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Innovative Approaches To Educational Supervision: Integrating Technology To Enhance Teacher Development

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Abstract:
This research aims to provide an innovative view in carrying out educational supervision by integrating technology to improve and develop teacher professionalism. This research uses a qualitative method with a case study approach. The sources of informants in this study include the principal, teacher council, quality control team, education supervisor, and education technology developer. Data collection techniques in this study involved observation, interviews and documentation to obtain comprehensive information about technology integration in educational supervision. The data analysis technique in this study used Milles and Huberman's interactive analysis model, which includes three main components: data reduction, data presentation, and conclusion drawing. Based on the results of the interviews, it can be concluded that MA Mukhtar Syafaat Blokagung has successfully implemented three innovative and effective professional development programs for its teachers. First, MOOC-based professional development programs, Second, the use of machine learning systems to predict teacher performance and Third, Teacher training using artificial intelligence (AI) simulations with advanced hardware support. All of these programs have created.

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INTRODUCTION

Teacher development can not only be achieved through traditional supervision methods, but more effectively by integrating technology that can provide real-time feedback and access to wider educational resources (Zhu et al., 2023; Hong & Zainal, 2024; Liu et al., 2024). Effective teacher development requires a more dynamic and responsive approach than traditional supervisory methods (Tunney & Hanreddy, 2021;Ocampo et al., 2021;Bohannon et al., 2024). Traditional methods are often limited to direct observation and periodic face-to-face sessions. In contast, the integration of

technology into educational supervision allows for more flexible and ongoing supervision. Technology can provide real-time feedback, which is crucial for immediate improvement and continuous development. This is reinforced by (Ghedin, 2021; Withorn et al., 2022; Hidayat-Ur-Rehman, 2024). that technology provides access to a wide and diverse range of educational resources, which can support the improvement of teacher competencies and skills more comprehensively. Thus, the integration of technology in educational supervision is more effective than traditional methods because it provides real-time feedback and access to extensive educational resources, thus supporting rapid improvement and a more comprehensive improvement of teacher competencies.

Research on innovative approaches to educational supervision that integrate technology into teacher professional development has been extensively studied by researchers. Teachers require ongoing professional development to remain relevant and effective in teaching (Winter et al., 2020; Hollweck, 2020; Rodrigues, 2023). Alsaywid et al (2023) Research by (Hammond LD, Hyle EM, 2017) found that professional development programs that use technology tend to be more effective in improving teaching skills than traditional methods. Thus, research on innovative approaches to educational supervision that integrate technology for teacher professional development has been extensive. Technology provides tools and platforms that enable more flexible, personalized, and interactive training, meeting diverse development needs (Aldosemani, 2023; Gupta, 2023). Research shows that technology-based professional development programs are more effective in improving teaching skills than traditional methods.

This research aims to provide an innovative perspective on implementing educational supervision by integrating technology to enhance and develop teacher professionalism. Efficiency in the Performance Evaluation Process: Technology accelerates the teacher performance evaluation process and provides more structured data for further analysis (Torabandeh et al., 2023; Sareminia & Mohammadi Dehcheshmeh, 2024). Experimental research using video-based observation shows that the use of technology in evaluation provides a more objective and detailed assessment of teaching practice, increasing the accuracy of evaluation (Tang et al., 2022; Estrella, 2024; Lyu et al., 2024). There fore, this research proposes a more innovative approach to educational supervision by integrating technology to enhance teacher professionalism. Technology accelerates and structures performance evaluations, provides more objective and detailed assessments of teaching practices, and improves evaluation accuracy.

The temporary argument in this study presents an innovative perspective in carrying out educational supervision by integrating technology to improve and develop teacher professionalism through MOOC-Based Professional Development Courses, Machine Learning Systems for Teacher Performance Prediction, and Teacher Training with Artificial Intelligence Simulation.

RESEARCH METHOD

The object of this research is the Islamic Educational Institution, namely MA

Mukhtar Syafa'at Blokagung, which was established and developed within the environment of the Mukhtar Syafa'at Blokagung Islamic Boarding School. The Islamic Educational Institution MA Mukhtar Syafa'at Blokagung was established within the Islamic boarding school environment, which has a significant influence on teaching methods, discipline, and learning culture. Researching this institution can provide an in-depth understanding of how the Islamic boarding school environment influences the education and development of students. The selection of MA Mukhtar Syafa'at Blokagung as the object of this research is based on the unique characteristics of the Islamic educational institution that was established and developed within the environment of the Mukhtar Syafa'at Blokagung Islamic Boarding School. This Islamic boarding school environment offers a rich context for exploring innovative approaches in educational supervision, especially in the integration of technology. MA Mukhtar Syafa'at Blokagung, with its strong Islamic history and tradition, provides an opportunity to see how technology can be applied within an educational framework oriented towards religious values. In addition, this institution has a strong commitment to teacher quality development, making it an ideal place to research the effectiveness and challenges of implementing technology in teacher supervision and professional development.

This research design uses a qualitative method with a case study approach to explore innovative approaches in educational supervision that integrate technology to improve teacher development. Qualitative methods allow researchers to explore in-depth the experiences, perceptions, and practices at MA Mukhtar Syafa'at Blokagung. The case study approach was chosen to provide a comprehensive understanding of the implementation of technology in educational supervision in one specific context, namely Islamic educational institutions in the Islamic boarding school environment. Data were collected through in-depth interviews, participant observation, and documentation analysis, then analyzed using thematic analysis techniques to identify key themes related to the effectiveness, challenges, and impacts of technology use in educational supervision.

The informants in this study included the principal, the teaching staff, the quality control team, the educational supervisor, and the educational technology developer at MA Mukhtar Syafa'at Blokagung. The principal provided strategic insights into technology policy and implementation in educational supervision, while the teaching staff shared their practical experiences and challenges in using technology for their professional development. The quality control team played a role in evaluating educational quality standards and the effectiveness of technology-based supervision, while the educational supervisor provided an external perspective on school and teacher performance. Additionally, the educational technology developer contributed by providing software and platforms used in the supervision process, ensuring that the technology implemented was aligned with educational needs and goals.

Data collection techniques in this study involved observation, interviews, and documentation to obtain comprehensive information regarding the integration of technology in educational supervision. Observations were conducted to directly observe the application of technology in the supervision process and daily interactions

at MA Mukhtar Syafa'at Blokagung. In-depth interviews with the principal, teachers, quality control team, educational supervisors, and educational technology developers allowed researchers to explore experiences, perceptions, and challenges related to technology use. Documentation, including reports, evaluation records, and training materials, was used for analysis.policies, procedures, and evidence of technology implementation in supervision. The combination of these three techniques ensures that the data obtained is accurate, relevant, and in-depth.

The data analysis technique in this study uses the Milles and Huberman interactive analysis model, which includes three main components: data reduction, data presentation, and conclusion drawing. Data reduction is carried out by filtering and summarizing relevant information from interviews, observations, and documentation, thus focusing the analysis on the main themes that emerge. Data presentation is carried out by organizing and arranging the reduced data in a form that facilitates interpretation, such as tables, graphs, or structured narratives. Conclusion drawing involves an in-depth analysis of the presented data to identify patterns, relationships, and meanings related to the use of technology in educational supervision and teacher development, as well as summarizing the main findings of the study.

RESULT AND DISCUSSION

Result

MOOC-Based Professional Development Courses

Based on field interview data, the MA Mukhtar Syafaat school has implemented MOOC-based professional development. The integration of Massive Open Online Courses (MOOCs) into teacher professional development allows teachers to flexibly take online courses tailored to their needs and interests.The integration of Massive Open Online Courses (MOOCs) into teacher professional development offers high flexibility and accessibility. Teachers can take online courses tailored to their needs and interests, anytime and anywhere, without being limited by time and place. This allows teachers to continue learning and developing despite their busy schedules. Based on field interview data, the MA Mukhtar Syafaat Blokagung school institution has implemented MOOC-based professional development. Teachers at the school reported that they were able to take various online courses relevant to their fields, which helped them update their teaching knowledge and skills. Based on an interview with Mr. Khoirul Anwar S.Pd, the principal of MA Mukhtar Syafaat Blokagung, that

> “At MA Mukhtar Syafaat Blokagung, we have been implementing a professional development program based on Massive Open Online Courses (MOOCs) for the past few years. This program is designed to provide our teachers with access to a variety of online courses relevant to their fields. The response from teachers has been overwhelmingly positive. They find these online courses very helpful in updating their knowledge and teaching skills. MOOCs provide significant flexibility, allowing them to study at their own pace, which is crucial given their busy teaching schedules.”

The interview above was confirmed by Mrs. Noviatul Azizah S.Pd, as the quality control board of MA Mukhtar Syafaat Blokagung, that

"MOOC-based professional development at MA Mukhtar Syafaat Blokagung has had a very positive impact. This program allows teachers to access up-to-date training materials tailored to their needs, significantly improving the quality of teaching. We give teachers the freedom to choose the courses that best suit their needs. However, we also provide general guidelines to ensure the courses are relevant to the subjects they teach and the skills they want to develop. Furthermore, we conduct regular evaluations to assess the effectiveness of the courses."

Based on the interview results above, the Massive Open Online Courses (MOOC) based professional development program at MA Mukhtar Syafaat Blokagung has been implemented successfully and has had a significant positive impact. Mr. Khoirul Anwar S.Pd, the principal, said that the teachers responded very well to the program, feeling that the online courses helped them update their teaching knowledge and skills, with the flexibility of time that was very helpful in coping with busy teaching schedules. Ms. Noviatul Azizah S.Pd, as the quality control board, added that the program allows teachers to access up-to-date and relevant training materials, and provides the freedom to choose courses that suit their needs, with general guidelines and regular evaluations to ensure their effectiveness. As a result, the MOOC program has succeeded in improving the quality of teaching at MA Mukhtar Syafaat Blokagung.

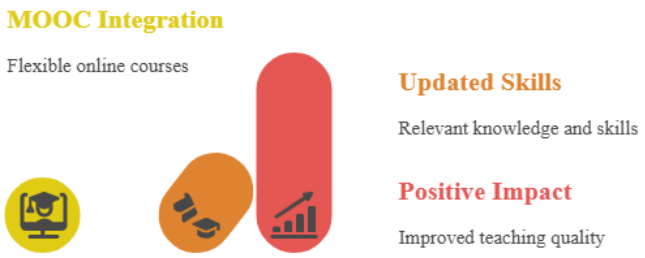

Figure 1. MOOCs Improve Teacher Skills

Machine Learning System for Teacher Performance Prediction

Based on field interview data at the MA Mukhtar Syafaat Blokagung school, this institution has implemented the use of a machine learning system to predict potential teacher performance based on historical data and key factors, so that supervisors can plan more effective interventions. The use of a machine learning system at MA Mukhtar Syafaat Blokagung to predict potential teacher performance is based on the ability of this technology to analyze historical data and identify complex patterns. With this analysis, supervisors can plan more targeted and effective interventions, helping to improve the quality of teaching and learning in schools. This is based on the results of an interview with the principal of MA Mukhtar Syafa'at Blokagung, Mr. Khoirul Anwar S.Pd. that

"At MA Mukhtar Syafaat, we have implemented a machine learning system to help predict teacher performance. This system analyzes historical teacher performance data and various key factors, such as educational background, teaching experience, and previous performance evaluations. Using machine

learning algorithms, we can make more accurate predictions about a teacher's potential future performance."

And reinforced again by Mrs. Noviatul Azizah, S.Pd. namely

"At MA Mukhtar Syafa'at Blokagung, we have implemented a machine learning system to predict potential teacher performance using historical data and key factors. The system analyzes various data, such as previous evaluation results, attendance, and feedback from students and supervisors. With this information, we can predict areas that may require more attention and plan more effective interventions. This helps us provide more targeted guidance and better support teachers' professional development."

Based on the results of interviews with Mr. Khoirul Anwar, S.Pd., and Mrs. Noviatul Azizah, S.Pd. from MA Mukhtar Syafa'at Blokagung, it can be concluded that this institution has successfully implemented a machine learning system to predict teacher performance. The system analyzes historical teacher performance data and various key factors, such as educational background, teaching experience, previous evaluation results, attendance, and feedback from students and supervisors. By using machine learning algorithms, the resulting predictions become more accurate regarding the potential future performance of teachers. This implementation allows supervisors to plan more effective interventions and provide more targeted guidance, thereby supporting optimal teacher professional development.

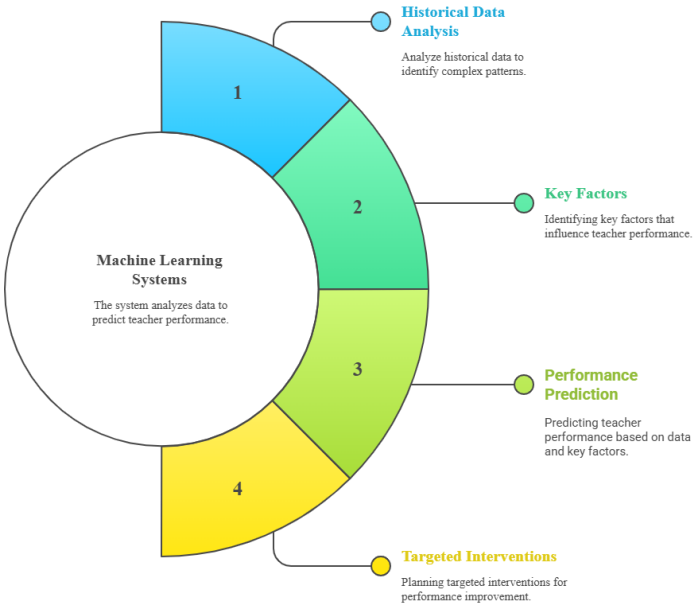

Figure 2. Predicting Teacher Performance with Machine Learning

Teacher Training with Artificial Intelligence Simulation

Based on field interview data, the MA Mukhtar Syafaat Blokagung school institution has begun using AI-based simulations to provide practical training to teachers in handling various classroom situations, including behavior management and teaching. The use of AI-based simulations at MA Mukhtar Syafa'at Blokagung aims to provide more effective and realistic practical training to teachers. The components that have been used in AI-based simulation training at MA Mukhtar Syafaat Blokagung

include Hardware and Supporting Equipment for computers or other devices compatible with simulation software, as well as audio and visual devices such as headsets, microphones, and screens or projectors. Interactive Training Modules that allow teachers to interact with simulations, make decisions, and see the consequences of their actions in real time. This module is designed to provide direct feedback to trainees. From the simulations that have been implemented, this allows teachers to practice facing various classroom situations in a safe and controlled environment, so they can develop better behavior management and teaching skills. By simulating real scenarios, teachers can experience and react to various classroom challenges, increase their confidence, and prepare them to face similar situations in the real world. This technology also provides immediate and objective feedback, which is crucial for continuous improvement and enhancing the quality of teaching. This rationale is supported by interviews with Mr. Khoirul Anwar, S.Pd., and Ms. Noviatul Azizah, S.Pd., which revealed:

> "At MA Mukhtar Syafaat, we use sophisticated computers and supporting equipment such as headsets, microphones, and projectors for AI simulations. Our computers are equipped with high specifications to ensure the simulations run smoothly without any technical hiccups. Headsets and microphones are used for live interaction during the simulations, allowing teachers to communicate and interact with the simulated scenarios. Projectors are used to display the simulations in the training room, allowing all participants to view and learn together. They found the use of modern, interactive hardware to be very helpful in the training. Our teachers were able to practice more realistically and intensively, and the devices provided a more immersive and effective learning experience. While there were some initial technical and adaptation challenges, over time, they became more accustomed and comfortable with the technology."

The interview above was confirmed by Mrs. Noviatul Azizah S.Pd, as the quality control board of MA Mukhtar Syafaat Blokagung, that

> "Our interactive training modules are designed to provide teachers with a practical and immersive learning experience. They cover a variety of realistic classroom scenarios, such as managing student behavior, teaching challenging material, and handling emergencies. Teachers can interact directly with the simulations, make decisions, and see the results of their actions in real time. The modules also provide instant feedback, allowing teachers to quickly understand and correct their mistakes. We've seen significant improvements in our teachers' classroom management skills and teaching strategies. They've become more prepared and confident in handling various classroom situations. Furthermore, we've seen an increase in positive interactions between teachers and students, which has resulted in a better overall learning environment."

Based on an interview with Mr. Khoirul Anwar, S.Pd. and Mrs. Noviatul Azizah, S.Pd., at MA Mukhtar Syafaat Blokagung, teacher training using artificial intelligence (AI) simulations with the support of advanced hardware such as high-performance computers, headsets, microphones, and projectors has been implemented. These devices enable the simulations to run smoothly and provide an immersive and

interactive learning experience for teachers. The interactive training modules cover realistic scenarios such as student behavior management, teaching difficult material, and handling emergency situations, and provide instant feedback to help teachers correct mistakes. As a result, there has been a significant improvement in classroom management skills and teaching strategies, as well as positive interactions between teachers and students, creating a better learning environment. Despite initial technical challenges, teachers are now accustomed and comfortable using this technology, demonstrating the success and effectiveness of the AI-based training program at the school.

DISCUSSION

The findings from the MA Mukhtar Syafaat Blokagung school highlight the success of integrating technology into teacher professional development programs. The implementation of MOOC-based professional development has proven to be an effective tool for enhancing teaching quality. The flexibility of MOOCs enables teachers to take courses at their own pace, tailored to their individual needs and interests. This flexibility has proven to be beneficial in addressing the challenges posed by teachers' busy schedules (Halagatti et al., 2023: Koddebusch et al., 2024). Teachers have reported positive outcomes from the program, with increased confidence in updating their teaching knowledge and skills. According to both the principal and the quality control board, the program has had a significant impact, as it provides access to up-to-date training materials and allows teachers the freedom to choose courses that align with their professional goals. This approach emphasizes the importance of making professional development adaptable and accessible, thereby fostering continuous learning that is not limited by time or place.

Another key innovation at the school is the use of machine learning to predict teacher performance. By analyzing historical data, including educational background, teaching experience, and past performance evaluations, the machine learning system enables school supervisors to make more accurate predictions about potential future performance. This enables targeted and effective interventions, ensuring that teachers receive the necessary support to improve. Both the principal and quality control board members highlighted the system's success in helping to identify areas where teachers may need additional guidance. This predictive model allows for more strategic and personalized professional development, ensuring that teachers receive the right interventions at the right time (Stanislaus, 2022; Khodabocus et al., 2022; Halagatti et al., 2023). The use of machine learning in educational supervision represents a modern approach to managing teacher performance, supporting a more data-driven and tailored method of intervention.

In addition to MOOCs and machine learning, the school has also integrated AI-based simulations into teacher training. These simulations offer a practical and immersive learning experience, allowing teachers to practice handling various classroom scenarios, such as managing student behavior or teaching challenging material, in a controlled and safe environment. The use of high-performance

computers, audio-visual equipment, and interactive training modules ensures that the simulations are smooth and engaging. Teachers can interact with the simulations, make decisions, and receive instant feedback, which is crucial for improving their skills. According to feedback from both teachers and the quality control board, the AI-based simulations have been highly effective in improving classroom management and teaching strategies (Torabandeh et al., 2023: Sareminia & Mohammadi Dehcheshmeh, 2024). Despite some initial challenges with the technology, teachers have adapted to the system, and the results have been positive, with significant improvements in their confidence and ability to handle classroom situations. This highlights the value of using AI in teacher training, offering a more effective and realistic approach to enhancing teachers' practical skills.

The successful implementation of these technological approaches—MOOCs, machine learning, and AI simulations at MA Mukhtar Syafaat Blokagung underscores the significant role technology can play in improving teacher development. These methods provide flexible, data-driven, and interactive ways to enhance teachers' skills and knowledge. They enable teachers to access personalized professional development opportunities, ensuring that interventions are tailored to their specific needs. As a result, the overall quality of teaching has improved, contributing to a more effective and adaptable educational environment. The integration of these technologies into educational supervision not only enhances the quality of teaching but also supports the broader goal of creating a more dynamic and skilled teaching workforce.

CONCLUSION

This study concludes that MA Mukhtar Syafaat Blokagung has successfully implemented three innovative and effective professional development programs for its teachers. First, professional development programs based on Massive Open Online Courses (MOOCs) allow teachers to flexibly participate in online courses tailored to their needs and interests, helping them update their teaching knowledge and skills despite their busy schedules. Second, the use of machine learning systems to predict teacher performance allows supervisors to plan more targeted and effective interventions based on analysis of historical data and key factors. Third, teacher training using AI-based simulations provides more realistic and interactive practical experiences, utilizing advanced hardware and interactive training modules to help teachers develop behavior management and instructional skills. As a result, there has been a significant improvement in the quality of teaching and learning, as well as a better learning environment at MA Mukhtar Syafaat Blokagung.

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