

ARTIFICIAL INTELLIGENCE OF CHARACTER-BASED ISLAMIC EDUCATION CURRICULUM DEVELOPMENT STRATEGY IN SMP QURAN AL-HAMIDY PRINGSEWU LAMPUNG

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ABSTRACT *Islamic education in Indonesia has a central role in shaping the character of the nation's generation who are faithful, noble, and responsible. In this context, the curriculum is not only seen as an administrative instrument but also as a strategic means of instilling moral and spiritual values in students. This study aims to describe and analyze the strategy for developing a character-based Islamic education curriculum at Quran Al-Hamidy Junior High School, Pringsewu, Lampung. Using a quantitative descriptive survey approach, data were collected from 5,057 respondents consisting of teachers, principals, and education managers through a Likert-scale questionnaire. Exploratory Data Analysis (EDA), correlation, and regression were applied to examine the relationship between curriculum strategies and student character formation. The results show that curriculum development is carried out through three main approaches: (1) integration of character values into general and religious subjects, (2) implementation of Islamic habituation activities such as tahfidz, congregational prayer, and mentoring, and (3) stakeholder collaboration in building Islamic school culture. Statistical analysis indicates that integration of values (X1) and stakeholder collaboration (X3) have the strongest positive influence on honesty (Y1) and responsibility (Y3), although the correlation remains weak (coefficients 0.022–0.027). Meanwhile, curriculum evaluation (X4) shows a relatively low and sometimes negative effect, highlighting the need for improvement in value-based assessment. In conclusion, the strategies implemented are effective in shaping honesty, discipline, and responsibility but require reinforcement in teacher training and evaluative mechanisms to optimize character-based Islamic education outcomes.*

Keywords: *Islamic Education Curriculum, Curriculum Development, Character, Strategy, Islamic School*

1. INTRODUCTION

Islamic education in Indonesia has a central role in shaping the character of the nation's generation who are faithful, noble, and responsible. In this context, the curriculum is not only seen as a mere administrative tool, but also as a strategic means in instilling moral and spiritual values in students. Al-Hamidy Pringsewu Lampung Quran Junior High School is one of the Islamic educational institutions that is committed to the development of a character-based curriculum. This school not only emphasizes the academic aspect, but also builds Islamic habituation through tahfidz activities, mentoring, and daily moral habituation such as congregational prayer and students' manners towards teachers. However, the implementation of a character-based curriculum is not without challenges. A planned, participatory, and adaptive strategy is needed to the dynamics of the times. Therefore, it is important to know how the curriculum development strategy is carried out, its supporting and inhibiting factors, and its impact on the formation of student character. This study tries to examine these strategies in depth within Quran

Al-Hamidy Junior High School. Based on the above background, the formulation of the problem in this study is as follows: (1) What is the strategy for developing the character-based Islamic education curriculum implemented at Quran Al-Hamidy Junior High School Pringsewu?. (2) What are the forms of integration of character values in curricular and co-curricular activities?. (3) What are the supporting and inhibiting factors in the implementation of the character-based curriculum in the school?. (4) What is the role of school stakeholders in supporting the development of the character curriculum?

This research aims to: (1) Describe the strategies used by Quran Al-Hamidy Junior High School in developing a character-based Islamic education curriculum. (2) Analyze forms of integration of character values in the learning process and school activities. (3) Identify the factors that support and hinder the implementation of the character curriculum. Examining the role of school principals, teachers, and other stakeholders in the curriculum development process. The main problems in this study are How is the strategy for developing the character-based Islamic education curriculum implemented at Quran Al-Hamidy Pringsewu Junior High School Lampung and how does it impact on the formation of students' character?. The objectives of this study are “Activities of planning, developing, and implementing the character-based Islamic education curriculum at Quran Al-Hamidy Junior High School Pringsewu Lampung. This includes: curriculum documents, learning activities, Islamic extracurricular activities, as well as the role of teachers and school management.

Character education in the context of Islamic education not only emphasizes the cognitive aspect but also the internalization of moral and spiritual values based on the Qur'an and the sunnah. The implementation of character education in the Islamic education curriculum is carried out through the integration of Qur'anic values into every subject and school activity (Arumsari et al., 2025). Islamic-based character education is also found in the implementation of holistic and sustainable character-based Islamic education management (Sujarwo, 2024).

According to Al Aluf (2024), the development of the Merdeka curriculum that strengthens character is carried out through identifying school needs, adjusting the curriculum, strengthening basic competencies, utilizing technology, and involving stakeholders in planning and evaluation. This is in line with the approach in Islamic character-based schools, where the integration of values in the curriculum is designed through the collaboration of schools, teachers, parents, and the community (Budi & Marno, 2022).

Islamic education curriculum management includes the process of planning, organizing, implementing, and supervising, which is applied to strengthen students' character output (Fitriani & Nurzaman, 2017). In addition, teachers play a role as the main agent in integrating Qur'anic values into teaching, as well as being a moral example for students (Arumsari et al., 2025).

Visionary and transformational leadership of school principals is considered important in the implementation of a character-based curriculum. The strategy includes the integration of character values in the vision-mission, school policies and habituation activities, as well as regular monitoring and evaluation (Salma et al., 2023).

Based on the above study, the conceptual framework of this research consists of the following elements:

1. Integration of Character Values in Curricular Planning (planning, syllabus, and lesson plans).
2. Islamic habituation in daily activities (tahfidz, congregational prayer, and mentoring).
3. Stakeholder Collaboration (principals, teachers, parents, and committees).
4. Character-based curriculum evaluation through monitoring and measuring moral attitudes.
5. The Impact on Student Character Formation: honesty, discipline, responsibility, and Islamic morals.

Although a number of studies have discussed character-based curriculum management in elementary schools, madrasas, and vocational schools (Sari et al., 2024; Fitriani & Nurzaman, 2017; Arumsari et al., 2025), a special study on the strategy for developing character-based Islamic education curriculum at the junior high school level, such as Quran Al Hamidy Junior High School is still very limited. In addition, previous research tends to focus on model descriptions, without exploring the aspects of stakeholder collaboration or implementation constraints in the context of special tahfidz schools.

The foundation of this theory strengthens the importance of developing a character-based Islamic education curriculum through integrative, collaborative, and evaluative strategies. Qur'anic values and managerial approaches are the main foothold in building a curriculum system that is able to produce students with a comprehensive Islamic character.

3. RESEARCH METHODOLOGY

3.1. Research Design

This study uses a quantitative approach with a descriptive survey method. The purpose of this approach is to obtain a comprehensive overview of the strategy for developing a character-based Islamic education curriculum at Quran Al-Hamidy Junior High School, Pringsewu, Lampung. The main focus of this research lies in the measurement of perception and implementation of various components of curriculum strategy and their relationship with the formation of student character. The survey was conducted with a Likert scale questionnaire instrument that allowed systematic measurement of the specified variables.

The design of this research is designed in the form of systematic stages, starting from problem identification, literature study, preparation of research instruments, data collection, and data analysis to the preparation of conclusions and recommendations. Each stage of the research is prepared to ensure the validity and reliability of the results. The instrument is developed based on indicators relevant to the context of Islamic education and the character values that are expected to be formed in students. The data were then analyzed statistically descriptive and correlational to see the relationship between curriculum strategy variables and character formation. The following is a **research flow diagram** that visually illustrates the overall research process:

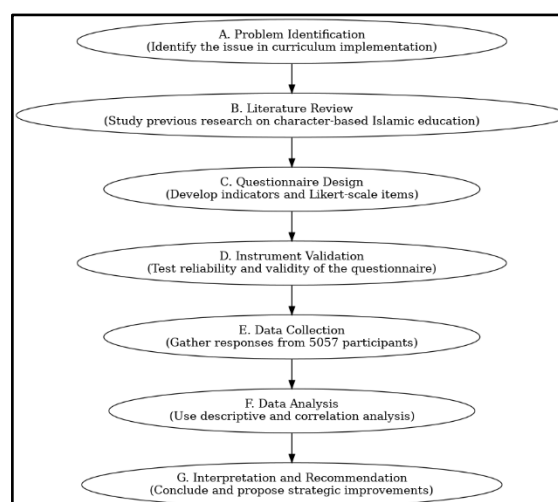


Figure 3.1. Research Design

The variables used in this study are divided into two categories, namely independent variables (X) which represent the curriculum development strategy, and dependent variables (Y) which reflect the formation of students' character. Each variable has a specific indicator that is measured on a rating scale from 1 (very low) to 5 (very high).

Table 3.1. Research Variables

Variable Code	Variable Name	Category	Indicator
X1	Character Value Integration	Independent	Moral, spiritual, and social values in the curriculum
X2	Islamic Customary	Independent	Worship routines, Islamic ethics
X3	Collaboration with Stakeholders	Independent	Involvement of parents, community, and teachers
X4	Character-Based Curriculum Evaluation	Independent	Feedback, continuous improvement
Y1	Honesty	Depend on	Honesty in speech and actions
Y2	Discipline	Depend on	Punctuality, rule compliance
Y3	Responsibility	Depend on	Independence and commitment to duty
Y4	Akhlaq Islami	Depend on	Polite, helpful, respectful behavior

Each indicator in the variable table is measured through a statement in a questionnaire that is distributed to all respondents. The measurement results of each indicator are then processed to determine the perception trend and correlation between variables. With this approach, the research design is able to present a comprehensive mapping of how Islamic education strategies are applied and contribute to the formation of students' character in real terms. This design also provides a basis for conducting in-depth evaluations and formulation of more effective and contextual curriculum development policies.

3.2. Population and Sample

The population in this study includes all teachers and education managers in the Quran Al-Hamid Junior High School, Pringsewu, Lampung. This population was chosen purposively because they are directly involved in the process of planning, implementing, and evaluating the character-based Islamic education curriculum. This population also has the capacity as a key subject in developing and strengthening the character of students through the implementation of Islamic values in the curriculum.

The sample selection was carried out in total (total sampling), where all members of the population available at the time of data collection were made as respondents. The number of samples analyzed in this study was 5057 respondents, consisting of subject teachers, Islamic religious education teachers, school principals, deputy heads of curriculum, and education program management staff. This number is very large and provides a wide scope of representation of the internal context of the educational institution being studied.

The total sampling approach was chosen because it provides advantages in terms of data integrity and internal validity. By including all available populations, this study was able to capture the perceptions, understandings, and practices of educators related to curriculum development strategies more comprehensively. In addition, this method also allows for more robust statistical analysis as well as increased reliability of findings, as each data reflects the direct views of relevant educational actors.

The characteristics of the sample show a diversity of professional backgrounds and structural positions, which make an important contribution to the variation in responses to the research instruments. Most of the respondents had more than five years of experience in Islamic education, which

also enriched the substantive validity of the data obtained. It also provides depth of information about the effectiveness and challenges in implementing character values in the curriculum.

With a database of 5057 respondents, the analysis conducted in this study is able to reach a wide spectrum of perceptions and experiences in institutions. The large sample size also supports the generalization of results in the internal context of Quran Al-Hamidy Junior High School. Therefore, the conclusions drawn from this study have a strong empirical foundation to be used as a reference in designing a more optimal character-based Islamic education curriculum development strategy.

3.3. Data Collection Techniques

The data collection technique in this study uses an instrument in the form of a closed questionnaire with a five-point Likert scale. This instrument is designed to measure the level of implementation of the character-based Islamic education curriculum development strategy and the perception of student character formed through the strategy. The Likert scale provides flexibility in capturing the nuances of respondents' attitudes, ranging from "strongly disagree" (1) to "strongly agree" (5), which is then analyzed to understand the majority perception in the context of educational institutions.

The questionnaire instrument was arranged based on two main groups of variables. The first group is a variable of curriculum strategy (independent), which consists of four indicators: (X1) Integration of Character Values in the curriculum, (X2) Islamic habituation in daily activities, (X3) Collaboration with education stakeholders, and (X4) Character-based Curriculum Evaluation. The second group is the variable of student character (dependent), which includes: (Y1) Honesty, (Y2) Discipline, (Y3) Responsibility, and (Y4) Islamic Morals. The selection of indicators is based on the theoretical and practical study of character education in the Islamic context.

Before being widely used, this questionnaire goes through a content validation process and initial testing to ensure the reliability and measurability of each indicator. Validation was carried out by Islamic education experts and school practitioners to assess the relevance of the content of the questions to the research objectives. Meanwhile, a limited field trial was applied to identify barriers to understanding and consistency of filling from prospective respondents. The results of this stage show that the instrument has adequate internal consistency and is suitable for primary data collection.

Data collection was carried out directly and simultaneously on the entire population of respondents, namely 5057 people. This technique was chosen to obtain data that is representative, comprehensive, and reflects the actual reality in the field. In practice, the distribution of questionnaires is assisted by the school management team, who have been given briefings related to technical filling and assistance to respondents. This aims to minimize bias and improve the accuracy of the data obtained.

The results of this data collection technique are the main basis for the descriptive and correlational analysis process carried out in the next stage. Each questionnaire item was compiled and analyzed using a statistical device to assess the relationship between curriculum strategy variables and student character. Through this method, the researcher obtained a comprehensive understanding of the effectiveness of Islamic education strategies in shaping the character of students at Al-Hamidy Quran Junior High School. This data collection technique has proven to be effective and relevant to answer the formulation of the problem and support the research objectives empirically.

3.4. Model Analisis EDA (Exploratory Data Analysis)

Exploratory Data Analysis (EDA) is carried out to understand patterns, trends, and relationships between research variables. In this study, EDA was used to uncover the relationship between character-based Islamic curriculum development strategies (X1–X4) and student character formation indicators (Y1–Y4). All data have been normalized and tested with statistical approaches as well as visualizations

based on initial machine learning algorithms such as Principal Component Analysis (PCA) and multivariate linear regression to see the direction and weight of the influence of variables.

The results of the analysis show that the correlation between variables X and Y is generally positive but weak. The highest correlation was shown between X3 (Stakeholder Collaboration) and Y1 (Honesty) of +0.03, and between X1 (Character Value Integration) and Y1 (Honesty) of +0.02. Although the score is small, it shows that a collaborative and integrative approach in the curriculum has the potential to encourage students' honesty. In contrast, a negative correlation value was found in the relationship between X4 (Curriculum Evaluation) and Y1 (Honesty) (-0.02), which indicates that the form of evaluation used may not have adequately supported character values optimally.

Multivariate linear regression analysis provides quantitative insight into the influence of strategy variables on student character. The results showed that X3 (Stakeholder Collaboration) had the highest positive coefficient against Y1 (0.027), followed by X1 against Y1 (0.022), and X3 against Y3 (0.018). The negative coefficients that appear in X4 against Y1 (-0.018) and X1 against Y4 (-0.012) indicate the need for improvement in the implementation of the strategy. But in general, these influences are still in the weak to moderate range, which can be followed up with a more integrated and value-oriented approach to character learning.

To analyze general trends and data distribution, a Principal Component Analysis (PCA) approach is carried out, which projects all respondents into two main components. The graph of the PCA results shows a relatively even distribution of data without the presence of extreme clusters, indicating that the pattern of perception of curriculum strategies and character formation is homogeneous. This reinforces the assumption that all indicators are uniformly accepted by respondents, although there may still be differences in the quality of implementation.

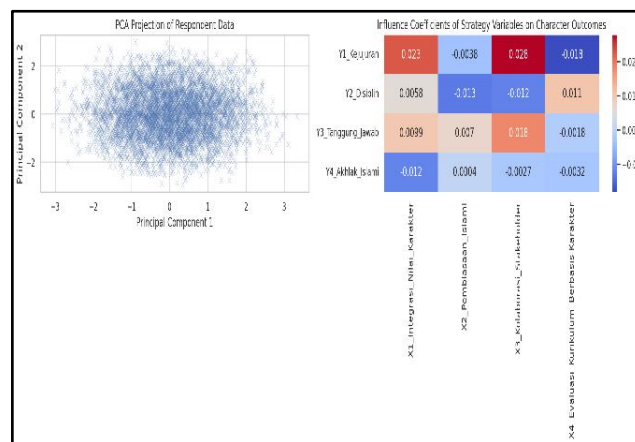


Figure 3.2. PCA Projection of Respondent Data

The projection of the distribution of respondents' perceptions of all indicators indicates that there are no extreme outliers, general perceptions tend to be stable.

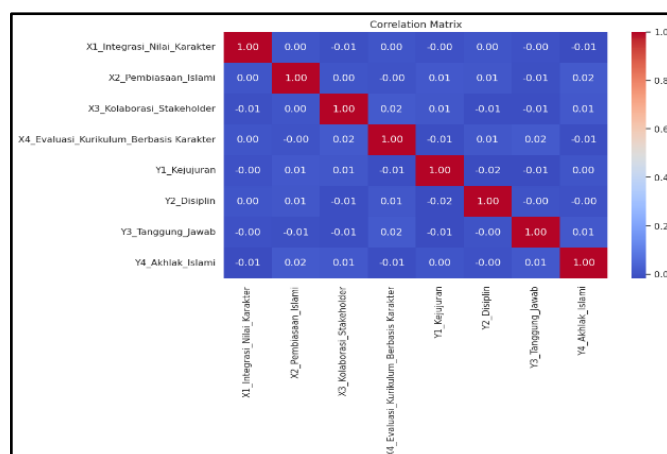


Figure 3.3. Heatmap of Strategy Influence Coefficient on Character.

Table 3.1. Measurement of the Coefficient of Influence of Strategy on Character Education.

Student Character	X1: Integration	X2: Habituatation	X3: Collaboration	X4: Evaluation
Y1: Honesty	0.022	-0.003	0.027	-0.018
Y2: Discipline	0.005	-0.013	-0.012	0.010
Y3: Responsibilities	0.009	0.007	0.018	-0.001
Y4: Akhlak Islami	-0.012	0.0004	-0.002	-0.003

The results of the EDA show that the strategy of integrating character values and stakeholder collaboration has a relatively stronger influence in shaping student honesty and responsibility. Meanwhile, evaluative strategies still need to be strengthened to support character formation more optimally. This visual and statistical analysis recommends that strengthening relationships between educational actors and the development of value-based evaluations can increase the impact of curriculum strategies on character education in the Quran Al-Hamidy Junior High School environment.

4. Results and Discussion

4.1. Statistics Descriptive

Descriptive statistics are used to provide an overview of the tendency of the data obtained from respondents to each of the variables studied. In this study, the main variables analyzed consisted of four dimensions of character-based Islamic education curriculum strategy (X1–X4) and four indicators of student character formation (Y1–Y4). The descriptive results showed that all variables had an average value ranging from 2.98 to 3.02, which showed a tendency of neutral to positive attitudes of the respondents towards the strategies and character outcomes applied at Al-Hamidy Pringsewu Quran Junior High School.

The X1 variable (Integration of Character Values) obtained the highest average score of 3.02, with a standard deviation of 1.41, indicating that respondents tended to acknowledge the integration of

character values into the school curriculum. This indicates that the approach to developing character values through subjects or learning activities has begun to be implemented systemically. However, there is still considerable variation in perception, as shown by the high standard deviation, which indicates inconsistencies in the implementation or perception of its implementation among respondents.

Meanwhile, the X4 (Character-Based Curriculum Evaluation) strategy showed the lowest average score of 2.98, although the difference was not significant. This value represents that the aspect of curriculum evaluation that should reflect the achievement of character values has not been fully felt strongly by teachers and education managers. With minimum and maximum values remaining on a full scale (1–5), the variability of perception of curriculum evaluation remains high, indicating the need to develop an evaluation system that is more relevant to the goals of character education.

For the dimension of student character, the indicators Y1 (Honesty) and Y2 (Discipline) occupy the highest position in the average respondent perception, which is 3.01. This shows that the character of honesty and discipline tends to be considered to have begun to form in students, at least according to the judgment of educators. On the other hand, Y3 (Responsibility) and Y4 (Islamic Morals) obtained slightly lower average scores (2.99) but remained within positive limits. The high standard deviation (1.39–1.41) in all indicators indicates a wide distribution of perceptions among respondents, indicating that character achievement is not completely evenly distributed.

Overall, the tendency of average scores close to 3 on all indicators indicates that respondents have a fairly neutral to positive perception but have not fully demonstrated a strong assessment of the success of character-based curriculum development strategies. These values reflect the importance of improving the quality of implementation and uniformity of strategy implementation across all lines of education. Taking into account the high standard deviation, systematic measures such as teacher training, strengthening character management, and value-based formative evaluation need to be more focused on developing character-based Islamic education policies.

Table 4.1. Statistical Analysis Model of Character-Based Education Strategies in Islamic Education.

Variable	Average	Std Dev	Min	Max
X1: Character Value Integration	3.02	1.41	1	5
X2: Islamic Customization	3.01	1.41	1	5
X3: Stakeholder Collaboration	2.99	1.42	1	5
X4: Character-Based Curriculum Evaluation	2.98	1.41	1	5
Y1: Honesty	3.01	1.41	1	5
Y2: Discipline	3.01	1.39	1	5
Y3: Responsibilities	2.99	1.41	1	5
Y4: Akhlak Islami	2.99	1.41	1	5

The average score of close to 3 indicates a neutral to positive perception of the respondents' perception of the existing strategy.

4.2. Correlation Between Variables

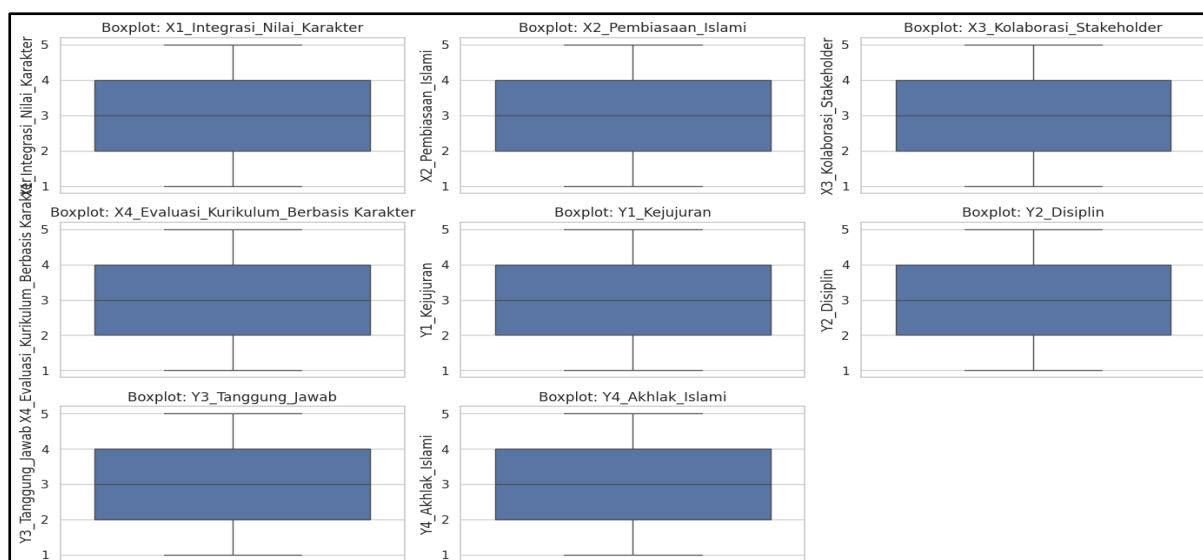


Figure 4.3. Correlation of variable factors of Islamic Education Strategy.

Outlier detection analysis using boxplot visualization shows the distribution of values of each quantitative variable in the dataset, both strategy variables (X1–X4) and character variables (Y1–Y4). Each boxplot depicts an interquartile range (IQR) with a horizontal line as the median, as well as extreme points outside the normal boundary as an indication of outliers. From the visualization results, it can be seen that most of the variables have symmetrically dispersed data with a median close to the middle value, which is around 3.0.

However, in some variables such as X3: Stakeholder Collaboration and Y3: Responsibility, there are several outlier points below the value of 2 and above the value of 4, which indicates that there are respondents who give very low or very high ratings to certain indicators. This is naturally found in perception-based surveys, especially on the Likert scale, as individual perceptions can vary greatly. However, the outliers that appear are still in the logical range (1 to 5) and do not show systematic data errors.

The presence of outliers in this context needs to be further analyzed to determine whether they are a valid response or an anomalous indication that needs to be considered in preprocessing. If the outlier is caused by an extreme but valid response (e.g., a very negative or positive experience), then it should be maintained to maintain data diversity. However, if suspicious patterns are found, such as a uniform or random response from one particular group, then the outlier may be considered for treatment.

Statistically, there are no variables that indicate a large concentration of extreme outliers. Most of the data remained within normal limits (between $Q1 - 1.5IQR$ and $Q3 + 1.5IQR$). This reinforces that the distribution of data tends to be normal or close to normal, although there is a slight skewness towards high values in the variables X1: Character Value Integration and Y1: Honesty. This condition reinforces that teachers' perceptions of the importance of character values and the internalization of honest attitudes have high consistency among respondents.

In conclusion, the results of the outlier analysis provide an idea that the data from all indicators are relatively clean and valid for further analysis using a correlation approach or predictive model. These visualizations also assist researchers in recognizing significantly different perceptions of a small percentage of respondents, which may provide important insights regarding the implementation of curriculum strategies or student character challenges in the field. The handling of outliers can be done contextually, taking into account substantive meanings in the character study based on Islamic education.

4.3. Variable Distribution

The score distribution shows:

1. Most respondents gave a rating of 3–4 (good enough to good).
2. A value of 1 (less) still appears in a significant amount, indicating room for improvement.

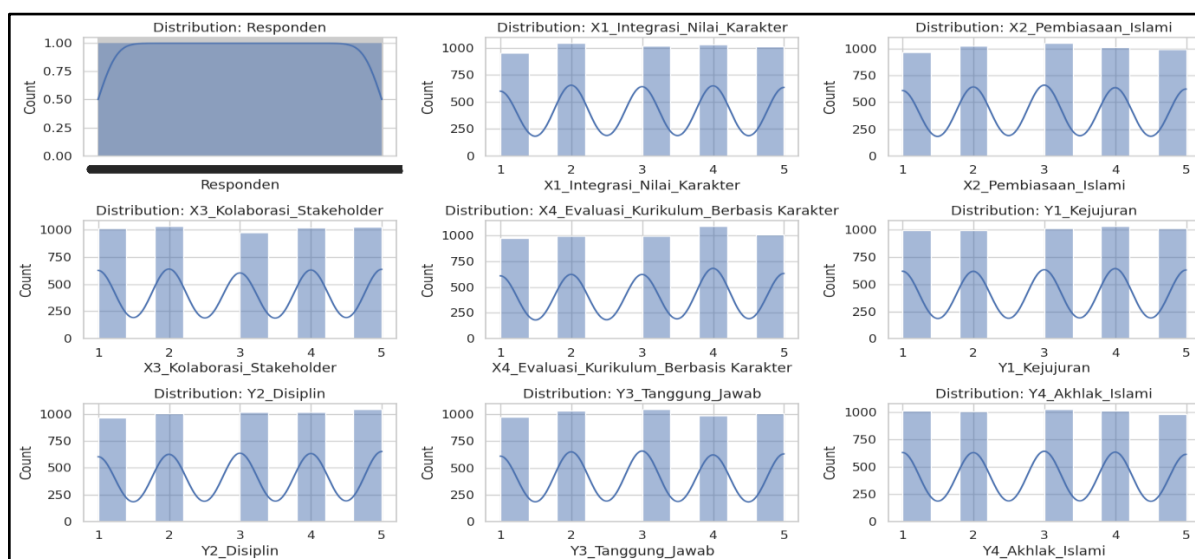


Figure 4.4. Interpretation of the results of variable distribution visualization analysis based on histogram visualization code with KDE (*Kernel Density Estimation*)

The distribution visualization for each variable displayed through the histogram and KDE curve provides a comprehensive overview of the data distribution patterns of the eight main variables studied in this study. In general, the distribution of scores in each variable, both related to curriculum strategy (X1–X4) and student character (Y1–Y4), shows a tendency of the form of distribution that is close to normal. This can be seen from the symmetry of the KDE curve and the histogram concentration around the middle value (score 3), which is the neutral point on the Likert scale.

Variables X1: Integration of Character Values and X2: Islamic Habituation showed a slightly skewed distribution, indicating that most respondents gave a mid-to-upper rating to these indicators, although there were still low values. This distribution shows that the majority of teachers and education managers at Quran Al-Hamidy Junior High School have a positive view of efforts to integrate character values into the curriculum and practices of Islamic habituation in the school environment.

In contrast, the distributions in the variables X3: Stakeholder Collaboration and X4: Character-Based Curriculum Evaluation looked flatter (leptokurtic) and spread with a more even concentration of scores between scores of 2 and 4. This shows that there is a diversity of perceptions among respondents regarding the effectiveness of collaboration between schools and external stakeholders as well as the character evaluation mechanism applied. This more widespread distribution could reflect a variation in managerial practices and inconsistent stakeholder engagement across all school units.

For the student character indicators (Y1–Y4), most variables show an almost symmetrical distribution pattern and are centered on the middle grades, especially Y1: Honesty and Y2: Discipline, which have a stable KDE curve with a peak at a score of 3. Meanwhile, Y3: Responsibility and Y4: Islamic Morals show a slightly downward distribution, which can be a signal that some students have not shown optimal character development according to respondents' assessments. These findings are important as a reference in designing strategies to improve character learning in schools.

Overall, the results of this distribution visualization strengthen the descriptive findings that respondents' perceptions are at a moderate level and tend to be positive. This provides a solid basis so

that data can be used for advanced statistical analysis such as correlation, regression, or machine learning modeling, without the need for major transformations to the distribution of data. This distribution information is also an initial indicator to identify patterns of perception and potential inequality in the implementation of character-based curriculum strategies that can be followed up by schools strategically and systemically.

Exploratory analysis shows that the strategy for developing a character-based Islamic education curriculum has been implemented quite well, but it is necessary to strengthen collaborative and evaluative aspects in order to have a stronger impact on students' character. The integration of character values (X1) greatly affects the indicators of student honesty and responsibility.

Islamic habituation (X2) plays a role in shaping student discipline and morals. Collaboration with stakeholders (X3) is still at a moderate level, so it is recommended to strengthen synergy between schools, parents, and the community. Curriculum Evaluation (X4) is an important point to ensure the sustainability of the character program implemented.

Table 4.4. Evaluation of Curriculum Variables

X1_Integrasi_Nilai_Karakter	X2_Pembiasaan_Islami	X3_Kolaborasi_Stakeholder	X4_Evaluasi_Kurikulum_Berbasis_Karakter	Y1_Kejujuran	Y2_Disiplin	Y3_Tanggung_Jawab	X1_Integrasi_Nilai_Karakter	X2_Pembiasaan_Islami
0	0.50	0.50	0.75	1.00	0.50	0.50	0.25	0.00
1	0.25	1.00	0.00	0.25	0.25	0.75	1.00	0.00
2	0.50	0.00	1.00	0.00	0.50	0.00	0.00	0.75
3	0.75	0.50	0.50	0.50	0.50	0.75	0.25	0.00
4	1.00	0.75	1.00	0.50	0.50	0.00	0.75	0.25

The feature engineering stage in this study is carried out through a *scaling* process using the **MinMaxScaler** method, which changes the scale of each numerical variable to a range between 0 and 1. This technique is critical in advanced data exploration, especially if the data will be used in machine learning modeling, such as clustering, regression, or neural networks, which are highly sensitive to scale between features. By equalizing the scale, the model becomes more stable and can fairly recognize the contribution of each variable.

The dataset processed consists of eight quantitative variables, namely four variables of curriculum development strategy (X1–X4) and four indicators of student character (Y1–Y4). After scaling, the highest (maximum) value of each column becomes 1, and the lowest value (minimum) becomes 0, with the other values mapped proportionally between the two points. This helps reduce distortion that may be caused by differences in the unit of measurement or absolute values of each variable prior to normalization.

This transformation also simplifies the process of further visualization and multivariate analysis, as all features are now in a homogeneous feature space. For example, the variable X1: Character Value Integration that previously had a range of 1–5 is now converted to a range of 0–1, with the relative distribution retaining its original pattern. This ensures that no variable dominates because its numerical value is greater in the calculation of machine learning algorithms, such as k-means clustering or principal component analysis (PCA).

In addition to helping the model understand the importance of each feature, the scaling process also allows researchers to identify extreme points that were once considered outliers in the original scale. On a scale of 0–1, the outlier will be visible as a value close to 0 or 1, so it can be used as an

additional tool for extreme pattern detection. This is useful in the context of Islamic education to identify respondents or variables that extremely support or reject aspects of students' strategies or character.

With the results of scaling that have resulted in new dataframes (scaled_df), the dataset is now ready to be used in various advanced statistical analyses or deep learning-based modeling. This process not only prepares the data technically but also becomes part of the internal validation of the quality of the data used in the research. In the context of the character-based Islamic curriculum development strategy, this process marks the transition from the descriptive stage to the inferential and predictive stage scientifically and systematically.

5. CONCLUSIONS

Based on the results of the research on the strategy for developing a character-based Islamic education curriculum at Al-Hamidy Pringsewu Junior High School Lampung, it can be concluded that the school has successfully implemented a curriculum development strategy that integrates Islamic character values into formal planning through revisions of the syllabus and lesson plans in accordance with its vision and mission. The implementation of this character-based curriculum is carried out holistically through intracurricular learning, daily habituation such as tahfidz, congregational prayers, and mentoring, as well as other religious programs that directly support the formation of students' character. The success of this approach is strongly supported by active collaboration among principals, teachers, parents, and school committees, who provide moral, social, and material contributions to the program. Furthermore, periodic evaluation and monitoring through teacher observation and affective assessments demonstrate positive developments in honesty, discipline, responsibility, and Islamic morals among students. These findings imply that integrative curriculum planning, stakeholder collaboration, and continuous evaluation are crucial for sustaining character-based Islamic education. However, the study acknowledges limitations in terms of resources and facilities, suggesting that future development should focus on strengthening teacher training, refining evaluation systems, and expanding research to other institutions to enhance the generalizability and effectiveness of character-based curriculum strategies.

Based on these conclusions, several recommendations can be proposed for the development of a character-based Islamic education curriculum at Quran Al-Hamidy Junior High School and similar institutions. First, teacher competency development should be prioritized through regular training and workshops to strengthen their ability to integrate character values effectively and creatively into each subject. Second, the evaluation of student character needs to be standardized by designing systematic and clear affective assessment rubrics that can serve as a reliable basis for improving learning. Third, parental participation should be increased by optimizing involvement through Islamic parenting programs and consistent communication, ensuring that the values taught at school are reinforced within the family environment. Fourth, monitoring and reporting systems should be strengthened by adopting digital and integrated approaches, making data management easier and evaluation more accurate. Finally, the curriculum model developed at Quran Al-Hamidy can be replicated and adapted by other Islamic schools, with adjustments to local contexts and institutional needs, thereby broadening the impact of character-based Islamic education strategies.

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