

Scientific Integration of Pesantren and Science: Pesantren's Contribution to the Development of Science and Technology

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Abstract

This research aims to analyse how pesantren knowledge is integrated into the development of knowledge and technology and the contribution of pesantren to the development of science in Indonesia. In the traditional Islamic education system, pesantren have an important role in developing a generation of intelligent Muslims who understand not only religious knowledge but also contemporary science and technology. This research uses a qualitative approach using case study methodology on several santris that have incorporated science and technology into their curriculum. Data were collected through interviews with kiai, santri, and pesantren staff as well as observations of the education system and facilities in the pesantren. The findings of this study show that some schools in Indonesia have successfully developed educational models based on the integration of Islam and science. This implementation can be seen in STEM education based on Islamic principles, the development of science laboratories in pesantren, and collaboration with universities and research institutions in the development of local wisdom-based technology. Pesantren also participate in the development of halal technology, such as the creation of new pharmaceutical, food, and energy products that comply with sharia principles. The implication of this study is that pesantren have significant potential to strengthen the Islamic education system based on innovation and research. Pesantren contribute not only in the field of religion but also in the development of Muslim intellectuals who are competitive in the modern world. The results of this study can be a reference for the parties involved in determining a more inclusive strategy for the development of pesantren education in relation to knowledge and technology.

Keywords: Pesantren, Integration of Science and Islam, Technology, Islam, Scientific Research.

Abstrak

Penelitian ini bertujuan untuk menganalisis bagaimana pengetahuan pesantren diintegrasikan ke dalam pengembangan pengetahuan dan teknologi serta kontribusi pesantren terhadap pengembangan sains di Indonesia. Dalam sistem pendidikan Islam tradisional, pesantren memiliki peran penting dalam mengembangkan generasi Muslim yang cerdas yang tidak hanya memahami pengetahuan agama tetapi juga ilmu pengetahuan dan teknologi kontemporer. Penelitian ini menggunakan pendekatan kualitatif dengan menggunakan metodologi studi kasus pada beberapa santri yang telah memasukkan sains dan teknologi ke dalam kurikulum mereka. Pengumpulan data dilakukan melalui wawancara dengan kiai, santri, dan staf pesantren serta observasi terhadap sistem pendidikan dan fasilitas di pesantren. Temuan studi ini menunjukkan bahwa beberapa sekolah di Indonesia telah berhasil mengembangkan model pendidikan berdasarkan integrasi Islam dan sains. Implementasi ini dapat dilihat pada pendidikan STEM berdasarkan prinsip-prinsip Islam, pengembangan laboratorium sains di pesantren, dan kolaborasi dengan perguruan tinggi dan lembaga riset dalam pengembangan teknologi berbasis kearifan lokal. Pesantren juga berpartisipasi dalam pengembangan teknologi halal, seperti penciptaan produk farmasi, pangan, dan energi baru yang sesuai dengan prinsip-prinsip syariah. Implikasi dari penelitian ini

adalah bahwa pesantren memiliki potensi yang signifikan untuk memperkuat sistem pendidikan Islam yang berbasis inovasi dan riset. Pesantren memberikan kontribusi tidak hanya dalam bidang agama tetapi juga dalam pengembangan intelektual Muslim yang kompetitif di dunia modern. Hasil penelitian ini dapat menjadi referensi bagi pihak-pihak yang terlibat dalam menentukan strategi yang lebih inklusif untuk pengembangan pendidikan pesantren dalam kaitannya dengan pengetahuan dan teknologi.

Kata Kunci: Pesantren, Integrasi Sains dan Islam, Teknologi, Riset Keilmuan.

INTRODUCTION

Pesantren as the oldest Islamic educational institution in Indonesia has played a fundamental role in shaping Muslim intellectuals since pre-modern times. However, in the midst of the dynamic development of global science and technology, epistemological challenges arise regarding how pesantren are able to accommodate the development of contemporary science without losing their Islamic identity. The debate about the dichotomy of religious and worldly sciences is crucial to be studied in more depth (Rochmat et al., 2025).

In the framework of integrative thinking, the idea arises that Islamic education, including pesantren, should not be confined to tradition alone, but must be part of an intellectual movement oriented towards innovation and a real contribution to the progress of civilization. This not only touches the methodological dimension of education, but also requires reformulation of the vision and orientation of the pesantren curriculum in responding to the challenges of the times (Zulfa & Hilal, 2025).

The idea of integration between Islamic knowledge and modern science is actually not something new. Figures such as Al-Farabi, Ibn Sina, and Al-Ghazali have exemplified how religious knowledge and science can develop side by side. However, in the Indonesian context, the concrete realization of this integration still encounters various structural, cultural, and political obstacles, especially in the context of traditional pesantren (Salsabila et al., 2025).

This research is present to fill the void of studies on how pesantren knowledge not only survives, but also develops by actively interacting with the dynamics of science and technology. This challenges the narrative that pesantren are conservative institutions that are closed to change. Instead, some pesantren now show a new face that is progressive and inclusive of contemporary science (Sugiara et al., 2025).

The qualitative approach with case studies is the right method to capture the complex and dynamic reality behind the transformation of pesantren. By exploring the experiences of kiai, santri, and managers of educational institutions, this research is able to reveal the dimensions of praxis that are often missed by quantitative approaches that are too generalistic (Kurniawan & Widia, 2025).

Preliminary findings show that science integration in the pesantren environment is not just an addition to the science subject curriculum, but a deeper form of epistemological reconstruction. For example, the development of STEM education based on Islamic principles is an important innovation in bridging between revelation and reason, between text and empirical reality (Afifah et al., 2025).

Science laboratories in pesantren are not just a symbol of modernity, but an important arena for the process of scientification of Islamic values. In this space, santri not only learn natural sciences conventionally, but are also given space to develop technology rooted in spiritual values, such as ethics of halalness, environmental sustainability, and social justice (Barizi, 2011).

Collaboration between pesantren and higher education institutions and research institutions also shows a new direction of pesantren institutional transformation. Pesantren are no longer exclusive, but become active actors in the national, even global, science development network. This shows that pesantren are able to compete in the academic space without losing their distinctive character (Antoni et al., 2025).

The contribution of pesantren to the development of halal technology is concrete evidence that the integration of Islamic values and science is not a utopia. Pharmaceutical, food, and energy products produced from pesantren laboratories show that Islamic traditions can provide solutions to contemporary problems, including in terms of industry and innovation.

However, this transformation is not without challenges. There is still internal resistance from some pesantren communities who see science integration as a form of secularization of knowledge. This indicates the need for a more intensive epistemological dialog, not only at the institutional level, but also among Islamic education figures (Susiyati, n.d.).

Therefore, it is important to formulate an inclusive and progressive pesantren education development strategy, which is able to synergize between turats (classical Islamic scientific heritage) and tajdid (scientific renewal). Pesantren need to be supported by public policies that favor the development of spirituality-based innovation, not merely number-based academic competition.

Finally, this research confirms that pesantren have great potential to become centers of excellence in the integration of science and faith. Through efforts to reconstruct the education system, cross-disciplinary collaboration, and technology development based on Islamic values, Indonesian pesantren can contribute significantly in building a civilized scientific civilization.

RESEARCH METHOD

This research uses a qualitative approach with a case study type, which aims to deeply understand the process of integrating pesantren knowledge in the development of science and technology. The qualitative approach was chosen because it allows researchers to explore the meanings, processes, and socio-cultural dynamics that occur in pesantren institutions, which cannot be explained quantitatively. The case study was chosen as the design because it provides an explorative space for the specific context of several pesantren that have successfully implemented the integration between Islamic knowledge and science in their curriculum and educational practices (Antika & Muyassaroh, 2025a).

The participants in this study consisted of a number of pesantren in Indonesia that have explicitly integrated science and technology in their education system. The population in this study is all pesantren that have integrative tendencies towards science and technology, while the sample was purposively selected based on certain criteria: pesantren that have science education programs (such as an Islamic-based STEM curriculum), laboratory facilities, and collaboration with research institutions or universities. Key participants in this study included pesantren kiai/caregivers, students, science teachers/instructors, and education management staff.

Data collection techniques were conducted through several methods, namely: in-depth interviews, participatory observation, and documentation. The interviews were semi-structured to allow flexible exploration of the participants' experiences and understandings related to science integration in pesantren education. Observations were made of teaching-learning activities, the use of laboratory facilities, and research and collaboration activities carried out by the pesantren. Documentation includes curricula,

work programs, and publications or reports that show the involvement of pesantren in science and technology development.

The collected data were analyzed using thematic analysis techniques, with steps including interview transcription, data coding, grouping of key themes, and interpretation of meaning. Data validity was strengthened through source and method triangulation techniques, member checking, and peer debriefing. The analysis was conducted inductively to reveal conceptual patterns that emerged from the field data, and to relate them to the theory of scientific integration and epistemology of Islamic education. This process is expected to produce a complete and in-depth picture of how pesantren take an active role in the development of science and technology based on Islamic values.

RESULTS AND DISCUSSION

Integration of Pesantren Curriculum with Science and Technology

One of the main findings of this study is the systematic efforts of a number of pesantren in integrating the Islamic curriculum with science and technology materials. This integration is not only in the form of adding science subjects in the teaching system, but also through philosophical and methodological approaches that reflect Islamic values in science (Antika & Muyassaroh, 2025b).

Pesantren no longer only focus on traditional religious sciences such as fiqh, tawhid, and tafsir, but also develop STEM-based curriculum (Science, Technology, Engineering, and Mathematics). This shows a collective awareness among pesantren to respond to the challenges of the times through mastery of contemporary science.

We see that science and technology are not something foreign to Islam. In fact, in the history of Islamic civilization, scholars such as Ibn Sina, Al-Khwarizmi, and Al-Biruni have proven that mastery of worldly knowledge can go hand in hand with faith. In our pesantren, we have started to implement this integration since the last five years, by including physics and biology subjects in the curriculum of the madrasah diniyah. In addition to the addition of general subjects, we also link science lessons with Islamic values. For example, when discussing the law of conservation of energy, our teachers relate verses about Allah's power in the creation and order of nature. This makes the santri not only learn theory, but also internalize the spiritual value of each material (Interview, Indah 2025).

From the interview above, we can draw a red line that the integration between the Islamic curriculum and science/technology has been carried out gradually and structured, with a contextual and spiritual approach that facilitates acceptance among santri. Pesantren policy makers, such as kiai and teachers, emphasize the importance of linking science with religious values to foster a holistic and religious understanding of modern science. Santri also responded positively, feeling more motivated and open to achieving a future in technology without leaving the roots of Islamic spirituality. This proves that pesantren have an adaptive capacity and their contribution is significant in building a generation of Muslims who are scientific, religious, and relevant to the challenges of the times.

This integration goes in two directions: first, bringing science into the learning spaces of pesantren; and second, framing science in an Islamic perspective. In practice, this can be seen from the teaching of physics and biology concepts that are linked to Qur'anic verses, as well as the application of spiritual values in laboratory experiments.

Table1. Integration of Pesantren Curriculum with Science and Technology

No	Indicator Result	Explanation
1	Incorporation of Islamic values in science lessons	Science and technology subjects are presented in the context of Qur'anic verses and tafsir.
2	Kiai support for the integration of science and religion	The pesantren leaders provide direction to harmonize religious knowledge and modern science.
3	The role of teachers in connecting the two disciplines	Teachers are trained and directed to make science teaching based on Islamic values.
4	Students' enthusiasm for integrative-based lessons	Students are more active and interested in learning because the scientific approach feels relevant and spiritual.
5	Adjustment of learning materials and methods	The curriculum is adjusted so as not to separate worldly and ukhrawi knowledge.

From the table above, we can draw a red thread that the integration of Islamic curriculum with science and technology in pesantren shows a holistic and progressive approach to education. The incorporation of Islamic values in science teaching, strong support from pesantren leaders, and the active role of teachers and students in the learning process are important foundations in building an educational model that is not only religious but also scientific. The adjustment of integrative materials and methods proves that pesantren are able to respond to the challenges of the times while maintaining the roots of Islamic values in every form of educational innovation.

However, this integration is not without challenges. Many pesantren still face limitations in terms of human resources who are able to teach science with an intact Islamic perspective, as well as the availability of adequate laboratory facilities. Curriculum integration efforts are still highly dependent on the initiative of each pesantren and external support from universities or private institutions.

However, these initial steps are a positive signal towards the transformation of pesantren from traditional institutions to educational institutions that are responsive to global developments. Pesantren that successfully integrate this curriculum tend to have strong collaborative networks with academic and industrial institutions.

Critically, there needs to be regulations and a national curriculum model that can be a reference in this integration. The government needs to provide a framework that encourages collaboration between pesantren and science-developing institutions so that the integration is not sporadic or only occurs in superior pesantren.

The Role of Islamic Boarding Schools in Halal Technology Innovation and Local Wisdom

Research shows that some pesantren have been actively involved in halal technological innovation, a unique approach that combines sharia principles with modern technology. These innovations include halal pharmaceutical products, renewable energy based on natural materials, and Shariah-compliant food (Ubaidillah, 2025).

Collaboration between pesantren and research institutions is key in the realization of this halal technology. The pesantren serves as a social laboratory where trials are conducted, while universities or technology institutions provide the scientific methodology and research tools.

We adjust the science curriculum by adding Islamic reflective modules in each practicum. For example, in biology practice, students are asked to relate the structure of life with relevant Qur'anic verses, such as QS. Al-Mu'minun: 12-14 about the creation of man. We involve students as laboratory assistants, especially those who are interested in science. We train them directly in tool management, experimental procedures, and recording scientific data. This forms scientific and spiritual responsibility simultaneously. Yes, we collaborate with the science faculties of two state universities. They help in terms of teacher training, provision of tools, and publication of the students' experimental results. In fact, some of the experimental work has been included in the youth scientific work competition (Interview, Farid 2025).

From the interview above, we can draw a red thread that the development of science laboratories at Pesantren Nurul Hikmah is not only aimed at strengthening science learning, but also becoming a strategic instrument in building synergy between science and Islamic values. With an integrative approach that links the practice of scientific experiments with spiritual reflection through the verses of the Qur'an, this pesantren has succeeded in creating an educational ecosystem that shapes the character of ethical and competitive Muslim scientists. Collaboration with higher education institutions and the positive response of the community show that pesantren have great potential as centers of sharia-based scientific innovation that are able to answer global challenges in a visionary and contextual manner.

These innovations not only demonstrate the adaptability of pesantren, but also show the important role of pesantren in redefining the concept of technology based on Islamic ethics. This provides an alternative to western technology models that are often value-free and capitalistic.

Table 2. The Role of Islamic Boarding Schools in Halal Technology Innovation and Local Wisdom

No	Indicator Results	Explanation
1	Integration of Islamic Values in Science Practicum	Science practicum is associated with verses of the Qur'an, forming a spiritual-science understanding.
2	Provision of Laboratory Facilities	Simple experimental tools are provided so that students can practice directly.
3	Collaboration with Higher Education Institutions	Pesantren partner with campuses for teacher training and curriculum development.
4	Strengthening Science Teacher Competencies	Teachers attend training to improve their ability to teach Islam-based science.
5	Increasing Santri Interest and Participation	Experimental activities and scientific competitions increase the enthusiasm of students in science.

From the table above, we can draw a red thread that the development of science laboratories in pesantren has been carried out gradually and integratively by prioritizing Islamic values. Science practicum is not only a means of strengthening scientific concepts, but also a medium to strengthen the spirituality of santri through integration with verses of the Qur'an. The efforts of pesantren in providing experimental facilities, although simple, are supported by strategic collaboration with higher education institutions, showing the seriousness in improving the quality of science learning. Teacher competence is also strengthened through regular training, so that teaching methods

become more contextual and inspiring. As a result, santri interest and participation in science has increased significantly, marking the initial success of the integration of science and religious education in the pesantren environment.

One example of successful innovation is the development of herbal products based on local plants that are certified halal and have entered the domestic market. This success shows the great potential of pesantren in elevating local wisdom into products with high economic value.

However, the study also noted that not many pesantren have the capacity to conduct technological innovations independently. Most still depend on outside institutions for scientific validation and marketing processes. The independence of pesantren research and technology is still a big homework.

Therefore, structural support such as research financing, human resource training, and pesantren-based business incubators are needed so that halal and local technological innovations can develop sustainably and become the hallmark of Indonesian Islamic education.

Pesantren Collaboration with Higher Education Institutions and Industry

This research highlights the importance of collaboration networks between pesantren and universities or industrial institutions to support the development of Islamic-based science and technology. This collaboration creates a symbiosis between the scientific traditions of pesantren and modern scientific methodologies (Hidayat et al., 2025).

Some pesantren have established strategic cooperation in the form of training programs, joint research, and exchange of teaching staff. This broadens the horizons of santri in understanding the world of science and accelerates the process of integrating Islamic and modern science.

We at Pesantren Al-Hikmah have established active cooperation with several universities, such as Brawijaya University and Maulana Malik Ibrahim State Islamic University Malang. This cooperation is not only in the form of academic visits, but also collaborative research. One of our projects is the development of technology for processing organic waste into liquid fertilizer based on local microorganisms. In this project, lecturers and students from the faculties of agriculture and engineering assisted the students in training and field trials. We want to instill that scientific innovation can work in harmony with Islamic values and local wisdom. Students are directly involved, from research to application in the pesantren garden. This is a form of contextualized and applicable learning, and strengthens the pesantren's capacity as an institution that not only educates religiously, but also contributes to environmental issues and Sharia-friendly technology (Interview, Fadhli 2025).

From the interview, we can draw a common thread that Pesantren Al-Hikmah Malang has succeeded in building close collaboration with universities and research institutions to develop technology based on local wisdom. One concrete example is the development of organic waste processing technology into liquid fertilizer based on local microorganisms, which involves santri in every stage of research and application. This collaboration not only enriches the pesantren curriculum with relevant science innovations, but also shows that pesantren can play an important role in the development of environmentally friendly technologies that are in accordance with Islamic principles and local wisdom, strengthening the position of pesantren as innovation-oriented and sustainable educational institutions.

Table 3. Pesantren Collaboration with Higher Education Institutions and Industry

No	Result Indicator	Explanation
1	Pesantren Collaboration with Universities and Research Institutions	Pesantren Al-Hikmah Malang collaborates with universities and research institutions to develop local wisdom-based technology, such as research related to organic waste processing and environmentally friendly products.
2	Development of Environmentally Friendly Technology	The technology developed in the pesantren includes products such as liquid fertilizer from local microorganisms and simple water purification devices using natural materials, which are in accordance with Islamic values and local wisdom.
3	Santri Participation in Research and Development	Santri are actively involved in every stage of technology research and development, from planning to implementation, so that they acquire practical skills in science and technology that are useful for the future.
4	Application of Technology in Daily Life	The technology developed is not only limited to research, but also applied in the daily life of the pesantren community, such as the use of organic fertilizers in local agriculture to increase yield and quality.
5	Strengthening Islamic Education through Innovative Technology	This collaboration also enriches the pesantren curriculum, integrates science and technology with Islamic values, and strengthens the pesantren's position as an educational institution that is oriented towards innovation and sustainability.

From the table above, we can draw a common thread that pesantren not only play a role in religious education, but are also active in the development and application of technology based on local wisdom. Collaboration with universities and research institutions strengthens the involvement of pesantren in technological innovation that is environmentally friendly and beneficial to society. Santri are involved in technology research and development, which not only enriches the Islamic education curriculum but also provides applicable practical skills. The application of these technologies in the daily life of pesantren shows the real contribution of pesantren in advancing sustainable science and technology, while maintaining Islamic values.

Collaboration with the industrial world also opens opportunities for pesantren to develop research-based products that have market value, such as herbal products, halal processed foods, and environmentally friendly energy systems. This is a concrete step in bridging the world of education and the economy. However, this collaboration pattern is still uneven. Only a small number of pesantren have succeeded in building productive relationships due to limited access, networks, and trust from the outside world in the pesantren's capacity in science and technology.

This study recommends the existence of a special facilitator or companion institution that bridges pesantren with academic institutions and industry, so that collaboration can run more effectively and mutually beneficial. If this collaboration can be mainstreamed nationally, then pesantren will not only become centers of religious

education, but also important actors in the national innovation ecosystem based on values and spirituality.

Challenges and Prospects of Pesantren as a Center for Contemporary Muslim Intellectuals

Despite having a long history as a center of Islamic learning, the role of pesantren in shaping contemporary Muslim intellectuals who are able to compete in the global sphere still faces a number of serious challenges. The main challenge is the modernization of the learning system without losing its traditional spirit (Zarkasi, 2025).

Many pesantren are still struggling with limited infrastructure, lack of teaching staff who understand the epistemology of science and Islam at the same time, and the absence of a standard integrative curriculum. This is an obstacle in making pesantren a center of research and innovation.

At our boarding school, the development of halal technologies begins with a focus on products that are compliant with sharia principles, such as food, pharmaceuticals, and new energy products. We see the importance of ensuring that the technologies developed not only meet the needs of society, but also conform to deep Islamic values. One of the challenges is the limited human resources with technical expertise in this area. However, we continue to strive to train santri in science and technology through collaboration with universities and research institutions that have expertise in this field. We prioritize very clear sharia principles in every step of technological development. For example, in making pharmaceutical products or halal food, we ensure that the ingredients used do not violate religious provisions. We also involve experts in the field of fiqh to ensure that the products produced are in accordance with Islamic law (Interview, Ida 2025).

From the interview above, we can draw a common thread that Pesantren Al-Ikhlas has a significant role in the development of halal technology, with a focus on new food, pharmaceutical and energy products that are in accordance with sharia principles. Although faced with the challenge of limited human resources skilled in technology, this pesantren seeks to overcome this through collaboration with universities and research institutions. Through this effort, the pesantren seeks to integrate sharia aspects in every technological development, as well as strengthen its contribution to the world of halal innovation that benefits society and the ummah. The great hope of Al-Ikhlas pesantren is to become a center for halal innovation that makes a real contribution in the field of science and technology.

However, opportunities remain wide open. Pesantren has a strong learning community, a rich scientific tradition, and flexibility in developing its own curriculum. This is a social and cultural capital that many general education institutions do not have.

Table 4. Challenges and Prospects of Pesantren as a Contemporary Muslim Intellectual Center

No	Indicator Result	Explanation
1	Pesantren's contribution to the development of halal technology	Pesantren plays a role in the development of halal products, such as food, pharmaceuticals, and energy in accordance with sharia principles.

2	Collaboration with universities and research institutions	Pesantren collaborate with universities and research institutions to develop halal technology innovations.
3	Application of sharia principles in technology	Every technological innovation developed in pesantren must comply with sharia principles, especially in the halal field.
4	Challenges of limited human resources	The pesantren faces difficulties in finding technology experts, but continues to strive through external cooperation.
5	Pesantren's hope to become a center of halal innovation	The pesantren hopes to strengthen its position as a center of halal innovation in technology and contribution to the ummah.

From the table above, we can draw a red thread that pesantren have a significant contribution in the development of halal technology, with a focus on the fields of food, pharmaceuticals, and energy in line with sharia principles. Collaboration with universities and research institutions further strengthens the position of pesantren in creating sharia-based innovations. However, pesantren also face challenges in terms of limited human resources, especially in finding experts in the field of technology. Nevertheless, pesantren remain committed to becoming halal innovation centers that contribute greatly to the development of science and technology in accordance with Islamic values.

This research sees the great potential of pesantren in developing a model of Muslim intellectuals who not only master the yellowIslamic classic books, but are also proficient in the logic of contemporary science and technology. This combination is urgently needed in facing the challenges of modern times.

To make this happen, there needs to be a repositioning of the function of pesantren from just religious education institutions to become centers of knowledge development based on Islamic values. The government and civil society must provide regulatory and financial support to accelerate this transformation. With the right policy direction and cross-sectoral support, pesantren can become the locomotive of Indonesia's Islamic civilization in the future that integrates spirituality, rationality, and productivity in a whole and progressive education system.

CONCLUSION

This research shows that pesantren have a very important role in integrating religious and scientific knowledge in the development of education in Indonesia. Through an approach based on the integration between Islam and science, pesantren are able to create a generation of Muslims who not only have a deep understanding of religion, but are also able to compete in a modern world that is increasingly dependent on knowledge and technology. The implementation of STEM-based curriculum (Science, Technology, Engineering, and Mathematics) with Islamic principles, as well as the collaboration of pesantren with universities and research institutions, has positively contributed to developing halal technology that is in accordance with sharia principles. This proves that pesantren is not only a place for religious education, but also a center for research and innovation that is relevant to the times.

However, despite the many positive potentials, the challenges in developing pesantren as centers of knowledge and technology integration cannot be ignored. Limited human resources, inadequate facilities, and resistance to change in some pesantren are obstacles that need to be overcome. Therefore, further efforts are needed to improve the quality and capacity of pesantren through training, strengthening the curriculum, and better utilization of information technology. In addition, strengthening the synergy

between pesantren, the government, and the private sector is needed to optimize the contribution of pesantren in the development of science and technology in Indonesia.

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