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# Developing a Dual-Method Pedagogical Model for Teaching Islamic Calendar Diversity in Indonesian Schools

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**Abstract**

**Objective**: This study aims to develop a dual-method learning model integrating Hisab and Rukyat to improve students' understanding, critical thinking, and attitudes toward religious diversity. **Theoretical framework:** The study is based on constructivist learning theory and Design-Based Research (DBR), emphasizing active learning, comparison, and reflective understanding. **Literature review:** Previous studies show that separate teaching of Hisab and Rukyat often causes fragmented understanding and confusion among students in Islamic education. **Methods:** This study uses a qualitative DBR approach through curriculum analysis, teacher interviews, and classroom observations in Muhammadiyah and Nahdlatul Ulama institutions. **Results:** The findings reveal that segregated teaching of Hisab and Rukyat results in fragmented student comprehension and confusion regarding Islamic calendar determination. In contrast, the implementation of an integrated dual-method pedagogical model enhances students' conceptual understanding by enabling them to compare and evaluate both approaches simultaneously. The model also promotes critical thinking skills and encourages more inclusive and moderate religious attitudes among students. **Implications:** The study provides an innovative teaching approach that supports inclusive Islamic education and reduces misunderstandings between different methodologies. **Novelty:** The novelty of this research is the development of a dual-method pedagogical model that combines Hisab and Rukyat in one integrated classroom learning system.

**Keywords:** islamic education, hisab, rukyat, pedagogical model, religious moderation.

## INTRODUCTION

Within Muslim communities, disagreements about how to determine the Islamic calendar continue to be a serious problem, especially in Indonesia, where prominent organizations like Muhammadiyah and Nahdlatul Ulama use different methodological techniques. While Nahdlatul Ulama follows Rukyat, which is predicated on the actual sighting of the moon, Muhammadiyah uses Hisab, an astronomical calculating approach [1]. These distinctions have practical ramifications in addition to philosophical ones, especially when it comes to celebrating significant religious holidays like Ramadan and Eid. These differences frequently cause students to become confused in Islamic educational settings, particularly when they are only exposed to one viewpoint without sufficient explanation of the opposite method [2].

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These distinctions offer an opportunity as well as a difficulty in the context of Islamic education. On the one hand, students may interpret the differences as conflicts rather than complementary approaches due to a lack of integrated teaching practices, which can lead to fragmented comprehension. However, when handled well, these distinctions can be a useful teaching tool for encouraging intellectual curiosity, critical thinking, and appreciation for variety. However, Hisab and Rukyat are currently taught independently at many institutions, which hinders students' capacity to have a thorough understanding of Islamic calendar determination [3].

Prior research has mostly concentrated on the legal dispute between Hisab and Rukyat, highlighting the theological and legal underpinnings of Islamic jurisprudence. Although these contributions are significant, they frequently ignore the educational aspect of how these distinctions are taught in schools [4]. Because of this, there is still a lack of information in the research about successful instructional approaches that might help students understand these methodological differences. This disparity emphasizes the necessity of an instructional strategy that not only clarifies the variations but also incorporates them into a cohesive learning process [5].

In order to close this gap, this study suggests a dual-method educational paradigm that incorporates both Rukyat and Hisab into classroom training. This study aims to assess current teaching methods, pinpoint their shortcomings, and create a novel educational model that fosters conceptual comprehension, critical thinking, and religious moderation through a qualitative approach utilizing Design-Based Research (DBR). In modern Islamic education, the emphasis on moderation is especially crucial since it supports the larger objective of fostering inclusive and balanced viewpoints in pupils [6].

Thus, the main goal of this research is to create and assess a dual-method educational model that may successfully address methodological disparities in the determination of the Islamic calendar [7]. The study aims to provide theoretical and practical contributions to the field of Islamic education by focusing on Islamic educational institutions connected to Muhammadiyah and Nahdlatul Ulama. In the end, it is anticipated that this research will offer a helpful framework for converting discrepancies into learning opportunities, improving the calibre and applicability of Islamic education in many circumstances [8].

This research is important because the diversity of Islamic calendar determination in Indonesia continues to generate differences in the observance of religious events such as Ramadan, Eid al-Fitr, and Eid al-Adha. These differences are not only theological and astronomical issues, but also educational and social challenges that influence students' understanding of religious plurality, tolerance, and national cohesion. In Indonesian schools, the teaching of Islamic calendar diversity is often limited to doctrinal explanations without integrating scientific reasoning, historical perspectives, and dialogical learning approaches. As a result, students may develop rigid attitudes toward differing interpretations among Islamic organizations and scholars. A dual-method pedagogical model that combines religious-textual understanding with scientific-astronomical analysis is therefore necessary to foster critical thinking, moderation, and intercultural religious literacy. This research is also significant because it supports the broader goals of multicultural Islamic education and contributes to strengthening social harmony in a pluralistic Muslim society. Furthermore, the study provides educators with practical teaching strategies that can bridge doctrinal instruction and scientific inquiry in Islamic education classrooms [7].

The novelty of this study lies in the integration of two complementary pedagogical approaches—normative Islamic scholarship and empirical astronomical education—within a single instructional framework for teaching Islamic calendar diversity. Previous studies generally discuss rukyat and hisab from theological or astronomical perspectives separately, while this research develops a pedagogical synthesis specifically designed for Indonesian school contexts. The study introduces an interdisciplinary model that combines comparative

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fiqh analysis, observational astronomy, collaborative discussion, and reflective learning activities to improve students' cognitive understanding and social tolerance simultaneously. Another innovative aspect is the incorporation of multicultural education principles into Islamic calendar instruction, enabling students to appreciate differences among Islamic organizations without reducing religious commitment. In addition, the research proposes classroom-based learning modules and participatory teaching techniques that can be directly implemented in Islamic Religious Education curricula. By positioning Islamic calendar diversity as both a scientific and socio-religious learning resource, this study offers a transformative contribution to contemporary Islamic pedagogy in Indonesia [8].

## LITERATURE REVIEW

Recent scholarship on Islamic education in Indonesia has increasingly emphasized the importance of developing pedagogical approaches that encourage inclusivity, critical thinking, and religious moderation in multicultural learning environments. Within this context, the teaching of Islamic calendar diversity has become an important educational issue because differences in determining the beginning of Ramadan, Eid al-Fitr, and Eid al-Adha frequently create debates among Muslim communities. Existing studies generally explain these differences through theological interpretations, astronomical calculations, or organizational perspectives, particularly between methods based on rukyat and hisab. However, many educational approaches still present these differences in a normative and one-dimensional manner, resulting in limited student understanding of the historical, scientific, and sociocultural dimensions of Islamic calendar diversity [9].

Previous research on Islamic Religious Education has highlighted the need for innovative teaching models capable of integrating religious values with scientific reasoning. Scholars have argued that contemporary Islamic pedagogy should not only focus on doctrinal transmission but also cultivate dialogue, analytical thinking, and intercultural awareness among students. In Indonesian schools, the challenge of teaching religious diversity is closely connected to broader issues of multicultural education and social harmony. Studies on multicultural Islamic education have demonstrated that dialogical learning methods can strengthen students' tolerance and appreciation of differing religious interpretations. Nevertheless, few studies specifically address how Islamic calendar diversity can be taught through an interdisciplinary educational framework [9].

Research in astronomy education has also contributed to discussions about integrating scientific observation into Islamic learning. Educational scholars have explored the use of lunar observation, digital simulations, and collaborative inquiry to improve students' understanding of celestial phenomena related to the Islamic calendar. Although these studies provide valuable scientific insights, they often lack integration with Islamic jurisprudential perspectives and classroom pedagogy. Similarly, studies in comparative fiqh frequently discuss methodological differences among Islamic scholars but rarely translate these discussions into practical teaching strategies for school settings [8].

The literature therefore indicates a significant gap in developing a pedagogical model that combines religious-textual instruction with empirical-scientific learning approaches. This study responds to that gap by proposing a dual-method pedagogical model that integrates Islamic scholarship, astronomy education, and multicultural pedagogy to enhance students' understanding of Islamic calendar diversity in Indonesian schools [9].

## METHODOLOGY

In order to create and assess a dual-method educational model for teaching Islamic calendar determination, this study uses a qualitative research methodology utilizing Design-

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Based Research (DBR). DBR is chosen because it enables the methodical planning, execution, and improvement of educational interventions in actual classroom environments, which makes it ideal for tackling real- world issues in Islamic education. The study focuses on incorporating Hisab and Rukyat methodologies into teaching practices in establishments connected to Muhammadiyah and Nahdlatul Ulama [9].

The research was conducted in selected Islamic educational institutions representing both Muhammadiyah and Nahdlatul Ulama systems. Participants included Islamic education teachers and students who are directly involved in the teaching and learning process of Islamic calendar topics. A purposive sampling technique was used to select participants who have relevant experience and knowledge of the subject matter. This ensures that the data collected is rich and relevant to the research objectives [10].

Data collection was carried out through three main techniques: curriculum analysis, semi-structured interviews, and classroom observations. The presentation of Islamic calendar determination in instructional materials and curricula was examined using curriculum analysis. Teachers' pedagogical strategies, difficulties, and viewpoints on teaching Hisab and Rukyat were investigated using semi-structured interviews. In order to comprehend actual teaching methods and student reactions during instruction, classroom observations were conducted [11].

Four steps make up the DBR process in this study: (1) problem identification and analysis of current teaching practices; (2) design of the dual-method pedagogical model; (3) implementation of the model in classroom settings; and (4) evaluation and improvement based on feedback and observed outcomes. Thematic analysis was used to examine the data in order to find trends in teaching methods, student comprehension, and attitudes regarding methodological variations [12].

By comparing data from several sources and techniques, the study used triangulation to guarantee the validity and trustworthiness of the conclusions. Participants were also involved in member verification, which involved confirming the accuracy of the results. By using this approach, the study hopes to develop a useful and successful teaching model that can improve critical thinking, conceptual comprehension, and religious moderation in Islamic education [13].

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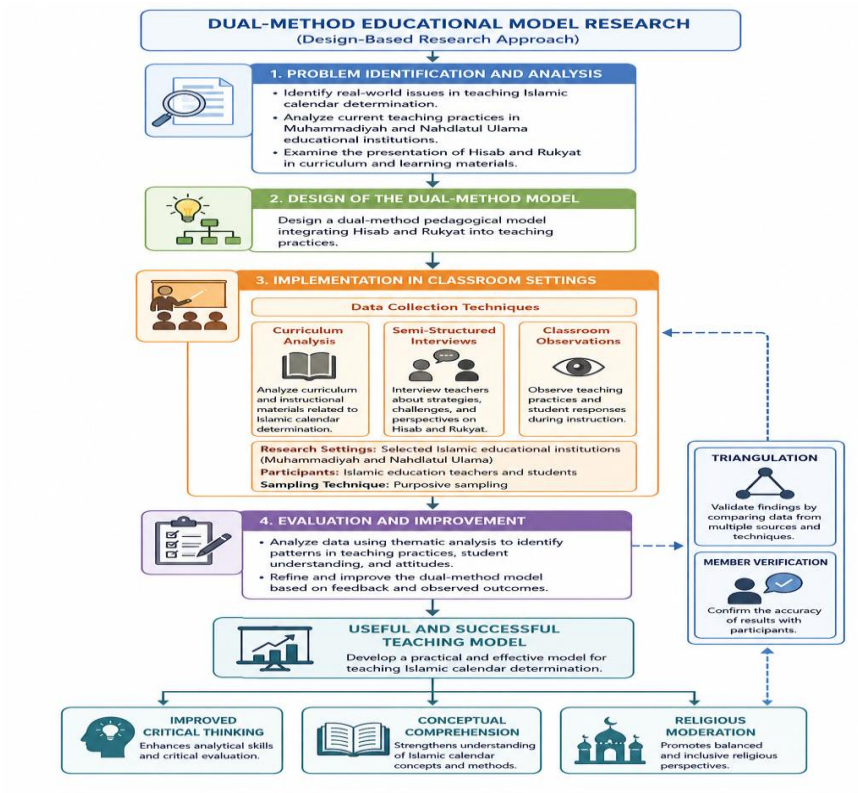


**Figure 1. Dual-Method Educational Model for Islamic Calendar Determination**

## RESULTS AND DISCUSSION

### Teaching Approaches in Muhammadiyah and Nahdlatul Ulama Institutions

The results of research found in the field show that bullying at the Darul Qur'an Islamic Boarding School in Surakarta occurs in verbal and relational forms, which are often unrealized as an act of bullying by students. The results show distinct and consistent variations in the methods of instruction used in establishments connected to Muhammadiyah and Nahdlatul Ulama, especially when it comes to determining the Islamic calendar [14]. Hisab is the primary teaching method used in Muhammadiyah-based schools. Astronomical data, mathematical computations, and the application of scientific reasoning are the main topics of instruction [15]. In order to help students comprehend the process logically and methodically, teachers frequently introduce concepts like lunar cycles, celestial body positions, and calculation formulas. Textbooks, visual aids, and even computer tools that mimic astronomical movements are used to assist this method. Students are thus encouraged to cultivate critical thinking, problem-solving abilities, and a logical comprehension of how the Islamic calendar is established [16].

Institutions connected to Nahdlatul Ulama, on the other hand, place a strong emphasis on using Rukyat as the main teaching method. In this setting, instruction centres on the firsthand observation of the moon, frequently supplemented with explanations derived from ancient practices and classical Islamic knowledge [17]. Teachers emphasize the significance of seeing the new moon as a religious act, connecting it to collective religious experiences and prophetic traditions. Students sometimes participate in hands-on activities that improve experiential learning, such as simulated or real-world moon sightings. This method encourages a greater understanding of religious authority, empirical observation, and the persistence of Islamic tradition [18].

The study also shows that, within their respective institutions, these approaches are frequently taught in isolation with little exposure to alternative approaches. While Nahdlatul

Ulama students might not be conversant with the scientific and computational aspects of hisab, Muhammadiyah students might not fully get the practical and traditional meaning of rukyat [19]. Students' capacity to gain a thorough and comparative understanding of the Islamic calendar determination may be hampered by this division. As a result, even if each method has advantages of its own analytical rigour in Muhammadiyah and experiential depth in Nahdlatul Ulama, the lack of integration emphasizes the necessity of a more comprehensive teaching approach that unites both viewpoints [20].

## Limitations of Segregated Teaching Practices

The existing segregated education style has a number of drawbacks, according to the report. First, it perpetuates a binary vision in which students see rukyat and hisab as opposing rather than complementary methods. Confusion may result from this, particularly during major religious occasions like Ramadan and Eid, when discrepancies in calendar determination become apparent to the general audience [21]. Second, opportunities for critical engagement are severely limited in the absence of comparison education. Teaching in the majority of observed classrooms is limited to a single methodological framework and makes little use of different viewpoints. Students are therefore seldom encouraged to examine, contrast, or assess hisab and rukyat in an integrated framework [22]. Higher-order thinking abilities like critical analysis, synthesis, and reflective judgment are hindered by this. Students who aren't exposed to a variety of viewpoints are less able to participate in rational conversations or resolve conflicts in a positive way. As a result, their capacity to apply knowledge in a variety of real- world situations where different interpretations coexist is underdeveloped [23].

Third, kids may unintentionally develop exclusivist views as a result of separated instruction. Students may form a strong connection to one technique while discounting others as less legitimate or even inaccurate when only one is portrayed as authoritative or normative [24]. This may result in a limited comprehension of Islamic knowledge, where variation is seen as abnormality rather than richness. The larger goal of promoting religious moderation (wasatiyyah) in Islamic education is challenged by such attitudes. The existing methodology runs the risk of strengthening ideological rigidity and restricting students' capacity to recognize pluralism within the Islamic intellectual heritage, rather than encouraging openness, tolerance, and respect for one another [25].

Furthermore, there is a gap between theoretical understanding and real-world religious experience due to the absence of integration between hisab and rukyat. While students in Nahdlatul Ulama contexts may have great observational and traditional understanding but struggle with scientific explanation, students in Muhammadiyah contexts may excel in computational correctness but lack experiential involvement with moon sighting. Because of this disparity, neither group can fully comprehend Islamic calendar determination, leading to limited knowledge [26].

**Table 1. Limitations of Segregated Teaching Practices in Islamic Calendar Instruction**

| Aspect | Description of Limitation | Impact on Students | Educational Implication |
|---|---|---|---|
| **Dichotomous Understanding** | Hisab and rukyat are taught as separate and opposing methods rather than complementary approaches. | Students develop confusion, especially during Ramadan and Eid, when differences become visible. | Limits holistic understanding and reinforces the misunderstanding of methodological diversity. |
| **Lack of Comparative Learning** | Instruction is confined to a single method with minimal | Weak development of critical thinking skills such as analysis, | Reduces students' ability to engage in rational discussion and |

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| | | | |
|---|---|---|---|
| | exposure to alternative perspectives. | evaluation, and synthesis. | apply knowledge in diverse contexts. |
| **Exclusivist Attitudes** | One method is presented as authoritative, leading students to dismiss other approaches. | Students develop rigid viewpoints and lack appreciation for diversity within Islamic traditions. | Undermines the goal of religious moderation (*wasatiyyah*) and tolerance. |
| **Fragmented Conceptual Understanding** | Absence of integration between scientific (*hisab*) and experiential (*rukyat*) approaches. | Students possess partial knowledge, either strong in calculation or observation, but not both. | Prevents comprehensive mastery of the Islamic calendar determination. |
| **Theory–Practice Gap** | Disconnection between theoretical instruction and real-world religious practices. | Muhammadiyah students lack experiential insight; NU students lack analytical depth. | Creates an imbalance in learning outcomes and limits interdisciplinary understanding. |
| **Limited Pedagogical Innovation** | Teachers rely on traditional, institution-specific teaching methods without integration. | Reduced engagement and limited exposure to diverse learning experiences. | Hinders the development of innovative, integrative teaching models. |

## Development of the Dual-Method Pedagogical Model

This study suggests a dual-method educational paradigm that methodically incorporates rukyat and hisab into a single instructional framework based on the findings. The model, which was created through the iterative processes of Design-Based Research (DBR), is both conceptual and useful because it has been improved through ongoing evaluation, teacher feedback, and classroom deployment [27]. By encouraging cognitive balance, methodological awareness, and inclusive religious knowledge, the model aims to alleviate the fragmentation found in current teaching techniques [28].

Three essential components are combined into a single, cohesive learning process by the model. First, students are introduced to both hisab and rukyat concurrently, as opposed to sequentially or separately, in order to develop conceptual unification [29]. Teachers clearly explain the epistemological underpinnings, methods, and goals of each approach, stressing that rukyat reflects an empirical and tradition-based approach based on observation and prophetic practice, while hisab represents a scientific-analytical approach based on astronomical calculation [30]. Students are encouraged to comprehend that both methods function within the same Islamic framework and share the goal of establishing the Islamic calendar through guided discussions, visual aids, and organized instruction. By reframing discrepancies as methodological variety rather than contradiction, this integrated paradigm helps dispel misconceptions [31].

Second, the model includes comparison learning exercises that actively involve students in comparing and contrasting the two approaches. After completing hisab computations, students must compare the outcomes with simulations or data pertaining to rukyat observations [32]. To increase comprehension, learning activities like group discussions, case studies of various Eid decisions, problem-based learning assignments, and reflective exercises are utilized. Through these procedures, students gain the capacity to recognize parallels and discrepancies, evaluate the advantages and disadvantages of each strategy, and formulate well-reasoned arguments. This promotes intellectual openness in addition to

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improving analytical and introspective thinking. In this situation, educators take on the role of facilitators, guiding students' inquiry, promoting discussion, and assisting them in examining other viewpoints [33].

Third, by fusing classroom-based scientific instruction with hands-on observation activities, the paradigm highlights a balance between experiential and analytical learning. Students can take part in simulated or actual moon sighting exercises in addition to studying astronomical computations [34]. Students are able to relate lived religious experiences to abstract ideas thanks to this integration. Those from Muhammadiyah backgrounds are thus exposed to the spiritual and experiential aspects of rukyat, whereas those from Nahdlatul Ulama backgrounds learn more about the computational and analytical aspects of hisab. By bridging the gap between theory and practice, this well-rounded approach guarantees that learning is comprehensive and significant [35].

The application of this paradigm shows improvements in student learning and instructional strategies. Due to students' increased participation, curiosity, and willingness to pose important questions, teachers reported higher levels of classroom engagement [36]. By combining the two approaches, the learning environment became more dynamic and engaging, shifting from passive instruction to active knowledge building. As they were able to define the distinctions and similarities between hisab and rukyat and defend their coexistence within Islamic tradition, students demonstrated an enhanced conceptual understanding. Students also showed improved critical thinking abilities, especially when it came to assessing the facts, contrasting viewpoints, and drawing fair judgments [37].

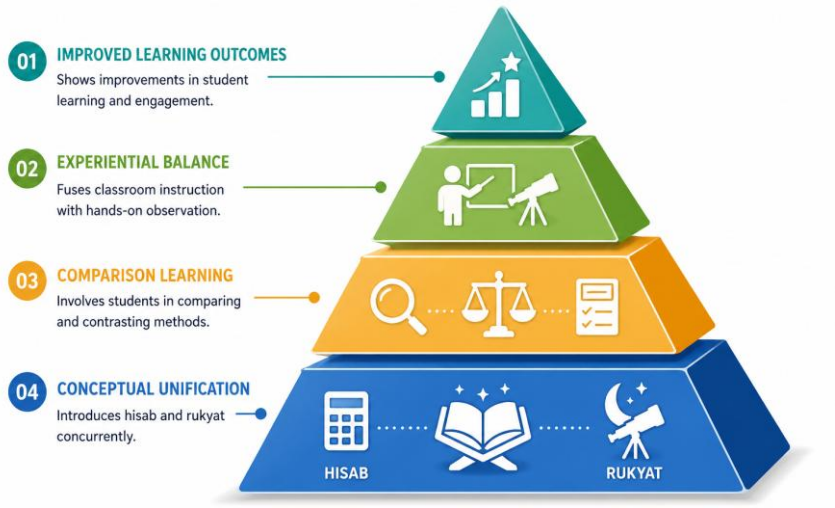


**Figure 2. Dual-Method Pedagogical Model**

The study's conclusions emphasize how crucial it is to incorporate many epistemological stances in Islamic education, especially when it comes to determining the Islamic calendar. The difference between Muhammadiyah's scientific orientation through hisab and Nahdlatul Ulama's experiential-traditional approach through rukyat illustrates a larger paradigm in Islamic intellectual history wherein transmitted knowledge (naql) and rational inquiry (‘aql) are complementary sources of understanding rather than mutually exclusive [38]. Although this duality has long been a defining characteristic of Islamic research, there is still little practical use of it in modern classrooms. The current study highlights the necessity for an integrative teaching model by showing that when different approaches are taught separately, students typically develop incomplete and fragmented understandings [39].

Students' conceptual knowledge can be greatly improved by integrating analytical and experiential techniques, as demonstrated by the application of the dual-method teaching model. Students are able to build knowledge more comprehensively by linking abstract scientific reasoning with tangible religious practices through simultaneous engagement with

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hisab and rukyat [40]. Constructivist learning theory's tenets that knowledge is actively created by interaction, experience, and reflection are supported by this. By combining experiential and comparative learning activities, students are able to make connections between what they already know and what they learn, which increases their cognitive engagement and promotes meaningful learning [41].

Additionally, the study shows that students' cognitive and affective development is greatly influenced by instructional design. Students are encouraged to critically interact with a variety of viewpoints through the transition from teacher-centred instruction to a more facilitative and inquiry-based approach. In addition to improving higher-order thinking abilities like analysis, assessment, and synthesis, this helps pupils deal with complexity and diversity in real-world situations. In this way, the dual-method approach portrays education as a forum for intellectual inquiry and discussion, going beyond the delivery of knowledge [42].

Crucially, the results also add to the larger conversation about wasatiyyah, or religious moderation, in Islamic education. A more inclusive and balanced viewpoint, where differences are recognized as acceptable variations rather than conflicts, is fostered by the merging of hisab and rukyat. Students who are exposed to this model exhibit increased tolerance, openness, and respect for different points of view, suggesting that instructional approaches can have a major impact on views regarding diversity. This is especially true in multicultural nations like Indonesia, where mutual understanding and social cohesion are greatly aided by educational institutions [43].

The study also highlights the potential of Design-Based Research (DBR) as a successful methodological approach for creating innovations in education that are context-sensitive. The dual- method paradigm was tailored to the reality of classroom practice through iterative cycles of design, implementation, and improvement, guaranteeing its applicability and relevance. This emphasizes how crucial it is to close the gap between theory and practice in educational research, especially in areas where knowledge, belief, and social context interact in intricate ways [44].

Overall, the conversation confirms that combining hisab and rukyat into a single pedagogical framework is a revolutionary approach to Islamic education rather than just a methodological enhancement. It reflects the complexity and depth of the Islamic intellectual tradition while also helping students to acquire inclusive attitudes, critical thinking abilities, and a thorough understanding. The dual-method pedagogical model makes a significant contribution to the development of modern Islamic education by reframing disparities as chances for learning rather than causes of division [45].

## CONCLUSION

This study concludes that the conventional separation between the teaching of rukyat and hisab in Islamic educational institutions has contributed to fragmented student understanding and limited opportunities for critical engagement with Islamic calendar diversity. In many classroom contexts, students are introduced to these approaches as competing methods rather than complementary intellectual traditions within Islamic scholarship. Such instructional limitations may unintentionally encourage rigid perspectives and reduce students' appreciation of methodological diversity in Islam. The findings of this research demonstrate that a dual-method pedagogical model can provide a more balanced and integrative learning experience for students in Indonesian schools. Using a Design-Based Research (DBR) approach, this study successfully developed and evaluated an instructional framework that combines scientific analysis, astronomical observation, religious-textual interpretation, collaborative discussion, and reflective learning activities. The integration of these components enables students to understand both the empirical and theological dimensions of Islamic calendar determination. The results indicate that students who participated in the

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dual-method learning process showed stronger conceptual comprehension, greater analytical ability, and more open attitudes toward differing interpretations among Muslim communities. In addition, the model encouraged active participation, dialogical interaction, and problem-solving skills that are essential in contemporary Islamic education. The study further reveals that integrating hisab and rukyat within a unified pedagogical structure contributes significantly to the cultivation of religious moderation (wasatiyyah), tolerance, and intellectual openness. Rather than viewing differences as sources of division, students learn to perceive them as part of the richness of Islamic intellectual heritage. This pedagogical transformation is particularly relevant in Indonesia's multicultural educational environment, where social harmony and mutual respect remain important educational goals. Therefore, the study emphasizes that the integration of scientific reasoning and experiential religious learning is essential for producing holistic, critical, and inclusive learners. The proposed dual-method pedagogical model offers both theoretical and practical contributions to the development of contemporary Islamic education in pluralistic societies.

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**Author Contribution**

Alwy Ahmed Mohamed designed research, collected data, drafted manuscript; Mowafg Masuwd supervised analysis, revised arguments, and validated pedagogical interpretations.

**Conflicts of Interest**

The authors declare no financial, institutional, or personal conflicts influencing research processes, interpretations, findings, or publication decisions regarding this study.

**Use of Artificial Intelligence (AI)**

The authors used AI tools exclusively for language refinement, grammar checking, and improving manuscript clarity. AI was not used for data generation, analysis, interpretation, or scholarly decision-making. The authors verified all content and accept responsibility for the final manuscript.

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