Mushola Bidayatul Hidayat, Desa Srijaya, Bekasi" 5 (2025): 173–88; Muhiran Muhiran et al., "Peningkatan Kapasitas Hukum Dalam Pengelolaan Bumdes Untuk Mewujudkan Kadipaten Menjadi Desa Mandiri Di Kabupaten Wonosobo," *Khidmatuna: Jurnal Pengabdian Masyarakat* 5, no. 2 (May 31, 2025): 157–72, <https://doi.org/10.54471/khidmatuna.v5i2.3482>; Elizabeth A Dunn, "Participatory Action Research and Service-Learning," in *Service-Learning for Disaster Resilience* (New York, College of Public Health, United States: Routledge, 2022), 80–96, <https://doi.org/10.4324/9781003182979-7>; Carlie D Trott, Laura B Sample McMeeking, and Andrea E Weinberg, "Participatory Action Research Experiences for Undergraduates: Forging Critical Connections Through Community Engagement," *Studies in Higher Education* 45, no. 11 (November 1, 2020): 2260–73, <https://doi.org/10.1080/03075079.2019.1602759>.

Table 1. General Profile of Activity Participants

Aspect	Description
Number of participants	30 people
Participant profile	Students, teachers/instructors, advisors, and <i>pesantren</i> residents
Partner role	Providing information on needs, arranging venues, participating in activities, offering feedback, and planning internal follow-up actions
Focus on needs	KHGT literacy, basic understanding of astronomical calculations, calendar reading, and practical explanations for <i>pesantren</i> residents

The training materials covered an introduction to KHGT, the fiqh basis and tarjih methodology, the principles of contemporary hisab hakiki, comparison between local and global calendar systems, use of the official KHGT portal, reading of the Global Calendar Parameter Fulfilment Map, and practice in explaining the beginning of a Hijri month in simple terms. The scope of hisab training in this program was limited to basic operational hisab, namely the skill of reading and using calendar information, rather than advanced mathematical astronomical calculation.

Evaluation was conducted using pre-test and post-test instruments converted to a 0-100 scale. The instrument was developed based on indicators of KHGT literacy and basic skills in using calendar information. Content validity was assessed through internal review by members of the engagement team who had competence in Islamic astronomy and tarjih. The data were analyzed descriptively using frequency, percentage, mean, median, mode, standard deviation, minimum score, maximum score, and N-gain. Because individual raw data are not presented in this article, the claims are limited to descriptive improvement rather than inferential testing.

The N-gain score was used as a descriptive indicator of learning improvement because it normalizes score increase relative to participants' initial baseline. Hake's normalized gain framework is widely used in educational evaluation to distinguish low, medium, and high learning gains. In this program, however, the N-gain value is interpreted only as descriptive evidence of immediate learning improvement, not as

proof of causal impact, because the design did not employ a control or comparison group.¹¹

Table 2. Activity Evaluation Rubric

Dimensions	Indicators	Forms of assessment
Knowledge of KHGT	Understand the concepts, objectives, and urgency of KHGT	Pre-test and post-test
Fundamentals of fiqh and tarjih	Understanding Sharia-based reasoning, the tarjih methodology, and the principle of a single global reference point	Pre-test, post-test, and discussion
Astronomical literacy	Recognizing the terms ijtimak, hilal, elongation, hilal altitude, and global calendar parameters	Pre-test, post-test, and Q&A
Basic calculation skills	Reading official calendars, converting dates, and interpreting KHGT parameter maps	Practical observation and worksheets
Readiness for dissemination	Being able to explain KHGT in simple terms to boarding school students	Reflection and participant feedback

The operationalization of PAR and service learning was structured to ensure that the partner was involved not only as a participant but also as a contributor to needs mapping, program implementation, feedback, and sustainability planning.

Table 3. Operationalization of PAR and Service Learning

Phase	Activities	Role of the Partner	Output
Needs Assessment	Initial observation and discussion of KHGT literacy needs	Communicate the initial situation and learning needs	Map of literacy needs for KHGT <i>pesantren</i>
Joint Planning	Development of materials, schedule, and evaluation mechanisms	Agree on the schedule, participants, and logistical details of the activity	Training design and evaluation tools
Educational Activities	KHGT orientation, discussion, Q&A, and basic hisab practice	Participate in the training, complete	Improvement of basic understanding and skills

¹¹ Richard R. Hake, "Interactive-Engagement versus Traditional Methods: A Six-Thousand-Student Survey of Mechanics Test Data for Introductory Physics Courses," *American Journal of Physics* 66, no. 1 (January 1, 1998): 64–74, <https://doi.org/10.1119/1.18809>.

		the exercises, and provide feedback	
Reflection and Follow-Up	Evaluation of results, feedback, and sustainability plan	Determine the need for follow-up support	Succession planning and literacy materials for <i>pesantren</i>

Results and Discussion

Initial Conditions and Partner Needs

The initial observation showed that the partner institution required KHGT literacy strengthening that was not only normative but also practical. Participants needed to understand why KHGT was developed, the fiqh and astronomical arguments supporting it, and how calendar information could be used in the educational and religious agenda of the *pesantren*. This need is consistent with the broader challenge of KHGT implementation, which requires education at the grassroots level rather than dissemination at the institutional leadership level only.

At the beginning of the activity, participants completed a pre-test to map their baseline understanding. The pre-test results indicated that participants' initial knowledge was in the low-to-moderate range. Scores were distributed between 30 and 65; 50% of participants scored below 50, and 80% scored below 60. This condition confirmed the relevance of implementing a KHGT literacy program in the *pesantren* environment.



Figure 1. Aligning Perspectives Between the Volunteer Team and the *Pesantren* During the Opening Phase of the Activity

The KHGT literacy session was conducted through an interactive presentation on the concept, rationale, scope, and urgency of the Unified Global Hijri Calendar. The material was delivered by connecting sharia, astronomical, and institutional aspects of *pesantren* life. Participants were not only introduced to the term KHGT but were also guided to understand the scientific and social reasons why a global calendar is needed.

The activity was dialogical. Participants were given space to ask questions about calendar differences, the foundations of hisab, the relationship between KHGT and rukyat, and the implications of KHGT for *pesantren* activities. This discussion was essential because, from the perspective of diffusion of innovation, acceptance of a new idea does not occur through information alone; it also requires persuasion, clarification, and social confirmation.



Figure 2. Presentation of KHGT Materials and Interactive Discussion with Participants

Program Implementation under a Participatory Action Cycle Approach

To address the partner's practical needs, the program did not stop at conceptual socialization. Participants also took part in basic operational hisab practice. In the context of this program, basic hisab was not understood as advanced

mathematical astronomy training; rather, it referred to the ability to read, understand, and use global Hijri calendar information based on contemporary hisab hakiki.

The practice involved introducing the official KHGT calendar, reading Hijri-Gregorian date conversions, explaining the Global Calendar Parameter Fulfilment Map, and helping participants understand the rationale for determining the beginning of a lunar month based on crescent altitude and elongation parameters. Participants were also trained to explain, in simple terms, the difference between local/regional calendars and a unified global calendar.

Table 4. Forms of Basic Arithmetic Training

Practical Components	Participant Activities	Expected Outcomes
Reading the KHGT calendar	Identify Hijri and Gregorian dates on the official calendar	Participants will be able to use the calendar as a reference for the <i>pesantren's</i> schedule
Date conversion	Cross-reference Hijri and Gregorian dates using official sources	Participants will understand the relationship between the Hijri and Gregorian calendars
Identifying parameters	Read basic information on the moon's altitude, elongation, and PKG	Participants will recognize the astronomical basis for determining the start of the month
Explaining the start of the month	Write a brief explanation of the rationale for determining the start of the month	Participants will be able to explain KHGT to the pesantren community in an appropriate manner



Figure 3. Calendar Explanation Session and Exercise on Reading KHGT Information

Evaluation Results from the Pre-test and Post-test

The evaluation data confirmed the initial observation that the partner needed KHGT literacy strengthening that was both conceptual and practical. Participants needed to understand the rationale for KHGT, its fiqh and astronomical basis, and the use of calendar information in the educational and religious agenda of the *pesantren*. The pre-test distribution therefore served as a baseline for assessing descriptive improvement after the literacy and basic hisab training sessions.

Table 5. Distribution of Pre-Test Scores

Score Range	Frequency	Percentage
30-39	6	20%
40-49	9	30%
50-59	9	30%
60-65	6	20%

Table 6. Distribution of Post-Test Scores

Score Range	Frequency	Percentage
75-84	8	26,7%
85-94	12	40%

95-100	10	33,3%
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Table 7. Descriptive Statistics of Score Improvement

Measure	Pre-test	Post-test	Improvement
Mean	49,3	89,3	40,0
Median	49,5	90,0	40,5
Modus	41	97	-
Standard deviation	9,4	8,5	-
Minimum value	34	75	41
Maximum value	65	100	35
Average N-gain	-	-	0,79 (tinggi)

The evaluation results show a substantial descriptive increase. The mean score rose from 49.3 in the pre-test to 89.3 in the post-test, or an increase of 40 points. The median increased from 49.5 to 90.0. No participant scored below 75 after the training, and 73.3% of participants achieved a score of 85 or higher. The average N-gain score of 0.79 indicates improvement in the high category.

An important correction in reading the data is that participants with pre-test scores below 50 numbered 15 out of 30, or 50%, not 60%. Therefore, the analysis of results must be stated consistently according to the data in the table. This improvement indicates that the literacy intervention and basic hisab training contributed to participants' understanding, although causal claims must remain limited because the evaluation design did not include a comparison group.

From a community engagement perspective, the central achievement of the program was not limited to score improvement. The activity also strengthened participants' ability to connect KHGT with the institutional needs of the *pesantren*. Participants gained an understanding that a calendar is not merely a technical issue of date calculation but is also related to certainty in worship, administrative order, and the strengthening of religious literacy.

When interpreted through diffusion of innovation theory, the activity helped participants move from the knowledge stage toward persuasion and trial use. The introduction of KHGT concepts built the knowledge stage; discussion and question-

and-answer sessions supported clarification; and practice in reading the calendar and hisab parameters functioned as a trial-use stage. In this sense, the *pesantren* can become a social-confirmation space for the gradual acceptance of KHGT.



Figure 4. Participant Engagement in Discussions and Activity Reflections

The PAR approach was reflected in the involvement of the partner institution in needs mapping, implementation, and reflection on follow-up plans. Service learning was reflected in the application of the engagement team's academic knowledge to address the real needs of the *pesantren* community. Nevertheless, sustainability remains a key factor. Short-term knowledge improvement needs to be followed by local cadres, concise teaching materials, and the integration of KHGT content into *pesantren* learning forums.

These findings align with community-engagement literature emphasizing that sustainable outcomes depend on reciprocal partnership, shared ownership, locally usable outputs, and community capacity. Community-based participatory research literature stresses that community members should participate not only in implementation but also in defining needs and using results. Likewise, service-learning literature views community engagement as a reciprocal process in which academic expertise is connected with community-defined priorities. Therefore, the KHGT literacy materials, worksheets, and focal point generated through this program should

be interpreted as early capacity-building assets that may support institutional continuity after the formal training ends.¹²

Partner Outputs and Sustainability Strategy

Beyond the immediate improvement in participants' cognitive understanding of the Unified Global Hijri Calendar, the program also produced several practical outputs intended to support the pesantren's internal capacity-building process. These outputs were designed not merely as supplementary materials, but as community-owned learning resources that can be reused by teachers, mentors, and students in subsequent religious learning activities. In this sense, the intervention was expected to move beyond a one-time training activity and contribute to the gradual institutionalization of KHGT literacy within the pesantren environment. The direct outputs for the partner are summarized in Table 8.

Table 8. Direct Outputs for Partners

Outputs	Benefits for partners
KHGT literacy materials	Serves as an initial reference for students and teachers in understanding the KHGT
Worksheets on basic arithmetic	Helps participants practice reading the KHGT calendar and parameters
Educational presentation/ poster materials	Can be reused in pesantren study sessions or community forums
KHGT literacy focal point	Serves as an internal liaison for ongoing support

The sustainability strategy was organized in three directions. First, KHGT literacy cadres should be developed from teachers or *pesantren* mentors who can continue internal education. Second, KHGT materials should be integrated into regular study sessions or lessons related to fiqh of worship and Islamic astronomy. Third, the program can be replicated in other Muhammadiyah *pesantren* by using the concise module and practical worksheets produced through this activity.

Through this strategy, the community engagement activity is not positioned as a one-time training event but as a model of community capacity building. Program

¹² Barbara A. Israel et al., "Review of Community-Based Research: Assessing Partnership Approaches to Improve Public Health," *Annual Review of Public Health* 19, no. 1 (May 1998): 173–202, <https://doi.org/10.1146/annurev.publhealth.19.1.173>.

replication can be conducted gradually by adapting to participants' baseline knowledge, the availability of facilitators, and the local needs of each *pesantren*.

Conclusion

The KHGT literacy and basic hisab training program at the Muhammadiyah Islamic boarding school in Makassar was implemented through PAR and service learning, positioning the partner institution as part of the process of need identification, implementation, and reflection on follow-up actions. The program was relevant because it addressed the *pesantren's* need to understand KHGT conceptually, sharia-wise, astronomically, and practically.

The evaluation results showed a substantial descriptive increase in participants' understanding. The mean score increased from 49.3 to 89.3, with an N-gain of 0.79 in the high category. In addition to cognitive improvement, the activity introduced basic hisab skills, including reading the official calendar, converting dates, recognizing KHGT parameters, and preparing practical explanations of the beginning of Hijri months.

The practical implication of this program is the need to strengthen *pesantren* as centers of KHGT literacy and basic Islamic astronomy cadre development. Program sustainability can be pursued through local cadres, concise modules, practice worksheets, and the integration of KHGT materials into *pesantren* study forums. The limitation of this program is that the evaluation was still based on descriptive pre-test and post-test results without a comparison group. Future programs are therefore advised to include a more structured practical-skill assessment and longer-term mentoring.

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