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MODELLING OF ISLAMIC SPIRITUALITY (MUROQOBAH) AND PRO-ENVIRONMENTAL BEHAVIOR: A FACTOR ANALYSIS APPROACH.

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ABSTRAK

Kerusakan lingkungan bukan hanya merupakan persoalan ekologis, tetapi juga tantangan moral dan spiritual, sehingga penting untuk mengkaji faktor-faktor psikologis internal yang mendukung perilaku berkelanjutan. Penelitian ini bertujuan untuk memvalidasi muraqabah sebagai konstruk regulasi diri berbasis spiritualitas Islam serta menguji pengaruhnya terhadap perilaku pro-lingkungan (pro-environmental behavior/PEB) pada mahasiswa Muslim. Dengan menggunakan desain kuantitatif, penelitian ini menerapkan analisis daya beda item, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), dan Structural Equation Modeling (SEM). Data dikumpulkan dari dua sampel independen, yaitu 105 partisipan pada tahap eksploratori dan 200 partisipan pada tahap konfirmatori serta struktural. Hasil penelitian mendukung struktur multidimensi Skala Muraqabah dan menunjukkan bahwa muraqabah berpengaruh positif signifikan terhadap PEB ($\beta = 0{,}605$; $p < 0{,}001$). Temuan ini menunjukkan bahwa muraqabah memperkuat tanggung jawab moral, regulasi diri, dan motivasi intrinsik untuk berperilaku ramah lingkungan. Penelitian ini memberikan kontribusi psikometrik melalui validasi muraqabah sebagai konstruk yang dapat diukur, sekaligus kontribusi substantif dengan menunjukkan perannya sebagai prediktor spiritual perilaku pro-lingkungan dalam konteks pendidikan tinggi Islam. Penelitian ini memiliki keterbatasan pada desain potong lintang, penggunaan instrumen laporan diri, dan cakupan sampel yang terbatas pada institusi tertentu; oleh karena itu, penelitian selanjutnya perlu melibatkan populasi yang lebih beragam dan menggunakan desain longitudinal.

Kata kunci: *Muraqabah, Spiritualitas Islam, Perilaku Pro-Lingkungan, Analisis Faktor Konfirmatori, Pemodelan Persamaan Struktural, Mahasiswa*

ABSTRACT

Environmental degradation is not only an ecological issue but also a moral and spiritual challenge, highlighting the need to examine internal psychological factors that support sustainable behavior. This study aimed to validate muraqabah as an Islamic spirituality-based self-regulation construct and to test its effect on pro-environmental behavior (PEB) among Muslim university students. Using a quantitative design, the study employed item

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discrimination analysis, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Structural Equation Modeling (SEM). Data were collected from two independent samples, comprising 105 participants in the exploratory phase and 200 participants in the confirmatory and structural phases. The findings supported the multidimensional structure of the Muraqabah Scale and showed that muraqabah had a significant positive effect on PEB ($\beta = 0.605$, $p < .001$). These results indicate that muraqabah strengthens moral responsibility, self-regulation, and intrinsic motivation for environmentally responsible behavior. This study offers both a psychometric contribution, by validating muraqabah as a measurable construct, and a substantive contribution, by demonstrating its role as a spiritual predictor of PEB in an Islamic higher education context. The study is limited by its cross-sectional design, self-report measures, and restricted institutional sample; future research should therefore involve more diverse populations and longitudinal designs.

Keywords: *Muraqabah, Islamic Spirituality, Pro-Environmental Behavior, Confirmatory Factor Analysis, Structural Equation Modeling, University Students*

INTRODUCTION

Environmental degradation has become a major global challenge that threatens ecological sustainability and human well-being. Efforts to address this problem have largely emphasized technological innovation, environmental policy, and institutional regulation. However, these approaches are often insufficient without a better understanding of the internal psychological factors that encourage individuals to behave responsibly toward the environment. In environmental psychology, pro-environmental behavior (PEB) refers to deliberate actions intended to reduce environmental harm and support ecological sustainability (Steg & Vlek, 2009; Lange & Dewitte, 2019). Because such behavior often requires individuals to forgo personal convenience for long-term collective benefits, identifying its underlying psychological determinants remains an important research agenda. Recent studies further show that pro-environmental behavior is shaped by a combination of motivational, dispositional, and contextual processes, including attitudes, self-control, self-efficacy, values, and behavioral intentions (Yuriev et al., 2020; Wyss et al., 2022; Brick et al., 2024).

One of the most frequently used frameworks for explaining environmentally relevant behavior is the Theory of Planned Behavior (TPB), which states that behavior is predicted by intention, while intention is shaped by attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991; Bosnjak et al., 2020). TPB has been widely applied in studies of PEB because it helps explain cognitive and social determinants that can be targeted through intervention (Yuriev et al., 2020). Nevertheless, this framework pays limited attention to deeper moral and spiritual dimensions that may strengthen ethical commitment, self-control, and behavioral consistency. Consequently, cognitive predictors alone may not fully explain why some individuals consistently engage in environmentally responsible behavior even in the absence of external monitoring or social pressure.

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Recent psychological research emphasizes self-regulation as a core mechanism underlying sustained moral and norm-consistent behavior. Self-regulation involves the capacity to monitor and adjust behavior in accordance with internalized standards and long-term goals. Pro-environmental behavior inherently demands such regulatory capacity, as individuals must often override immediate personal convenience in favor of long-term collective and ethical considerations.

This limitation has encouraged researchers to consider self-regulation as a key mechanism underlying sustained moral and norm-consistent behavior. Self-regulation refers to the capacity to monitor, evaluate, and adjust behavior in accordance with internalized standards and long-term goals (Baumeister et al., 2006). In the context of environmental responsibility, self-regulation is especially relevant because pro-environmental behavior often depends on the willingness to restrain short-term impulses for broader ethical and collective interests. This perspective is consistent with calls to examine internal sources of moral motivation that shape environmentally responsible behavior across cultural settings (Steg & Vlek, 2009).

Within this perspective, spirituality has increasingly been recognized as a potential source of internal motivation and self-regulation. Previous studies suggest that spirituality may strengthen ethical awareness, intrinsic motivation, and value-driven action, thereby supporting consistent behavior beyond situational demands. For example, Wang et al. (2019) show that spirituality, operationalized through spiritual leadership, can enhance intrinsically motivated and ethically oriented behavior. In environmental contexts, spirituality has also been associated with stronger climate concern and greater pro-environmental behavior, while rigid forms of religiosity may weaken ecological engagement (Skalski et al., 2022). These findings indicate that spirituality may function as a measurable psychological resource that guides responsible behavior.

Despite these advances, previous studies have mostly conceptualized spirituality in broad and general terms. As a result, they have not sufficiently explained which specific spiritual mechanisms operate as self-regulatory forces in environmentally relevant behavior. In particular, empirical research has not yet adequately examined muraqabah as a distinct psychological construct, nor has it established its latent dimensions through rigorous psychometric testing. This is an important gap because muraqabah is a central concept in Islamic spirituality that refers to continuous awareness of Allah's presence and supervision, which fosters moral vigilance, ethical self-monitoring, and disciplined conduct (Isgandarova, 2019). Psychologically, muraqabah may be understood as a form of spiritual self-regulation that integrates awareness, submission, and behavioral control through God-centered consciousness. Although it shares some functional similarities with mindfulness, muraqabah differs in its explicit moral and theological orientation because awareness of divine supervision is inseparable from personal accountability before God.

Empirical evidence further supports the relevance of reflective spirituality in environmental contexts. Studies demonstrate that spirituality is positively associated with

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climate concern and pro-environmental behavior, whereas religious fundamentalism tends to undermine ecological engagement through rigid and authoritarian orientations (Skalski et al., 2022). These findings indicate that non-dogmatic spiritual awareness functions as a psychological resource for ethical self-regulation, providing a strong conceptual foundation for examining muraqabah as a spiritually grounded determinant of environmental behavior.

This study is positioned at the intersection of environmental psychology and Islamic psychology. Its novelty lies in three main aspects. First, it treats muraqabah not merely as a theological or spiritual concept, but as a measurable psychological construct. Second, it seeks to validate the factorial structure of the Muraqabah Scale through exploratory and confirmatory analyses. Third, it examines the structural effect of muraqabah on pro-environmental behavior among Muslim university students, a context that remains underrepresented in the literature. These contributions are important because they extend current discussions on spiritual self-regulation beyond generalized spirituality and place them within a culturally grounded Islamic framework.

The context of Muslim university students is particularly relevant in Islamic higher education in Indonesia. Students are expected not only to develop academic competence, but also to cultivate moral responsibility and ethical awareness in responding to contemporary social and environmental challenges. Islamic teachings position human beings as khalifah, or stewards of the earth, entrusted with maintaining balance and preventing destruction (Q.S. Al-Baqarah [2]:30). Within this context, muraqabah may serve as an internal spiritual foundation that translates religious values into concrete pro-environmental attitudes and behaviors.

Based on these considerations, this study aims to validate the construct of muraqabah through factor-analytic procedures and to examine its effect on pro-environmental behavior among Muslim university students. The hypothesis proposed in this study is that muraqabah has a positive and significant effect on pro-environmental behavior. The study is limited to Muslim university students at UIN Walisongo Semarang and uses a cross-sectional survey design with self-report measures. Despite these limitations, the study is expected to contribute theoretically by extending the literature on spiritual self-regulation and pro-environmental behavior, methodologically by providing evidence for the psychometric validity of the Muraqabah Scale, and contextually by offering a culturally grounded model of Islamic psychology in environmental behavior research.

RESEARCH METHODS

This study employed a quantitative cross-sectional design and was conducted in two sequential phases. The first phase focused on the development and psychometric evaluation of the Muraqabah Scale using item discrimination analysis, Exploratory Factor Analysis (EFA), and Confirmatory Factor Analysis (CFA). The second phase tested the structural relationship between muraqabah and pro-environmental behavior (PEB) using Structural Equation Modeling (SEM). This EFA–CFA–SEM sequence was chosen to ensure that the latent construct

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of muraqabah was first explored and validated before being used in the structural model. Conceptually, the study integrates Islamic spiritual psychology and contemporary behavioral science. In Islamic psychology, muraqabah refers to a continuous awareness of Allah's presence and supervision that promotes moral vigilance, self-observation, and disciplined conduct (Al-Jauziyah & Suhardi, 1998; Isgandarova, 2019). In modern psychology, this construct is relevant to self-regulation, moral monitoring, and value-based behavioral control, which are important determinants of pro-environmental behavior (Ajzen, 1991; Bosnjak et al., 2020; Stern, 2000; Ghazali et al., 2019; Al Mamun et al., 2022). Accordingly, muraqabah was operationalized as a multidimensional construct consisting of awareness of Allah's supervision, submission of the self, and self-regulation.

The population of this study comprised fifth-semester undergraduate students at Universitas Islam Negeri (UIN) Walisongo Semarang, Indonesia. Fifth-semester students were selected because they were considered to have sufficient academic adaptation, cognitive maturity, and exposure to religious and social values, enabling them to understand the questionnaire content and reflect those values in everyday behavior. Two independent samples were used in this study. The first sample, consisting of 105 students, was used for item discrimination analysis and EFA, whereas the second sample, consisting of 200 students, was used for CFA and SEM. Participants were selected using proportional random sampling across the relevant academic units to ensure proportional representation of the target population. The demographic characteristics of the participants should be reported in detail in the final manuscript, including gender, age, and study program. Specifically, the manuscript should state the number and percentage of male and female participants, the mean age and standard deviation or age range, and the distribution of participants across study programs or faculties. These details are important to clarify the composition of both the exploratory and confirmatory samples and to strengthen the interpretability of the findings.

The two samples were independent, meaning that respondents in the exploratory phase were not included in the confirmatory and structural phases. This separation was important to reduce overlap between model exploration and model confirmation and to minimize the risk of capitalization on chance. The sample size for the exploratory phase met the minimum requirement for factor analysis, whereas the second sample met the commonly recommended minimum size for latent variable modeling. Thus, the sampling strategy was designed to support both scale validation and structural testing within a single study framework.

Data were collected online using a structured questionnaire distributed through Google Forms. Before completing the questionnaire, participants were informed about the purpose of the study, the voluntary nature of participation, the anonymity of their responses, and their right to withdraw at any time before submission. Only respondents who agreed to the informed consent statement were allowed to continue to the questionnaire. No personally identifying information was collected, and all responses were analyzed anonymously. This study was conducted in accordance with the ethical principles of voluntary participation, informed

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consent, confidentiality, and responsible data management. If available, the final manuscript should state the name of the ethics committee, approval number, and date of approval. If formal ethical clearance was not required, the manuscript should include a clear statement to that effect, together with an explanation that the study involved minimal risk, anonymous responses, and non-invasive procedures.

This study employed two main instruments, namely the Muraqabah Scale and the Pro-Environmental Behavior (PEB) Scale. All items were rated on a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Unfavorable items were reverse-coded before analysis so that higher scores consistently reflected higher levels of the intended construct. This scoring procedure was applied to maintain consistency in interpretation across all items and dimensions included in the study.

The Muraqabah Scale was developed by the authors based on the spiritual framework of Ibn Qayyim al-Jawziyyah, particularly the concept of muraqabah in Madarij al-Salikin. The initial scale consisted of 52 items representing three theoretically derived dimensions, namely (1) awareness of Allah's presence and supervision, (2) submission of the self, and (3) self-regulation. To evaluate content validity, the initial item pool was reviewed by five experts from the fields of environmental psychology, psychotherapy, Sufism, cultural anthropology, and research methodology. Each expert assessed the relevance, clarity, and representativeness of the items using a five-point relevance scale. Content validity was quantified using Aiken's V, with coefficients ranging from 0.64 to 0.96 (M = 0.86), indicating acceptable to high content validity (Aiken, 1985). Several items were revised editorially before empirical testing based on expert feedback.

The Pro-Environmental Behavior (PEB) Scale was adapted from Kaiser et al. (2007). The adapted instrument initially consisted of 40 items representing six aspects of pro-environmental behavior, namely energy conservation, environmentally friendly mobility, waste avoidance, recycling, conscious consumerism, and social behavior toward conservation. Because the instrument was adapted for use in an Indonesian Islamic higher education context, the adaptation procedure should be described explicitly. First, the original English items were translated into Indonesian by a bilingual translator familiar with psychological and educational terminology. Second, the translated version was back-translated into English by an independent bilingual translator to evaluate conceptual equivalence with the original version. Third, the Indonesian version was reviewed by expert judges to assess linguistic clarity, cultural appropriateness, and construct relevance for Muslim university students in Indonesia. Any discrepancies identified during the translation and back-translation stages were discussed and resolved through revision until semantic equivalence was achieved.

In addition to expert review, the adapted PEB items should be reported as having undergone preliminary empirical evaluation before inclusion in the SEM model. This is important because an adapted instrument requires evidence of validity and reliability in the target population, not only reliance on the psychometric quality of the original version. Because

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the PEB instrument was used as a latent construct in SEM, its psychometric properties also needed to be evaluated in the present sample. Item discrimination analysis was first applied to the adapted PEB items using corrected item-total correlation. Internal consistency reliability should be reported using Cronbach's alpha and/or Composite Reliability (CR), whereas construct validity should be supported through CFA by reporting standardized factor loadings, model fit indices, and, where applicable, Average Variance Extracted (AVE). This step is methodologically essential because the use of PEB in the SEM model requires evidence that the adapted scale is valid and reliable in the present study context.

Data analysis was conducted in several stages to evaluate the psychometric quality of the instruments and test the proposed structural model. Before the main analyses, the dataset was screened for response completeness, scoring direction, and coding accuracy, including reverse coding for unfavorable items. All items on the Muraqabah Scale and the adapted PEB Scale were first examined using corrected item-total correlation to assess their discrimination power. An item was considered acceptable when the corrected item-total correlation was at least 0.30 (Nunnally & Bernstein, 1994; Azwar, 2012). Items below this threshold were considered for removal or further evaluation. The corrected item-total correlation was computed using the correlation between each item score and the total score of the remaining items in the same scale. This procedure was used to determine whether each item contributed adequately to the internal consistency of the instrument.

EFA was conducted on the first sample to identify the latent structure of the Muraqabah Scale. The extraction method used was principal axis factoring with Promax rotation because the dimensions of muraqabah were theoretically expected to correlate. Suitability of the data for factor analysis was assessed using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Items with factor loadings of 0.40 or higher were retained, whereas items with low loadings or problematic cross-loadings were considered for removal. CFA was then conducted on the second independent sample to confirm the factor structure identified in the exploratory phase. Items with standardized factor loadings of 0.50 or higher were retained in the measurement model. Model fit was evaluated using the following criteria: chi-square divided by degrees of freedom (χ^2/df) ≤ 3, Comparative Fit Index (CFI) ≥ 0.90, Tucker-Lewis Index (TLI) ≥ 0.90, Root Mean Square Error of Approximation (RMSEA) ≤ 0.08, and Standardized Root Mean Square Residual (SRMR) ≤ 0.08 (Hair et al., 2019; Kline, 2016).EFA was used to uncover the latent structure of both scales. The factor model is expressed as:

$$X = \Lambda F + \epsilon$$

where:
X= vector of observed variables
Λ= factor loading matrix
F= vector of latent factors
ϵ= measurement error

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Confirmatory Factor Analysis (CFA)

CFA was performed on an independent sample to confirm the factor structure identified in EFA. Items with factor loadings ≥ 0.50 and significant t-values were retained. Modification indices were examined to improve model fit, while maintaining theoretical consistency with the muraqabah framework and pro-environmental behavior construct. CFA was performed to confirm the factor structure revealed by EFA. The measurement model is represented as:

$$y = \Lambda\eta + \epsilon$$

where:

y= observed indicators
η= latent constructs
Λ= factor loadings
ϵ= measurement errors

Criteria for good CFA model based on (Hair et al., 2019; Kline 2016), show below:

Standardized factor loadings ≥ 0.50
Construct reliability (CR) ≥ 0.70
Average variance extracted (AVE) ≥ 0.50

Model fit was evaluated using multiple indices, including $\chi^2/df \leq 3$, Comparative Fit Index (CFI) ≥ 0.90, Tucker-Lewis Index (TLI) ≥ 0.90, Root Mean Square Error of Approximation (RMSEA) ≤ 0.08, and Standardized Root Mean Square Residual (SRMR) ≤ 0.08.

Finally, SEM was employed to examine the structural relationships between muraqabah as a spiritual determinant and pro-environmental behavior. The SEM analysis allows for the estimation of direct and indirect effects, accounting for measurement error and latent variable relationships simultaneously. This integrative approach enables a comprehensive understanding of how spiritual awareness influences ecological behavior, providing empirical evidence for the conceptual model proposed in this study. SEM was employed to examine the structural relationships between muraqabah and pro-environmental behavior. The SEM structural model is expressed as:

$$\eta = B\eta + \Gamma\xi + \zeta$$

where:

η= endogenous latent variables
ξ= exogenous latent variables
B= regression coefficients among endogenous variables
Γ= regression coefficients from exogenous to endogenous variables
ζ= residuals

Criteria for good SEM model:

All path coefficients statistically significant ($p < 0.05$)
Standardized regression weights between 0.50–0.95 (Hair et al., 2019)

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By combining discrimination analysis, EFA, CFA, and SEM, this study ensures that both scales are psychometrically robust, culturally relevant, and theoretically consistent, providing a strong foundation for advancing contextual Islamic psychology in environmental behavior research.

RESULTS AND DISCUSSION

Results

The results are presented in a sequential manner, beginning with item discrimination analysis, followed by exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and finally structural equation modeling (SEM). This sequence was intended to ensure that the construct of Muraqabah was empirically examined and validated before being included in the structural model predicting pro-environmental behavior (PEB). To improve clarity, the findings are reported concisely and are separated from broader theoretical interpretation, which is addressed in the Discussion section. In addition, the terminology is used consistently throughout this section, with the construct referred to as Muraqabah in all tables and narrative descriptions.

Item Discrimination Analysis

Item discrimination analysis was conducted using the Reliability Analysis feature in the Jamovi software for the Muraqabah variable. The results at Table 1, showed that 39 items demonstrated corrected item–total correlations (item–rest correlations) of $r \geq 0.30$. These retained items were then subjected to factor analysis in the next stage, whereas items below the threshold were excluded from further analysis. The retained and removed items are summarized in Table 1, which should be presented in a cleaner format by simplifying repeated labels and aligning the item numbers and correlation coefficients more clearly. The table caption should also state explicitly that items marked with an asterisk were removed because they did not meet the minimum discrimination criterion.

Table 1. Item Discrimination Results for the Muraqabah Scale

M1	Item-correlation	M2	Item-correlation	M3	Item-Correlation
I1	0.312	I25	0.571	I2	0.238*
I3	0.140*	I26	0.560	I7	0.510
I4	0.391	I27	0.508	I10	0.107*
I5	0.293*	I28	0.485	I11	0.437
I6	0.368	I29	0.511	I12	0.553

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I8	0.444	I30	0.539	I13	0.345
I9	0.348	I31	0.278*	I37	0.501
I14	0.561	I32	0.579	I38	0.436
I15	0.311	I33	0.393	I39	0.584
I16	0.358	I34	0.251*	I40	0.434
I17	0.348	I35	0.461	I41	0.602
I18	0.555	I36	0.525	I42	0.348
I19	0.303	I43	0.266*	I45	0.156*
I20	0.498	I44	0.437	I46	0.513
I21	0.278*	I47	0.098*	I48	0.240*
I22	0.555	I49	0.505		
I23	0.156*	I50	0.548		
I24	0.506	I51	0.146*		
		I52	0.546		
VALID	14item	VALID	14item	VALID	11item

* Items marked with an asterisk (*) indicate those that were selected for removal (r < 0.30).

Based on Table 1, the item discrimination analysis of the Muraqabah Scale showed that the quality of the items varied across the three dimensions tested, namely M1, M2, and M3, with corrected item-total correlation used as the basis for determining item validity. In this study, an item was considered valid if it had a correlation value of at least 0.30, whereas items with values below this threshold were marked with an asterisk (*) and considered for removal. In dimension M1, 14 items met the validity criterion, namely I1, I4, I6, I8, I9, I14, I15, I16, I17, I18, I19, I20, I22, and I24, while I3, I5, I21, and I23 did not meet the criterion. In dimension M2, 14 items were also found to be valid, namely I25, I26, I27, I28, I29, I30, I32, I33, I35, I36, I44, I49, I50, and I52, whereas I31, I34, I43, I47, and I51 were excluded because their correlation values were below 0.30. In dimension M3, 11 items were valid, namely I7, I11, I12, I13, I37, I38, I39, I40, I41, I42, and I46, while I2, I10, I45, and I48 did not meet the minimum criterion. Overall, these results indicate that out of all the initial items tested, 39 items demonstrated adequate discrimination power and were therefore suitable for use in the

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subsequent stages of analysis, suggesting that most items in the Muraqabah Scale were sufficiently capable of distinguishing respondents with high and low levels of the construct.

The adapted Pro-Environmental Behavior (PEB) Scale was also evaluated before being used in the structural model. Because PEB was specified as a latent construct in SEM, its measurement quality needed to be established in the target sample. However, the current manuscript does not yet report the PEB validation results with the same level of detail provided for the Muraqabah Scale. The revised manuscript should therefore report the number of PEB items retained after item screening, the reliability coefficient, the CFA factor loadings, and the fit indices of the adapted PEB model. Without this information, the structural relationship between Muraqabah and PEB should be interpreted as preliminary rather than fully established, because the adequacy of the endogenous measurement model has not yet been documented comprehensively.

Instrumen Construct Validity of the Muraqabah Scale

The construct validity of the Muraqabah scale was examined through Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The results of the EFA show at Table 2, revealed a three-factor structure consistent with the theoretical framework of muraqabah. A total of 33 items were retained after the analysis, distributed across three dimensions: 15 items for the first factor, 10 items for the second factor, and 8 items for the third factor. This structure aligns with the conceptual foundation proposed by classical Islamic scholars, confirming that the empirical model adequately represents the multidimensional nature of muraqabah as a construct of spiritual awareness and self-regulation.

Although the EFA results supported a three-factor structure, the final measurement model used in CFA contained fewer items than the exploratory solution. This reduction occurred because some items that were retained in EFA did not meet the stronger criteria required in the confirmatory stage or were removed during model refinement to improve construct clarity and model fit. Therefore, the manuscript should explicitly distinguish the number of items retained after item discrimination analysis, after EFA, and after the final CFA model. A clear explanation of this sequence is essential to avoid confusion and to demonstrate transparency in the scale development process. The tables should also be simplified so that readers can immediately see the progression from the initial item pool to the final retained indicators.

Table 2. Factors Extracted (EFA) on Muroqobah Factor Loadings

	Factor			
	1	2	3	Uniqueness
I1	0.577			0.637

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I11	0.448		0.369	0.599
I12			0.772	0.184
I13	0.432		0.471	0.55
I14			0.67	0.321
I16			0.481	0.735
I17	0.55			0.624
I18		0.705		0.445
I19	0.585			0.651
I20		0.638		0.504
I22		0.712		0.525
I24		0.646		0.598
I25	0.779			0.377
I26	0.513			0.516
I27	0.744			0.494
I28		0.343	0.534	0.268
I29	0.654			0.575
I30	0.518			0.577
I32		0.488		0.442
I35	0.555			0.612
I36	0.348		0.507	0.38
I37	0.501			0.534
I39		0.503		0.522
I40	0.535			0.699
I41			0.512	0.435
I42	0.329	0.373		0.741
I44		0.575		0.582
I46		0.432		0.721
I49	0.513	0.375	-0.506	0.55
I52		0.679		0.458
I6		0.45		0.747

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I8	0.64	0.464

The factor loading pattern from EFA is presented in Table 2. Overall, the retained items showed meaningful loadings on their respective factors, although several items appeared to have cross-loadings or weaker loadings than others. In the revised manuscript, the dominant loading for each item should be emphasized and items with problematic cross-loadings should be justified or removed. In addition, any negatively signed loading should be explained carefully, especially if it reflects reverse-coded wording rather than substantive inconsistency. The table should also be visually simplified by labeling the factors directly as M1, M2, and M3 rather than only as Factors 1, 2, and 3. Such clarification is important to strengthen the interpretability of the factor solution.

Subsequent to the EFA results, a Confirmatory Factor Analysis (CFA) was conducted to validate the three-factor structure of the Muraqabah scale. The model demonstrated acceptable goodness-of-fit indices (show on Table 3), indicating a reasonably good model fit after several theoretically justified modification indices were applied.

Table 3. Model Fit Criteria of Muroqobah

Fit Measures					
				RMSEA 90% CI	
CFI	TLI	SRMR	RMSEA	Lower	Upper
0.866	0.852	0.074	0.0782	0.0659	0.09

Following the exploratory stage, CFA was conducted using the second independent sample to test the adequacy of the three-factor model. The CFA results indicated that the model demonstrated moderate rather than strong fit. As shown in Table 3, the model achieved CFI = 0.866, TLI = 0.852, SRMR = 0.074, and RMSEA = 0.078 with a 90% confidence interval of 0.066 to 0.090. These values suggest that the model met some absolute fit criteria, particularly SRMR and RMSEA, but the incremental fit indices were still below the commonly recommended threshold of 0.90. Therefore, the model should be interpreted cautiously as showing marginally acceptable fit and not as evidence of a strongly fitting measurement model. Accordingly, claims that the model showed good or strong fit should be avoided in the manuscript.

All standardized factor loadings exceeded 0.50, supporting good convergent validity (see Table 4). The Composite Reliability (CR) values for all factors were above 0.70, satisfying the reliability criterion. Although the Average Variance Extracted (AVE) values for two factors were slightly below 0.50 (see Table 5), were still considered acceptable due to sufficiently high CR values, as suggested by(Fornell & Larcker, 1981). The discriminant validity test, assessed

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using the Fornell–Larcker criterion, confirmed that each factor was adequately distinct, particularly for the third factor, where the square root of AVE (√AVE) exceeded the inter-construct correlations. Thus, the measurement model of the Muraqabah scale was deemed valid and reliable, and therefore suitable for subsequent structural equation modeling (SEM) analyses together with the Pro-Environmental Behavior (PEB) construct. The full representation of the CFA model is presented in Figure 1.

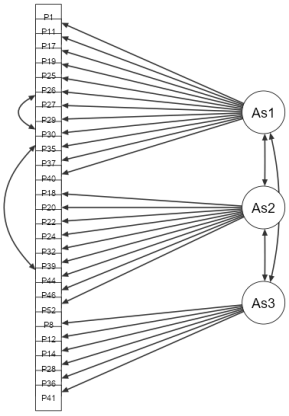

Figure 1. Path Diagram of Muroqobah

Table 4. Factor Structure of Muroqobah Confirmed Through CFA

Factor	Indicator	Estimate	SE	Stand. Estimate
M1	I1	0.285	0.0439	0.603
	I11	0.341	0.0523	0.607
	I17	0.225	0.0342	0.611
	I19	0.243	0.0411	0.564
	I25	0.354	0.0407	0.756
	I26	0.508	0.0711	0.654
	I27	0.336	0.0471	0.653
	I29	0.451	0.0657	0.632
	I30	0.489	0.0708	0.627
	I35	0.508	0.0808	0.589
	I37	0.459	0.059	0.695

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	I40	0.399	0.0684	0.553
M2	I18	0.678	0.08	0.738
	I20	0.587	0.0675	0.753
	I22	0.581	0.089	0.605
	I24	0.483	0.0894	0.517
	I32	0.643	0.0744	0.749
	I39	0.571	0.0756	0.678
	I44	0.579	0.0837	0.62
	I46	0.503	0.0863	0.551
	I52	0.587	0.07	0.732
M3	I8	0.646	0.0798	0.705
	I12	0.599	0.0552	0.861
	I14	0.462	0.0465	0.815
	I28	0.752	0.069	0.863
	I36	0.449	0.0484	0.778
	I41	0.429	0.0481	0.756

The standardized factor loadings from CFA are presented in Table 4. In general, the retained indicators showed acceptable to strong loadings on their respective latent dimensions, providing support for convergent validity at the indicator level. However, the final CFA solution included fewer items than the exploratory solution, indicating that the measurement model was refined during the confirmatory stage. Based on the final model shown in Table 4, the CFA solution retained 12 items for M1, 9 items for M2, and 6 items for M3. This final 27-item structure should be stated explicitly in the manuscript to ensure consistency across the Results section. The table itself should be streamlined so that only the most essential columns are retained in the main text, while additional technical details may be moved to supplementary material if needed.

Table 5. Reliability of Muroqobah

Aspect	CR	AVE
M1	0.89	0.40
M2	0.86	0.44
M3	0.91	0.64

The reliability of the final Muraqabah Scale is summarized in Table 5. The Composite Reliability (CR) values for all three dimensions exceeded 0.70, indicating satisfactory internal

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consistency at the construct level. However, the AVE value for M3 exceeded the recommended threshold of 0.50, whereas the AVE values for M1 and M2 remained below that criterion. This means that convergent validity was stronger for M3 than for the other two dimensions. Although high CR values may still support acceptable construct reliability (Fornell & Larcker, 1981), the convergent validity of M1 and M2 should be interpreted with caution because the shared variance captured by the indicators was not yet fully optimal. Accordingly, the manuscript should avoid overstating convergent validity and should acknowledge that further refinement of item quality and dimensional homogeneity is still needed in future studies.

Table 6. Blueprint of Muroqobah

Aspect	No.	Item
M1	I1	I try to pray on time as a form of remembrance of Allah
	I11	I try to be honest in various situations
	I17	I worship out of awareness of Allah, not for praise from others
	I19	I pray both when I have problems and when I don't
	I25	I try to remember Allah for peace of mind
	I26	I remember Allah more often when I am sad
	I27	I help others without needing anyone to witness
	I29	I feel closeness to Allah when I am truly present in worship
	I30	Sometimes I feel far from Allah even though I am worshipping
	I35	I restrain myself when I have the urge to speak badly of others
	I37	I try to avoid content that incites hatred on social media
	I40	I often procrastinate without a clear reason
M2	I18	I feel more enthusiastic about worship when others are present
	I20	Sometimes I doubt whether my prayers are really heard
	I22	I feel easily discouraged when my prayers are not answered
	I24	I only feel close to Allah when I am in a place of worship
	I32	Sometimes I forget to pray when life feels easy
	I39	I try to be wiser in using my time
	I44	Sometimes my heart is not present when listening to the Qur'an
	I46	Sometimes I forget to watch my words and end up hurting others
	I52	Sometimes I blame circumstances when facing difficulties
M3	I8	I easily judge others harshly without clear reasons

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I12	Sometimes I lie about small things
I14	Sometimes I speak without a clear purpose
I28	Sometimes I am more motivated to help when many people are watching
I36	Sometimes I get carried away listening to gossip about others
I41	I learn to restrain myself when I have the urge to talk about others

The Muraqabah scale items are grouped into three distinct aspects, as summarized in Table 6. Aspect 1/ M1 (awareness of Allah's presence and supervision) encompasses items include efforts to perform prayers on time, practicing honesty, worship driven by sincere awareness of Allah rather than social praise, and feelings of closeness or distance to Allah during worship. Aspect 2/M2 (submission of the self) consists of 10 items related to the themes of submission, spiritual doubts, and mindfulness in daily life. This aspect captures experiences such as feeling more enthusiastic when worshipping in the presence of others, doubts about whether prayers are heard, moments of forgetfulness in spiritual practices, and struggles in maintaining consistent mindfulness. Aspect 3/ M3 (self-regulation) contains 8 items focused on self-control and restraint, particularly in social interactions. Items in this aspect describe tendencies to judge others harshly, resist engaging in gossip, control speech, and avoid behaviour motivated by external validation

Structural Equation Modeling (SEM)

After the measurement model was considered sufficiently interpretable for further analysis, SEM was performed to examine the structural relationship between Muraqabah and pro-environmental behavior. The overall structural model demonstrated acceptable fit to the empirical data. The chi-square value was $\chi^2 = 1087$ with df = 772 and $p < 0.001$. Because the chi-square statistic is sensitive to sample size, model evaluation was based primarily on additional fit indices rather than on the chi-square test alone. This explanation should be stated briefly and only once in the manuscript to avoid unnecessary repetition.

The structural model showed CFI = 0.90, TLI = 0.90, RMSEA = 0.045 with a 95% confidence interval of 0.039 to 0.051, and SRMR = 0.066. These values indicate that the structural model had acceptable fit, supporting the plausibility of the hypothesized relationship between the latent constructs. This information can be reported more concisely in a single paragraph, followed directly by the structural coefficient results. Such a presentation will make the SEM findings clearer and more efficient for readers.

Based on Table 7, the path coefficient from SEM demonstrates a positive and significant effect of Muraqabah on PEB, with a standardized coefficient $\beta = 0.605$.

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Table 7. Coefficient of SEM Parameters estimates

				95% Confidence Intervals				
Dep	Pred	Estimate	SE	Lower	Upper	β	z	p
PEB	Muroqobah	0.671	0.0264	0.619	0.722	0.605	25.4	<.001

As presented in Table 7, the standardized path coefficient from Muraqabah to PEB was $\beta = 0.605$, with $z = 25.4$ and $p < 0.001$. This result indicates a positive and statistically significant structural relationship between Muraqabah and pro-environmental behavior. In substantive terms, students with stronger spiritual awareness and self-regulation tended to report higher levels of environmentally responsible behavior. Because the study used a cross-sectional design, this finding should not be described as a causal effect but rather as a predictive association or structural relationship. Accordingly, terms such as causal effect or causal influence should be avoided throughout the manuscript.

The final manuscript would be strengthened further by reporting the proportion of variance explained in PEB (R^2). This information is important because it indicates how much of the variability in pro-environmental behavior can be accounted for by Muraqabah in the structural model. If available, the value should be reported directly after the path coefficient results. This would provide a more complete interpretation of the substantive contribution of the predictor and would strengthen the presentation of the SEM findings.

For a second-order measurement model, the SEM equation can be expressed as:

$$\text{PEB} = \beta \cdot \text{Muroqobah} + \zeta$$

Where:

PEB = Pro-Environmental Behaviour (latent variable)

Muroqobah = latent variable (second-order factor)

$\beta = 0.605$ = standardized path coefficient

ζ = residual term capturing unexplained variance

Expanded version including first-order factors (measurement model):

$$\text{PEB} = 0.605 \cdot \text{Muroqobah} + \zeta$$
$$\text{Muroqobah} = \lambda_1 \cdot M1 + \lambda_2 \cdot M2 + \lambda_3 \cdot M3 + \delta$$
$$\text{PEB} = \lambda_4 \cdot P1 + \lambda_5 \cdot P2 + \lambda_6 \cdot P3 + \delta$$

$M1, M2, M3$= first-order dimensions of Muroqobah

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$P1, P2, P3$= first-order dimensions of PEB

λ= standardized factor loadings

δ= measurement error terms

These findings provide strong empirical support that integrating Islamic spiritual dimensions into the pro-environmental behaviour model is both theoretically meaningful and empirically valid within the context of UIN Walisongo Semarang students. Therefore, spirituality based on muraqabah can serve as a psychological foundation that strengthens internal motivation for environmentally friendly behaviour, potentially enriching educational interventions and sustainable character development programs.

Furthermore, the excellent model fit opens opportunities for developing more comprehensive models, for example by incorporating psychological mediators or socio-cultural contextual variables as factors that enhance or moderate the relationship between spirituality and ecological behaviour in future studies.

Discussion

The findings of this study indicate that Muraqabah is a multidimensional construct and is positively associated with pro-environmental behavior among Muslim university students. The factor-analytic results supported three interrelated dimensions, namely awareness of Allah's presence and supervision, submission of the self, and self-regulation. This structure is important because it demonstrates that Muraqabah is not merely a theological abstraction, but a measurable psychological construct with distinct but related components. In this sense, the study contributes not only to Islamic psychology but also to environmental psychology by introducing a spiritually grounded form of self-regulation into the explanation of sustainable behavior.

The first important contribution of this study lies in the validation of the Muraqabah Scale. The emergence of three dimensions suggests that spiritual awareness operates through several interconnected psychological processes rather than through a single undifferentiated orientation. Awareness of Allah's supervision reflects moral consciousness and attentional presence, submission of the self reflects inner surrender and humility, and self-regulation reflects the practical control of impulses and behavior in daily life. Together, these dimensions support the view that Muraqabah functions as an internal system of ethical monitoring and behavioral guidance. This interpretation is consistent with Islamic spiritual thought, in which self-awareness before God is inseparable from discipline, sincerity, and moral restraint (Al-Jauziyah & Suhardi, 1998; Isgandarova, 2019).

At the same time, the psychometric evidence should be interpreted carefully. Following the construct validation process using Confirmatory Factor Analysis (CFA), the measurement models of Muraqabah and PEB were expected to demonstrate adequate psychometric quality through fit indices such as CFI, TLI, RMSEA, and SRMR, which are commonly used to

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evaluate validity and reliability at the construct level (Brown, 2015; Kline, 2016). In the present study, the CFA findings supported the general three-factor structure of Muraqabah, although the incremental fit indices remained below the conventional 0.90 criterion. In addition, the AVE values for two dimensions remained below 0.50, indicating that convergent validity was not fully strong across all dimensions. These findings do not invalidate the scale, but they do suggest that the measurement model is still in a developing stage and would benefit from additional refinement in future studies. Therefore, the contribution of the scale should be framed as promising psychometric evidence rather than as definitive validation.

The second major finding is the significant positive structural relationship between Muraqabah and pro-environmental behavior. After the establishment of sufficiently interpretable measurement models, Structural Equation Modeling (SEM) was used to examine the relationship between Muraqabah as a spiritual construct and PEB as a behavioral outcome. SEM is particularly relevant in this context because it allows simultaneous modeling of latent variables and provides a rigorous framework for testing integrated theoretical relationships among unobservable constructs (Hair et al., 2019). More broadly, SEM has long been recognized as a useful approach for examining complex psychological mechanisms and strengthening model-based inference after exploratory and confirmatory stages (MacCallum & Austin, 2000;Lomax, 2015).The standardized coefficient indicates that students with stronger Muraqabah tended to show stronger environmentally responsible behavior. This finding is consistent with self-regulation theory, which emphasizes that morally relevant behavior is more likely to be sustained when individuals are able to monitor and align their actions with internalized standards (Bandura, 1991; Baumeister et al., 2006). It is also compatible with established behavioral perspectives such as the Theory of Planned Behavior and the Value-Belief-Norm framework, both of which emphasize the importance of internalized evaluations, norms, and regulatory processes in shaping environmentally relevant action (Ajzen, 1991;Stern, 2000). In the context of environmental responsibility, such self-regulation is especially important because pro-environmental behavior often requires individuals to restrain convenience, delay gratification, and act for collective rather than immediate personal benefit. The present findings therefore suggest that Muraqabah may serve as a spiritual source of behavioral consistency in everyday ecological conduct.

The present study also contributes to the broader literature on environmental behavior by addressing the well-known attitude-behavior gap. Previous studies have shown that environmental concern or positive attitudes do not always translate into actual pro-environmental action (Janmaimool & Khajohnmanee, 2019). The current findings suggest that spiritually grounded self-regulation may help explain why some individuals are more consistent in enacting ecological values. In other words, Muraqabah may provide an internal moral mechanism that strengthens the translation of values and intentions into concrete behavior. This interpretation is compatible with research showing that intrinsically meaningful motives and internal moral commitment are central to sustained environmentally responsible action

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(McDonald et al., 2015; Thøgersen & Ölander, 2003). muraqabah enhances moral accountability and ethical presence, positioning environmental behavior as a spiritually meaningful practice. This interpretation aligns with(Alfiah et al., 2024), who emphasizes tasawuf as a reflective process of self-development that shapes ethical conduct in everyday life.

From a theoretical perspective, the findings can also be linked to established environmental behavior models such as the Theory of Planned Behavior (TPB) and the Value-Belief-Norm (VBN) framework. Although TPB explains behavior through attitudes, subjective norms, perceived behavioral control, and intention, it pays less attention to deeper spiritual and moral sources of self-regulation (Ajzen, 1991). Likewise, the VBN model emphasizes personal norms and moral obligation, but it does not explicitly identify spiritually grounded awareness as a psychological source of those norms (Stern, 2000). The present findings suggest that Muraqabah may complement these frameworks by functioning as an internalized spiritual basis for moral commitment, self-monitoring, and norm-consistent action. In addition, the acceptable fit of the structural model, reflected in CFI and TLI values at 0.90 and RMSEA and SRMR values within recommended thresholds, is broadly consistent with commonly used SEM evaluation standards (Hu & Bentler, 1999; Brown, 2015). Thus, this study extends existing behavioral theory by showing that spiritual self-awareness may enrich the explanation of pro-environmental behavior in religious and culturally specific settings. However, this theoretical contribution should still be interpreted with caution because the evidence is based on a single cross-sectional sample and the validation of the PEB construct has not yet been reported comprehensively.

The findings also have practical implications for Islamic higher education. If Muraqabah contributes to environmentally responsible behavior, then environmental education in Islamic universities should not rely only on knowledge transmission or behavioral regulation through external rules. It may also be beneficial to integrate reflective spiritual practices that encourage students to connect ecological responsibility with worship, moral accountability, and the Islamic concept of humans as khalifah. Programs such as reflective journaling, spiritually framed environmental campaigns, or classroom discussions linking faith and sustainability could help strengthen the internal motivation underlying pro-environmental action. In this way, environmental responsibility may be cultivated not only as a civic duty but also as part of spiritual character development.

Despite these contributions, several limitations should be acknowledged. First, the study used a cross-sectional design, which limits the ability to make strong causal claims from the structural relationship observed. Second, all data were collected through self-report instruments, which may increase the risk of social desirability bias and common method bias. Third, the sample was drawn from a single Islamic university, which limits the generalizability of the findings to other institutional, regional, or cultural contexts. In addition, the psychometric

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reporting of the adapted PEB scale still needs to be strengthened, because the credibility of the structural model depends on the quality of both measurement models.

Future research should build on these findings in several ways. Longitudinal studies are needed to examine whether Muraqabah predicts changes in pro-environmental behavior over time. Studies involving multiple universities and more diverse Muslim populations would also help test the broader applicability of the model. Future models may also examine mediating or moderating variables such as personal norms, environmental identity, self-control, or institutional climate. In addition, measurement invariance testing across gender, faculty, or educational background would provide stronger evidence for the robustness of the Muraqabah Scale. Overall, the present study provides an important foundation for further research on spiritually grounded determinants of sustainable behavior in Islamic educational settings.

CONCLUSION

This study provides initial psychometric and structural evidence that Muraqabah is a multidimensional construct that is positively associated with pro-environmental behavior among Muslim university students. The findings support a three-dimensional representation of Muraqabah consisting of awareness of Allah's presence and supervision, submission of the self, and self-regulation. These results suggest that Muraqabah may function as a spiritually grounded form of self-regulation that is relevant to environmentally responsible behavior. At the same time, the findings should be interpreted with caution because the study was based on a cross-sectional design, involved students from a single institutional context, and has not yet reported the psychometric properties of the adapted PEB scale as comprehensively as the Muraqabah scale.

The structural analysis further indicated a positive and significant relationship between Muraqabah and pro-environmental behavior, suggesting that students with stronger spiritual awareness and self-regulation tended to report more environmentally responsible behavior. However, this relationship should be understood as a structural association or predictive relationship rather than as definitive causal evidence. Accordingly, the present study offers promising rather than conclusive support for the relevance of Islamic spiritual self-regulation in environmental behavior research. A specific contribution of this study is the introduction of Muraqabah as a measurable construct within the intersection of Islamic psychology and environmental psychology, while also providing an initial multidimensional measurement framework for use in future empirical studies.

Despite these limitations, the study contributes to the literature by showing that spiritually grounded self-awareness may enrich existing explanations of pro-environmental behavior, particularly in religious and culturally specific educational settings. This finding highlights the potential value of integrating spiritual dimensions into environmental education and character development programs in Islamic higher education. Future research should test

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this model using larger and more diverse samples, longitudinal designs, and more complete psychometric reporting for all constructs, especially the adapted PEB scale. Further studies are also needed to examine mediating or moderating variables, such as personal norms, environmental identity, self-control, and institutional context, in order to clarify the mechanisms through which Muraqabah relates to pro-environmental behavior.

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