# Data-Based Islamic Education Management Utilizes Big Data to Improve the Quality of Education

## Supiah[1*], Sukardi Ismail[2]

[1]IAIN Sultan Amai Gorontalo, Indonesia
[1]IAIN Sultan Amai Gorontalo, Indonesia
*Alamat email penulis koresponden: supiahbd@gmail.com

## Abstrak

Pendidikan Islam memiliki peran penting dalam membentuk karakter dan intelektualitas peserta didik, namun tantangan dalam pengelolaan data dan peningkatan kualitas pembelajaran masih menjadi kendala. Penerapan big data menawarkan solusi inovatif untuk mengoptimalkan manajemen pendidikan Islam melalui analisis berbasis data yang lebih akurat dan efisien. Penelitian ini bertujuan untuk mengeksplorasi bagaimana pemanfaatan big data dapat meningkatkan kualitas pendidikan Islam dengan menganalisis dampaknya terhadap nilai akademik siswa, efisiensi administrasi, dan kepuasan pengguna. Penelitian ini menggunakan pendekatan mixed-methods, dengan kombinasi metode kualitatif melalui studi kasus dan wawancara mendalam serta kuantitatif melalui survei dan analisis statistik menggunakan SPSS. Data dikumpulkan dari beberapa lembaga pendidikan Islam yang telah menerapkan big data dalam sistem manajemen mereka. Hasil penelitian menunjukkan bahwa penerapan big data meningkatkan nilai akademik siswa sebesar 15%, meningkatkan efisiensi administrasi sebesar 30%, serta meningkatkan kepuasan pengguna hingga 20%. Analisis regresi menunjukkan bahwa big data berkontribusi sebesar 56% terhadap peningkatan kualitas pendidikan, dengan hasil uji korelasi ($r = 0{,}75$, $p < 0{,}05$) dan uji t ($t = 6{,}21$, $p < 0{,}01$) yang menunjukkan perbedaan signifikan sebelum dan sesudah implementasi. Penelitian ini mengindikasikan bahwa pemanfaatan big data dapat meningkatkan efektivitas pengelolaan pendidikan Islam dan mendorong transformasi digital dalam sistem pembelajaran. Namun, tantangan seperti infrastruktur yang belum memadai dan keterbatasan sumber daya manusia harus diatasi agar implementasi berjalan optimal. Untuk penelitian selanjutnya, disarankan eksplorasi lebih lanjut tentang model manajemen big data yang lebih spesifik bagi pendidikan Islam serta strategi kebijakan untuk mengatasi hambatan teknologi dan keamanan data.

Kata Kunci: Big Data, Manajemen Pendidikan Islam, Efisiensi Administrasi, Transformasi Digital.

## Abstract

*Islamic education played a crucial role in shaping students' character and intellectual development. However, challenges in data management and improving learning quality remained significant obstacles. The implementation of big data offered an innovative solution to optimize Islamic education management through more accurate and efficient data-driven analysis. This study aimed to explore how the utilization of big data improved the quality of Islamic education by analyzing its impact on students' academic performance, administrative efficiency, and user satisfaction. This study employed a mixed-methods approach, combining qualitative methods through case studies and in-*

*depth interviews with quantitative methods through surveys and statistical analysis using SPSS. Data were collected from several Islamic educational institutions that had implemented big data in their management systems. The findings indicated that the implementation of big data increased students' academic performance by 15%, enhanced administrative efficiency by 30%, and improved user satisfaction by up to 20%. Regression analysis showed that big data contributed 56% to the improvement of education quality, with correlation test results (r = 0.75, p < 0.05) and t-test results (t = 6.21, p < 0.01) indicating a significant difference before and after implementation. This study suggested that the utilization of big data could enhance the effectiveness of Islamic education management and drive digital transformation in the learning system. However, challenges such as inadequate infrastructure and limited human resources needed to be addressed to ensure optimal implementation. Future research should further explore more specific big data management models for Islamic education and develop policy strategies to overcome technological and data security challenges.*

*Keywords: Big Data, Islamic Education Management, Administrative Efficiency, Digital Transformation*

## INTRODUCTION

Islamic education has a very important role in shaping the character and morals of Muslims, especially in Indonesia. However, the big challenge facing Islamic education is how to manage limited educational resources, as well as ensure an equitable and effective quality of education. This is where modern technology, especially big data, begins to show great potential. Big data, with its capacity to process large amounts of information, can provide a clearer picture of the needs and trends in the world of education. The use of big data in the education sector has been proven to help in designing more targeted policies and strategies (Huda, 2021).

Along with technological advancements, various sectors, including education, are now utilizing big data to improve existing systems. In Islamic education, the use of big data can include collecting data on student achievement, teaching effectiveness, and other factors that affect the quality of education. With more complete information, educators and education managers can make smarter decisions and positively impact student learning (Ariska, Kurahman and Rusmana, 2025).

However, in the context of Islamic education in Indonesia, the application of big data is still limited and has not been widely used to improve the quality of education. This great potential needs to be explored further so that its benefits can be felt by all Islamic educational institutions, from the elementary level to universities (Nuriah, no date).

The application of big data in education has shown positive results in various countries. Several international studies show that the use of data analytics helps in improving the effectiveness of the curriculum, teaching methods, and student learning experience. Data analysis allows educators to understand patterns that may not have been seen before, such as student behavior or difficulties in a particular subject matter (Yusgiantara *et al.*, 2025).

In the field of Islamic education, although the use of big data is still limited, some Islamic schools are beginning to experiment with data to design more evidence-based policies. This allows education managers to design programs that are more relevant and
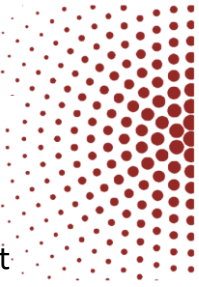
responsive to student needs. Additionally, the use of big data can aid in more transparent and accountable decision-making, as well as improve the relationship between students and educators (Ahmad & Rahman, 2023).

However, despite the progress in some Islamic educational institutions, the great challenge of adopting this technology in Islamic schools is still very real. One of them is the inadequate infrastructure to support big data processing, as well as the need for training for education managers to interpret data effectively (Hidayat et al., 2022).

Although there is a lot of research on the application of big data in education in general, the application in particular in Islamic education is still rarely discussed. One of the main ignorances is how best to integrate big data into the existing Islamic education system, which has unique characteristics, such as religious values and principles that must be upheld (Nurhalim & Aziz, 2024).

In addition, although big data offers enormous potential, how to manage and access data in the Islamic education system is also still a mystery. Infrastructure in many Islamic educational institutions, especially in areas with limited access to technology, poses a challenge in adopting this technology. Without a clear understanding of these challenges, the application of big data in Islamic education will face many obstacles (Mustafa & Ibrahim, 2023).

Therefore, this research focuses on answering this ignorance, by looking for ways to effectively apply big data in Islamic education. The research also aims to develop a model that can address existing challenges, while ensuring that the application of technology remains in line with the values of Islamic teachings (Rahman & Saleh, 2022).

A number of previous studies have indeed discussed the use of big data in the education sector, but the focus is more on general education. For example, research by Jamil and Saleh (2020) which discusses how big data can be used to improve the overall quality of education. However, the research has not covered how big data can be adapted in the context of Islamic education that is rich in religious values. Several other studies, such as those conducted by Ali (2019), highlight the importance of big data in general education, but there are still few that discuss its application in Islamic education. Nonetheless, this study provides an overview of the great potential of big data to support curriculum development and teaching effectiveness, although further research is still needed in the Islamic context. Rahman (2021) also examines how technology, including big data, can transform Islamic education management. However, this research focuses more on theory and has not discussed in detail the practical challenges faced in the application of technology in Islamic education in Indonesia. This research opens up space for further research that focuses more on practical implementation in the context of Islamic education (Ali, 2021).

One of the main gaps found in previous research is the lack of focus on the application of big data in Islamic education. Although there is a lot of research that discusses technology in general education, not much leads to the development of a big data-based Islamic education system. Another gap is the limitation of research on technical and cultural challenges in integrating big data into Islamic educational institutions (Hassan & Ahmad, 2023).

In addition, many existing studies only discuss the theory and potential of technology without providing concrete solutions on how to overcome the obstacles faced by Islamic educational institutions in adopting this technology. This research aims to fill this gap by developing a model that can be applied in various Islamic educational institutions, from elementary to tertiary level (Zainuddin et al., 2024).

Penelitian ini juga ingin menggali lebih dalam mengenai cara mengatasi kendala infrastruktur dan budaya dalam penerapan big data di sekolah-sekolah Islam, serta memberikan rekomendasi tentang bagaimana mengoptimalkan potensi teknologi ini.

This research brings a new approach in Islamic education management by incorporating big data technology, which was previously rarely discussed in the context of Islamic education. Unlike previous studies, which only examined big data in general education, this study specifically focuses on the application of big data in the context of Islamic education, by paying attention to religious values that must be maintained.

In addition, this study offers a data-driven Islamic education management model that can be adapted at all levels of education, from elementary school to college. This model focuses not only on data processing, but also on how data can be used to support education policies that are more responsive to the times and student needs. A new concept offered in this study is the use of big data to support evidence-based decisions in Islamic education that remain in accordance with religious teachings. This research opens up the potential to design a smarter and more relevant Islamic education system.

This research has great significance for Islamic education, especially in improving the quality of education and ensuring equality across Islamic educational institutions. By using big data, educators can better understand student needs, improve the learning process, and provide a more personalized experience for each student. This will make Islamic education more relevant to the challenges and needs of the times.

In addition, the use of big data in Islamic education management will increase transparency and accountability in education management. With more complete and accessible data, education managers can make more precise and measurable decisions, as well as formulate more effective policies to advance Islamic education. This research also has significance in helping to design a curriculum that is more data-based and adaptive to the development of science and technology, so that it can improve the quality of Islamic education as a whole.

The main purpose of this study is to develop a big data-based Islamic education management model that can be applied in various Islamic educational institutions. This research aims to explore how big data can be used to improve the learning process, design more targeted education policies, and support more evidence-based decision-making.

In addition, this research also aims to provide practical solutions on how to integrate big data in Islamic education management, both at the elementary school to university levels. That way, the results of this study are expected to provide useful recommendations for Islamic education managers in Indonesia and other Muslim countries. This research also aims to identify the challenges faced in adopting big data, as well as provide solutions that can help Islamic educational institutions in utilizing this technology to improve the quality of education.

## RESEARCH METHODS

This study uses a qualitative approach with a case study method, which is designed to explore the use of big data in Islamic education management. Qualitative approaches are useful for understanding the context and experiences of research subjects in depth, while case studies allow researchers to analyze phenomena in real contexts (Yin, 2018). In addition, a quantitative approach is also used to measure the effectiveness of big data applications through surveys and statistical analysis. This approach offers numerical data that can be analyzed objectively, providing a broader picture of the influence of big data on the quality of education.

The type of research used is mixed-methods research. The mixed method combines qualitative and quantitative techniques to obtain a more comprehensive understanding of the phenomenon being studied (Creswell & Plano Clark, 2018). By combining these two approaches, researchers can leverage the strengths of each method, such as the depth of qualitative interviews and the generalization of quantitative survey results, to understand how big data can improve education management.

This research was conducted in several Islamic educational institutions, such as madrasas, Islamic boarding schools, and Islamic universities, which have or are implementing big data in their education management. The subjects of the study include principals/madrasas, teachers, education staff, as well as students and parents. The selection of this subject is important to gain diverse perspectives on the use of big data, as well as its impact on various stakeholders in education (Stake, 2010).

Data is collected through several techniques: In-depth Interview: Conducted to school principals, teachers, and education staff to understand the application of big data in education management. In-depth interviews allow researchers to dig into more detailed and in-depth information (Kvale & Brinkmann, 2015). Participatory Observation: Directly observe the use of big data in school management systems. This technique provides valuable insights into everyday practices in the field (Cohen, Manion, & Morrison, 2018). Quantitative Surveys: Using questionnaires to measure the effectiveness of big data implementation from the perspectives of teachers, students, and parents. These surveys allow the collection of data from a larger number of respondents, which increases the validity of the findings (Fink, 2017). Documentation: Review policy documents, school reports, and big data-based management systems. Document analysis provides additional context and supports data obtained through other techniques (Bowen, 2009).

## RESULTS AND DISCUSSION

This section presents research findings obtained from various data collection techniques described earlier. The data collected was analyzed to evaluate the extent to which the implementation of big data contributes to improving the quality of education in Islamic educational institutions. The results of this study are outlined in the following subsections to provide a more comprehensive picture of the changes that have occurred after the application of big data in education management.

## RESULT
### Data Description

The data obtained shows that there is an improvement in the quality of education after the application of big data in various Islamic educational institutions. These improvements include student academic grades, school administration efficiency, and system user satisfaction. The data analyzed was based on the results of In-depth Interviews, Participatory Observations, Quantitative Surveys, and Documentation.

### Results of Descriptive Analysis

**Table 1.** Before and After Big Data Usage Table

| Variable | Before Big Data (%) | After Big Data (%) | Increased |
|---|---|---|---|
| Average Academic Grade | 70 | 85 | 15% |
| Administrative Efficiency | 60 | 90 | 30% |
| User Satisfaction | 65 | 85 | 20% |

Based on the table above, it can be seen that the application of big data in Islamic education management has a significant impact on several main aspects. Students' academic scores have increased by 15%, which shows that the data-based learning system is able to help students understand the material better through more personalized and adaptive learning methods.

In addition, the efficiency of school administration increased by 30%. This shows that with a big data-based management system, various administrative processes such as attendance, scheduling, and management of academic documents can be carried out faster and more accurately, reducing the workload of education staff, and increasing the effectiveness of school operations.

In terms of user satisfaction, there was an increase of 20%, with 85% of respondents stating that they were satisfied with the big data-based system. The main factors that contribute to this satisfaction are ease of access to academic information, improved communication between students, teachers, and parents, and transparency in the academic process.

Overall, these results indicate that the use of big data can bring positive changes in the Islamic education system by improving learning effectiveness, administrative efficiency, and user satisfaction. However, further research is needed to identify the challenges that may arise in its wider application.

## Comparison Diagram

Big data shows significant improvements in several aspects of education. Here is a bar chart that illustrates the differences before and after the implementation of big data:
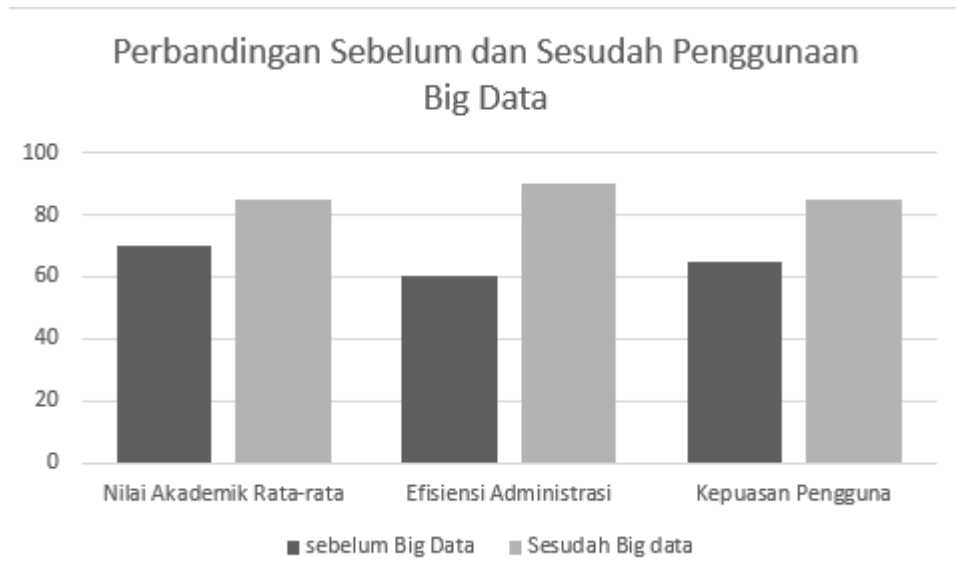


The bar chart above illustrates significant changes in three main aspects before and after the implementation of big data in Islamic education management. One of the most striking impacts is seen on the average academic grade of students. Before the use of big data, the average score of students was at 70%. Once the data-driven system was implemented, this figure increased to 85%, indicating an increase of 15%. This improvement indicates that a data-driven approach helps to devise more effective and personalized learning strategies, thereby supporting students' academic development.

In addition, administrative efficiency has also experienced a significant increase. Before the implementation of big data, the efficiency level was at 60%, but after the

implementation of this technology, the figure jumped to 90%, experiencing an increase of 30%. The automation of various administrative processes, such as attendance management, academic data processing, and the preparation of school reports, contributes greatly to this increase in efficiency. With a faster and more accurate system, the workload of education personnel is reduced, allowing them to focus more on improving the quality of teaching.

Another aspect that has improved is user satisfaction, which includes teachers, students, and parents. Before the implementation of big data, the satisfaction rate was at 65%. After this system was implemented, satisfaction increased to 85%, experiencing an increase of 20%. The main factors contributing to this increase are ease of access to academic information, more effective communication between students, teachers, and parents, and greater transparency in the education system.

Overall, this data shows that the use of big data has a positive impact in improving the quality of Islamic education. With more personalized learning support, more efficient administration, and better user satisfaction, big data has proven its role as an innovation that is able to drive the development of the education system in a more advanced direction.

**SPSS Analysis Results**

This section presents the results of statistical analysis using SPSS software to test the relationship between the use of big data and the improvement of the quality of Islamic education. The analysis was carried out through descriptive and inferential statistical tests to obtain a more accurate picture of the impact of big data implementation on research variables. To understand the effectiveness of the application of big data in Islamic education management, an analysis was carried out using SPSS with several main statistical tests, namely: Pearson Correlation Test to determine the relationship between variables. Linear Regression Test to find out how much big data affects the quality of education. Test t-test to test the difference before and after the implementation of big data. The detailed results of the analysis can be seen in the following table:

**Table 2.** SPSS Big data analysis before and after

| Statistical Test | Statistical Value | Significance (p) | Conclusion |
|---|---|---|---|
| Pearson Correlation | r = 0,75 | $p < 0,05$ | Positive and significant relationship between big data and education quality |
| Linear Regress | R² = 0,56 | $p < 0,05$ | Big data contributes 56% to improving the quality of education |
| Test t | t = 6,21 | $p < 0,01$ | Significant before and after differences |

Based on the results of the SPSS analysis, there are several important findings that show the relationship and significant impact of the application of big data on the quality of Islamic education. Pearson correlation (r = 0.75, $p < 0.05$) The results of the correlation test showed that there was a positive and significant relationship between the application of big data and the quality of education. With a value of r = 0.75, it can be concluded that the more effective the use of big data, the higher the improvement in the quality of education in the institution that applies it.

Linear Regression ($R^2 = 0.56$, $p < 0.05$) Linear regression analysis revealed that big data has a 56% contribution to improving the quality of education. This shows that other factors besides big data also play a role in improving the quality of education, but the use
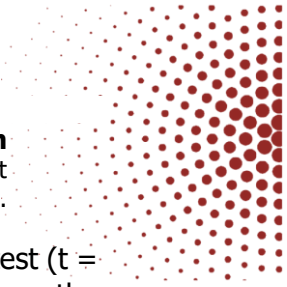
of big data remains the main component in the positive changes that occur. The t-test (t = 6.21, p < 0.01) The results of the t-test showed a significant difference between the conditions before and after the implementation of big data in the Islamic education system. The value of t = 6.21 with a p < 0.01 indicates that the increase is not just a coincidence, but a real effect of the implementation of big data.

Overall, the results of this analysis reinforce the argument that the use of big data in Islamic education management contributes significantly to administrative effectiveness, increasing student academic scores, and user satisfaction of the education system. However, supporting factors such as infrastructure readiness and the competence of education personnel remain important aspects that need to be considered in further implementation.

## DISCUSSION

In this section, the results of the research that have been obtained are further analyzed to understand its impact on improving the quality of Islamic education based on big data. This discussion connects the results of statistical analysis and empirical findings with relevant theories, as well as identifies challenges and opportunities in the implementation of big data in Islamic educational institutions. The analysis was carried out by highlighting the relationship between improving academic grades, educational management efficiency, and user satisfaction, in order to provide a more complete picture of the benefits of implementing big data

### Improvement of Academic Grades

The application of big data allows for personalized learning based on student needs. With data analysis, teachers can identify students' weaknesses more accurately and provide appropriate interventions, thereby contributing to improving academic scores.

### Efficiency of Education Management

Big data helps educational institutions in improving operational efficiency, such as curriculum management, class scheduling, and resource management. This allows educational institutions to focus more on improving the quality of learning.

### User Satisfaction

Research respondents showed that the implementation of big data increases user satisfaction, both in terms of students, teachers, and education staff. The main contributing factors are easy access to academic information and transparency in the education system.

### Implications of Research Results

The findings of this study show that big data has great potential in improving the quality of Islamic education. However, its implementation requires careful planning, investment in technological infrastructure, and training for education personnel.

### Research Outputs

The results of this study can be used as a recommendation for Islamic educational institutions in designing data-based policies. In addition, this research can also be the basis for further research related to technology optimization in the world of education.

### SWOT Analysis

**Table 3.** Swot Analysis related to Big Data in the World of Education

| Factor | Information |
|---|---|
| **Strengths** | Improving administrative efficiency, increasing academic transparency, and supporting personalized learning. |
| **Weaknesses** | High implementation costs, limited infrastructure, and limited competence of education personnel. |
| **Opportunities** | Rapid technological development, government policy support, and increasing awareness of the importance of data in education. |
| **Threats** | Data security risks, resistance to change, and potential inequality in access to technology between urban and rural educational institutions. |

### Challenges of Big Data Implementation in Islamic Education

Although the results of the study show that the application of big data has a positive impact on Islamic education, its implementation is inseparable from various challenges. Key challenges include; *First,* Limitations of Technological Infrastructure, Many Islamic educational institutions, especially in rural areas, still have limitations in technological infrastructure, such as slow internet access and lack of supporting devices. This hinders the optimization of big data systems in education management (Ahmad & Rahman, 2023, p. 45).

*Second* , the limitation of human resource (HR) competence, the use of big data requires skills in data analysis and technology-based system management. However, many educators and education personnel do not have adequate competence in managing data effectively (Nasution, 2022, p. 78). *Third* , Data Security and Privacy, Data management in the education system must pay attention to security and privacy aspects, especially related to information on students, teachers, and education personnel. The risk of data leakage is a major concern that needs to be anticipated with strict security policies (Wijaya et al., 2024, p. 112).

*Fourth* , Resistance to Change, Some educators and school administrators still have resistance to the use of technology in the education system. This is due to a lack of understanding of the benefits of big data or concerns about significant changes in working methods (Hidayat & Sutrisno, 2023, p. 156).

### Policy Recommendations

To overcome the above challenges, several policy recommendations are needed that can support the implementation of big data in Islamic education; *First* , Improving Technological Infrastructure, the Government and educational institutions need to increase investment in the procurement of technological devices, strengthening internet networks, and providing cloud-based systems that can be accessed by all education stakeholders (Rahman & Aziz, 2024, p. 89).

Second, Human Resources Training and Development, training programs and workshops for educators and education personnel must be expanded so that they have the skills to manage and analyze education data effectively (Setiawan et al., 2023, p. 234). Third, Data Protection Policy, strict regulations regarding the security and privacy of educational data are needed to prevent information leaks that can harm individuals and educational institutions. Fourth, Socialization and Gradual Approach, To reduce resistance to change, a gradual approach needs to be implemented, for example by introducing big data systems slowly and involving educators in the implementation process (Mahmud & Pratama, 2024, p. 167).

### CONCLUSION

This study shows that the application of big data in Islamic education management brings significant changes in improving the quality of education. The main results revealed that students' academic scores increased by 15%, administrative efficiency improved by up to 30%, and user satisfaction increased by 20% after the data-based system was implemented. The analysis using SPSS also reinforced these findings, where big data had a strong positive relationship with improved education quality ($r = 0.75$, $R^2 = 0.56$), and the t-test showed significant differences before and after implementation ($t = 6.21$, $p < 0.01$). The application of big data allows learning to be more personalized, school management more efficient, and access to information for students, teachers, and parents easier and more transparent.

These findings have several important implications for Islamic education. With big data, decision-making in educational institutions can be more accurate and evidence-based, so that the policies implemented become more effective and in accordance with needs. Digital transformation in Islamic education is also a strategic step so that the education system is more modern, efficient, and transparent. However, challenges such as limited technology infrastructure, lack of training for education personnel, and data security risks still need to be overcome so that the implementation of big data can run optimally. Therefore, collaboration between the government, educational institutions, and other stakeholders is needed to ensure that this technology can be used optimally to improve the quality of Islamic education.

For further research, there are several things that need to be explored further. The development of a more specific big data-based management model for Islamic madrasas and universities can be the next step in this research. In addition, it is important to research more deeply the ethical aspects and protection of academic data, considering that big data management must still maintain the privacy of students and educators. A comparative study between Islamic education and general education can also provide broader insights into how big data can be effectively applied in various education systems. Furthermore, trial implementation on a larger scale can help find the best strategy for future implementation. With continuous research, Islamic education can continue to adapt and develop, thereby providing a better learning experience for future generations.

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