Insight: Vol. 4, No. 6 November 2026
pp. x-xx
E-ISSN: 3032-453X
https://doi.org/10.59888/insight.v4i6.127

The Implementation of Brain-Based Learning in Islamic Religious Education and Its Contribution to the Religiosity and Psychological Well-being of Students at SMA Negeri 1 Purwosari

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Keywords:
Brain-Based Learning; Islamic Religious Education; Religiosity; Psychological Well-Being; Educational Neuroscience

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ABSTRACT

Backround: Islamic Religious Education (IRE) in Indonesian secondary schools still tends to emphasize cognitive mastery, while the internalization of religious values and students' psychological well-being receive less attention.
Objective: This study aims to describe how Brain-Based Learning (BBL) is implemented in IRE and how it contributes to students' religiosity and psychological well-being at SMA Negeri 1 Purwosari.
Method: A qualitative case study design was employed. The participants were the IRE teacher and grade XI students selected purposively. Data were collected through classroom observations, semistructured interviews, and documentation of teaching modules and students' written reflections, and were analyzed thematically with source and technique triangulation.
Results: The findings show that the teacher implemented BBL through an emotionally safe classroom climate, interactive methods, contextual linking of materials to daily life, and guided reflection. These practices were associated with more active student engagement and with the ritual and consequential dimensions of religiosity, such as honesty, responsibility, and participation in school religious routines, although the religious school culture also shaped these outcomes. Regarding psychological well-being, students described greater classroom comfort, more positive relations with peers and the teacher, and more confidence to express opinions, which relate to the positive relations, autonomy, and environmental mastery dimensions of Ryff's model. The main challenge was the varied readiness and confidence of students.
Conclusion: The study concludes that BBL offers a humanistic framework for affective IRE learning. IRE teachers are advised to combine emotional support with structured reflection, and schools should align religious programs with classroom practice.

INTRODUCTION

Globally, adolescence is marked by two concerns that are directly relevant to religious education in schools. First, adolescents' religious knowledge does not automatically translate into religious behavior. A survey of 442 Indonesian junior secondary students found that scores on the

ideological dimension of religiosity were consistently higher than those on the consequential dimension, which reflects the application of values in daily social life (Nur et al., 2025). A phenomenological study in a West Java senior high school similarly reported high compliance with formal rituals, with about 95% attendance at congregational prayer, alongside inconsistent moral behavior such as academic dishonesty and bullying (Nurholis, 2025). Second, adolescent mental health has become a global priority. Data from the Global Burden of Disease Study show that in 2019 about 293 million people aged 5 to 24 years lived with at least one mental disorder, with a prevalence of 13.96% among those aged 15 to 19 years (Kieling et al., 2024). In Indonesia, the first national adolescent mental health survey found that one in three adolescents aged 10 to 17 years experienced a mental health problem in the previous 12 months, while only 2.6% of them accessed services (Center for Reproductive Health et al., 2022).

Within this context, Islamic Religious Education (IRE) plays an important role in shaping students' character, morality, and personality. In secondary education, IRE is intended not only to provide a conceptual understanding of Islamic teachings but also to instill religious values that students practice in everyday life. However, recent studies show that IRE learning still tends to be oriented toward theoretical mastery, so that students' understanding has not been fully translated into daily behavior and a gap remains between the cognitive, affective, and psychomotor domains (Ristiani et al., 2026). This tendency is reinforced by written evaluations that focus on cognitive achievement and by school cultures that reward ritual achievement more than moral integrity (Nurholis, 2025). A preliminary observation and an informal interview with the IRE teacher at SMA Negeri 1 Purwosari in [month, year] indicated a similar pattern: students could explain the materials, but several of them were reluctant to participate actively and did not consistently show the expected attitudes outside the classroom. Therefore, IRE learning needs to extend beyond intellectual development to support students' religious attitudes and personality formation.

In addition to religiosity, students' psychological well-being deserves attention in the educational process. This study refers to Ryff's eudaimonic model, which defines psychological well-being through six dimensions: self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth (Ryff, 2018). It is important to distinguish this broad and relatively stable construct from situational classroom experiences such as comfort, safety, and confidence to participate. Such experiences do not represent overall well-being, but they are the conditions through which schools can nurture several of its dimensions. A meta-analysis of 61 studies showed that a positive classroom climate, including emotional support and warm relations with teachers and peers, is associated with students' motivation, engagement, social competence, and lower emotional distress (Wang et al., 2020). In IRE, monotonous instruction has been linked to student boredom and unstable well-being, so learning designs that attend to emotional processes are needed (Raniya et al., 2025). Consequently, IRE learning should create an environment that supports students' positive psychological experiences and personal growth.

One approach considered relevant to these challenges is Brain-Based Learning (BBL). BBL refers to instructional design informed by findings on how the brain learns, emphasizing emotional

engagement, meaningful experiences, a supportive environment, and active participation. Developmental neuroscience shows that learning is inherently social and emotional, because emotions and relationships shape attention, memory, and motivation (Immordino-Yang et al., 2019). In Islamic education, this perspective has been integrated into a model of IRE grounded in neuroscience that treats the optimization of the brain's potential as part of holistic character formation (Suyadi & Widodo, 2019). Such an approach is relevant to IRE because religious values are expected not only to be understood conceptually but also to be internalized through meaningful experiences. Empirical syntheses report that BBL has a large positive effect on academic achievement and a moderate positive effect on students' attitudes (Ekemen & Beyhan, 2020), as well as a large effect on conceptual understanding (Funa et al., 2024).

Several studies have examined BBL in IRE, but with different foci and designs. (Wahyudi & Widodo, 2020) used a descriptive qualitative design with interviews and observations at SMK Muhammadiyah 1 Temon and found that BBL made students more aware of the learning process and had a positive influence on their daily lives. (Somantri et al., 2024) used a quantitative design involving 100 seventh grade students in three public junior high schools and found significant differences and interactions in IRE learning outcomes based on students' school origin and cognitive stage. (Raniya et al., 2025) conducted a literature based analysis and argued that IRE grounded in neuroscience can support emotional intelligence and psychological well-being by attending to the limbic system. Comparing these studies shows that the first two focused on learning processes and cognitive outcomes, while the third linked BBL to well-being only conceptually. None of them examined, with field data from a senior high school, how specific BBL practices relate to students' religiosity and psychological well-being at the same time.

This literature mapping reveals the research gap more precisely. Studies published between 2019 and 2025 mostly examined BBL or learning grounded in neuroscience in relation to instructional models and academic outcomes (Funa et al., 2024; Somantri et al., 2024; Suyadi & Widodo, 2019; Wahyudi & Widodo, 2020). Studies on adolescent religiosity focused on its dimensions and on school religious culture (Nur et al., 2025; Nursalim et al., 2023), whereas studies on students' mental health and well-being examined family and religious education factors through surveys (Shodiq et al., 2025) or remained conceptual (Raniya et al., 2025). Consequently, empirical evidence on how BBL principles are enacted in the senior high school IRE classroom, and on which dimensions of religiosity and psychological well-being they touch, is still limited. This study addresses this gap in terms of outcomes (religiosity and well-being together), population (public senior high school students), and method (a qualitative case study that traces classroom processes).

Research on this issue is urgent for three reasons. First, the Merdeka Curriculum places faith, piety, and noble character as the first dimension of the Pancasila Student Profile, and IRE is expected to be the main subject that realizes it (A'yun et al., 2023). Second, the national survey cited above shows that most adolescents with mental health problems do not receive professional help, and schools were the most common source of services chosen by caregivers (38.2%) (Center for Reproductive Health et al., 2022), so everyday classroom practice becomes an important protective setting. Third, a recent survey of 498 senior high school students in four Indonesian cities found a

strong positive path from religious education to students' mental health (Shodiq et al., 2025), which suggests that the way IRE is taught matters for students' well-being. If IRE continues to be delivered mainly through cognitive transmission, the gap between religious knowledge and behavior is likely to persist, and an important school based opportunity to support adolescents' well-being will be lost.

The novelty of this study lies in three aspects. First, it examines religiosity and psychological well-being together as affective outcomes of BBL in IRE, rather than learning achievement. Second, it maps specific BBL practices onto the ideological, ritual, and consequential dimensions of religiosity (Nur et al., 2025) and onto Ryff's well-being dimensions (Ryff, 2018), thereby explaining the mechanism through which BBL may support affective development rather than only asserting its effect. Third, it provides field evidence from a public senior high school in East Java, a context that differs from the vocational, junior secondary, and conceptual settings of previous studies (Raniya et al., 2025; Somantri et al., 2024; Wahyudi & Widodo, 2020).

Based on this background, this study aims to describe and analyze the implementation of BBL in IRE and its contribution to the religiosity and psychological well-being of students at SMA Negeri 1 Purwosari. Because the study adopts a qualitative design, it is guided by research questions rather than statistical hypotheses: (1) How is BBL implemented in IRE learning? (2) How do BBL practices relate to students' religiosity? (3) How do BBL practices relate to students' psychological well-being? (4) What challenges arise, and how does the teacher respond to them?

Theoretically, this study is expected to contribute to educational neuroscience in Islamic education by showing how BBL principles connect with affective outcomes in religious learning. Practically, the findings can serve as a reference for IRE teachers in designing lessons that combine emotional support, contextual materials, and reflection; for schools in aligning classroom practice with religious programs; and for policy makers and teacher education institutions in preparing IRE teachers to achieve the affective goals of the Merdeka Curriculum. The broader implication is that the success of IRE should be judged not only by cognitive scores but also by the quality of students' religious and psychological experiences.

METHOD

This study employed a quantitative approach with an explanatory survey design to examine the influence of Brain-Based Learning-based Islamic Religious Education on students' religiosity and psychological well-being. The research was conducted at SMA Negeri 1 [AR9.1]Purwosari. The research respondents consisted of students who participated in Islamic Religious Education learning activities. Data were collected using questionnaires designed to measure the implementation of Brain-Based Learning in Islamic Religious Education, students' religiosity, and psychological well-being. The questionnaire was distributed directly to the selected respondents to obtain data related to the research variables. The collected data were processed through scoring and tabulation before being analyzed statistically. Regression analysis was employed to examine the influence of Brain-Based Learning-based Islamic Religious Education on students' religiosity and psychological well-being. The analysis was intended to determine the direction and

significance of the relationships between the research variables. The results were subsequently interpreted to address the research objectives and test the proposed hypotheses.

RESULTS AND DISCUSSION

Implementation of Brain-Based Learning in Islamic Religious Education

Observations of [n] meetings and the interview with T1 show that BBL in IRE at SMA Negeri 1 Purwosari was understood by the teacher as an approach that adapts the learning process to the way students learn best, particularly through emotional comfort and active involvement (O; I-T1). T1 explained that the lessons were not only meant to deliver the material but were deliberately prepared to create a comfortable and emotionally supportive atmosphere so that students would be willing to participate (I-T1). The teaching modules also listed discussion, case analysis, and reflection as planned activities (D).

This finding is consistent with studies showing that the gap between theory and practice in IRE arises when learning is oriented mainly toward theoretical explanation (Ristiani et al., 2026). In the observed classes, the teacher's emphasis on emotional readiness before content delivery was a deliberate response to this problem. It also supports the qualitative findings of (Wahyudi & Widodo, 2020), who reported that BBL made students more aware of the learning process.

The observation sheet recorded five BBL principles in the classroom: creating an emotionally safe environment, encouraging active participation, connecting materials with real life, applying varied methods, and guiding reflection (O). In the [n] observed meetings, an emotionally safe climate and varied methods appeared in every meeting, contextual linking appeared in [x] meetings, and structured reflection appeared in [x] meetings. According to T1, monotonous and stressful situations were avoided because students' emotional condition affects their readiness to receive and process information (I-T1).

Meaningful learning was the principle most visible in the teaching modules, which planned discussions, simulations, educational games, and reflective activities as alternatives to teacher centered instruction (D). In Ausubel's theory, learning becomes meaningful when new information interacts with the learner's prior knowledge and when the learner is willing to learn (Agra et al., 2019). This interpretation is supported by meta-analytic evidence that BBL strategies improve conceptual understanding (Funa et al., 2024).

Field notes indicate that during interactive activities students asked more questions, joined discussions, and expressed opinions more often than during lecture segments (O). On average, [x] student questions or contributions were recorded per meeting in discussion segments, compared with [y] in lecture segments. These observations should be read as descriptive indications of engagement rather than as measured learning gains.

Teacher Strategies and Student Engagement

Only one IRE teacher (T1) taught the observed classes, so the findings on strategies refer to this teacher's practice. T1 applied specific strategies to keep the classroom less stressful and paid attention to students' emotional condition throughout the lesson (O; I-T1).

The strategies observed and their links to BBL principles are summarized in Table 2. They included group discussions, question and answer sessions, case studies, ice breaking activities, and reflection on everyday experiences, and the teacher connected IRE materials with situations familiar to students (O; D). Implementation fidelity was checked by comparing the activities planned in the teaching modules with those recorded in the observation sheets.

Table 2. Teacher strategies, BBL principles, and observed student responses

Strategy	BBL principle	Observed student response	Source
Group discussion	Active participation and social interaction	Students exchanged opinions and asked peers and the teacher questions	O, I-S
Question and answer session	Emotionally safe climate and active participation	Students asked questions without fear of being blamed	O, I-S
Case study on daily issues	Meaningful and contextual learning	Students related the materials to experiences at school and at home	O, D
Ice breaking	Emotionally safe climate	Classroom tension decreased and attention increased before core activities	O
Reflection on everyday experiences	Reflection and self evaluation	Students wrote and shared reflections on their attitudes and habits	D, I-S

Source: Data Processed

From the perspective of educational neuroscience, emotional and social engagement supports attention and the consolidation of learning (Immordino-Yang et al., 2019). The engagement recorded in this study is in line with this account, but the study did not measure neural or cognitive processes, so the link is interpretive.

Student informants described themselves as more confident in asking questions and expressing opinions when the teacher used a communicative approach (I-S). [x] of [n] student informants stated that they had tended to be quiet in previous IRE lessons and felt more willing to speak in the BBL classes. Because the study did not use a pretest or a longitudinal design, this finding reflects students' retrospective perceptions rather than measured change.

T1 avoided authoritarian practices, invited students' opinions, and responded respectfully to answers during discussions (O). These practices resemble what is called psychological safety, a shared belief that it is safe to speak up and take interpersonal risks (Edmondson & Bransby, 2023). Psychological safety was not measured with a validated instrument in this study, so it is used here only as an interpretive lens. In terms of well-being, such a climate relates most closely to the dimension of positive relations with others (Ryff, 2018).

T1 also built positive interactions through warm communication, light humor, and motivation (O). In the interviews, student informants explained that they felt comfortable participating because the teacher did not only explain the material but also interacted with them in an enjoyable way (I-S).

These findings suggest that a supportive emotional environment is an important supporting factor for students' motivation and enthusiasm in IRE. This interpretation is consistent with a meta-analysis showing that emotional support in the classroom is associated with motivation and engagement (Wang et al., 2020). However, alternative explanations should be considered, such as the teacher's personal characteristics and the novelty of interactive activities, which may also have increased students' interest.

Contribution of Learning Activities to Students' Religiosity

Religiosity in this study was explored through three dimensions: ideological (understanding and belief), ritual (worship practices), and consequential (the application of values in social behavior) (Nur et al., 2025). Interviews and written reflections indicate that BBL activities touched mainly the consequential and ritual dimensions, while the ideological dimension was addressed through the lesson content (I-S; D).

Observation notes show that the teacher related the materials to everyday behaviors such as honesty, responsibility, religious discipline, respect for parents, and tolerance, which belong to the consequential dimension (O). For example, when discussing moral values, students were asked to reflect on their experiences of maintaining honesty at school and in their social environment (O; D). Several written reflections described concrete situations, for example completing assignments without copying from friends.

Connecting the materials with students' experiences reflects meaningful learning, in which new information is anchored to prior knowledge (Agra et al., 2019). In this study, this process appeared to help students treat religious teachings as guidance for behavior rather than as abstract concepts (I-S; D). This is consistent with (Nur et al., 2025), who found that the consequential dimension was the weakest dimension of adolescents' religiosity and argued that applying values is the main challenge of religious education.

Some student informants ([x] of [n]) reported that they had become more used to joining ṣalāt al-ḍuḥā, reading the Qur'an, and maintaining appropriate behavior at school (I-S). However, these practices are also part of the school's religious program, so they cannot be attributed to BBL alone. The data indicate an association between BBL activities and students' reported practices, not a causal effect.

The internalization of values must be distinguished from observable religious practice. Practice can be driven by school rules and supervision, whereas internalization implies that students accept the values as their own (Nurholis, 2025). Studies of religious character in Indonesian senior high schools show that internalization requires a combination of knowledge, religious activities, a religious school culture, integration across subjects, and continuous supervision (Nursalim et al., 2023). The present findings suggest that BBL contributes mainly through the reflective and contextual components of this process.

T1 used reflective activities after the lessons to help students understand the spiritual meaning of the materials, through discussions, written reflections, and personal opinions (O; D). The written reflections were not standardized, but all students in the observed classes received the

same reflection prompts. A review of [n] written reflections showed three recurring themes: awareness of one's own habits, the intention to improve worship, and the relevance of the lesson to relations with family and friends.

These reflections relate to self-awareness, because students evaluated their own behavior in light of religious teachings (D). Self-awareness is not identical with religiosity, but it can be viewed as a bridge between the ideological and consequential dimensions. Because self-awareness was not measured separately in this study, this interpretation remains tentative.

The data also show that students' religiosity was supported by factors outside BBL, particularly the school environment, teacher role modeling, and routine religious activities such as collective prayers, Qur'an recitation before lessons, and congregational prayers (O; D). This finding is consistent with (Nursalim et al., 2023), who found that religious culture and organized religious activities are central to internalizing religious character in senior high schools. These factors are possible confounding influences, so the contribution of BBL cannot be isolated from the school culture in this case.

T1 also acted as a role model. In the interviews, student informants stated that they responded more positively to religious guidance when the teacher showed friendliness, patience, and discipline (I-S). Role modeling is not a BBL technique as such, but it supports the BBL principle of an emotionally safe and socially rich learning environment (Immordino-Yang et al., 2019).

Overall, students' religiosity in this case appears to be shaped by the interaction of cognitive understanding, emotional experiences, and religious practices, with BBL providing opportunities for contextual learning and reflection. This finding extends the work of (Wahyudi & Widodo, 2020), who reported a positive influence of BBL on students' daily lives, by specifying which dimensions are involved. In relation to the second research question, BBL practices were associated mainly with the consequential and ritual dimensions of religiosity, in combination with the school's religious culture.

Implications for Students' Psychological Well-Being

Psychological well-being was explored through students' accounts of their classroom experiences, which were mapped onto Ryff's dimensions (Ryff, 2018). The data relate most clearly to positive relations with others, autonomy (the confidence to express one's own opinion), and environmental mastery (the ability to cope with classroom demands). The other dimensions, namely self-acceptance, purpose in life, and personal growth, appeared only occasionally in students' reflections (I-S; D).

T1 reduced classroom tension through relaxed communication, opportunities to express opinions, and constructive responses to mistakes (O). Student informants explained that they felt more comfortable asking questions when they were not judged by the teacher (I-S).

A sense of safety and acceptance is important for students' learning readiness. The meta-analysis by (Wang et al., 2020) showed that emotionally supportive classroom climates are

associated with lower emotional distress. Because anxiety was not measured in this study, this association is used only to interpret students' statements about feeling calmer.

The greater willingness of previously quiet students to speak, reported in the previous subsection, also has a well-being dimension. T1 explained that giving students opportunities to express ideas without fear of being blamed helped them develop confidence (I-T1).

Confidence and self-efficacy are distinct from psychological well-being, but the confidence to express one's views relates to Ryff's autonomy dimension, and appreciation from the teacher supports positive relations with others (Ryff, 2018). This interpretation is consistent with evidence that secondary students who perceive more differentiated and supportive instruction report higher school well-being and academic self-concept (Pozas et al., 2021).

Interactive activities, reflection, and the connection between religious materials and everyday experiences made IRE more interesting for students. [x] of [n] student informants stated that they felt more enthusiastic when lessons involved discussions, educational games, and reflection (I-S).

Student informants also reported feeling calmer and less bored when lessons involved interaction and reflection rather than continuous explanation (I-S). These statements are self-reports from a small number of informants and may be influenced by social desirability.

In line with the qualitative design, these findings are indications of students' psychological experiences during IRE lessons, not standardized measurements of their overall psychological well-being. This is consistent with the revised abstract and method, which no longer claim a statistical effect.

In relation to the third research question, BBL practices were associated with classroom experiences that correspond to the positive relations, autonomy, and environmental mastery dimensions of psychological well-being. This contribution is provisional, because it may also reflect the teacher's personal qualities and students' self-report bias. It is consistent with (Raniya et al., 2025), who argued conceptually that IRE grounded in neuroscience can support students' well-being.

Implementation Challenges and Supporting Factors

Observations and the interview with T1 identified challenges related to differences in students' characteristics, abilities, confidence, and emotional readiness (O; I-T1). These challenges relate to the principles of active participation and an emotionally safe climate, which cannot be achieved at the same pace for all students.

Some students adapted easily to discussions and reflection, while others remained passive or lacked confidence (O). T1 explained that certain students needed additional attention to participate and understand the materials (I-T1). The challenges, their possible causes, and the teacher's responses are summarized in Table 3.

Table 3. Implementation challenges, possible causes, and teacher responses

Challenge	Possible cause	Teacher response	Source
Some students remained passive in discussions	Low confidence and fear of making mistakes	Gradual participation through small groups and simple reflection	O, I-T1
Different levels of readiness and understanding	Diverse abilities and prior knowledge	Additional individual attention and varied tasks	I-T1
Uneven emotional readiness	Students' emotional condition before the lesson	Ice breaking and relaxed communication	O, I-T1
Diverse preferences for activities	Different student characteristics and interests	Varied media and activities (pictures, videos, discussions, presentations)	O, D

Source: Data Processed

These differences show the importance of recognizing individual characteristics. Educational neuroscience emphasizes that emotion, social context, and prior experience shape how each learner engages with a task (Immordino-Yang et al., 2019). In this study, learner heterogeneity was documented through observation and the teacher interview rather than tested statistically.

To address these challenges, T1 reported using a personal and persuasive approach. Students were not required to participate in every activity immediately; instead, their confidence was developed through small group discussions, simple reflection, and less stressful activities (I-T1).

T1 also varied the activities and media, for example using pictures and videos in some activities and discussions and group presentations in others (O; D). This practice is better understood as differentiated instruction that responds to students' readiness and interests, not as matching instruction to visual or verbal learning styles, because the learning styles hypothesis is not supported by empirical evidence (Newton & Salvi, 2020). Differentiated instruction, in which the teacher acts as a facilitator who adjusts instruction to students' needs, has been positively associated with secondary students' well-being and academic self-concept (Pozas et al., 2021).

Taken together, the findings support a humanistic view of education that considers students' emotional and psychological development alongside academic achievement. In this case, the humanistic orientation was visible in concrete practices, such as respectful responses to mistakes and reflection prompts, although the design does not allow conclusions about its effects beyond this classroom.

In summary, the answers to the research questions are as follows. BBL was implemented through an emotionally safe climate, interactive and contextual methods, and reflection (first question). It was associated with the consequential and ritual dimensions of religiosity, together with the school's religious culture (second question), and with classroom experiences related to

positive relations, autonomy, and environmental mastery (third question). The main challenge was students' varied readiness, which the teacher addressed through gradual and differentiated strategies (fourth question).

This study has several limitations. It was conducted in a single school with one IRE teacher and a small number of student informants, so the findings cannot be generalized. The data on religiosity and well-being came mainly from self-reports and observation rather than validated scales, there was no comparison class, and the influence of BBL cannot be separated from the school's religious programs and the teacher's personal qualities. Future studies should use validated instruments for religiosity and psychological well-being, involve several schools, and apply quasi-experimental or longitudinal designs to test the relationships suggested here.

CONCLUSION

This study concludes that BBL in IRE at SMA Negeri 1 Purwosari was implemented through an emotionally safe climate, interactive and contextual methods, and guided reflection. These practices were associated with the consequential and ritual dimensions of students' religiosity and with classroom experiences related to the positive relations, autonomy, and environmental mastery dimensions of psychological well-being, although the school's religious culture also contributed. The main contribution of the study is to show how specific BBL practices connect with affective outcomes in IRE rather than only with learning achievement. Practically, IRE teachers are advised to combine emotional support with structured reflection and to connect the materials with issues students face, such as social relationships and social media use, while schools are advised to align religious programs with classroom practice. The study is limited by its single case, small number of informants, and reliance on self-reports. Future research should use validated measures of religiosity and psychological well-being in several schools with quasi-experimental designs.

FUNDING

This research received no external funding. The article processing charge was personally covered by [the authors / the research supervisor, Ahmad Ma'ruf], who had no role in data collection, analysis, or interpretation.

CONFLICT OF INTEREST

The authors declare that this research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

AUTHOR CONTRIBUTIONS

Nela Cahya Anggraini contributed to the research design, data collection, data analysis, and manuscript preparation. Ahmad Ma'ruf contributed to research supervision, conceptual guidance, and critical revision of the manuscript. Both authors reviewed and approved the final version of the manuscript.

GENERATIVE AI STATEMENT

The authors acknowledge the limited use of generative artificial intelligence (AI) in preparing this manuscript, primarily to assist with language refinement, sentence construction, and grammatical clarity. AI was used solely as a supporting tool and did not replace the authors' intellectual contributions or academic judgment. The research design, data collection, data analysis, interpretation of findings, and conclusions were determined by the authors. The authors reviewed and verified the manuscript and take full responsibility for the accuracy, integrity, and final content of this work.

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