

Leadership Challenges in The Digital Era: Leadership Development Strategies for Man 2 Banyuwangi Principal in The Age of Technology

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Abstract: This study aims to formulate a principal's leadership strategy in the digital era with a focus on developing digital literacy, transforming school culture, and a collaborative approach. The study used a qualitative method with a case study approach with data collection methods through observation, interviews, and document analysis. Data were analyzed using the Miles and Huberman model through four stages, namely data collection, data reduction, data presentation, and drawing conclusions, with data validity guaranteed through triangulation. The results of the study indicate that digital literacy is a key competency that supports innovation, improves 21st century skills, and encourages institutional achievements such as the National Active Literacy School Champion 1 award. Principals play a role as agents of digital transformation through superior programs such as the Madrasah Literacy Movement (GELEM), the Joint Outdoor Literacy Movement (GLOBE), and the School Writing Book Movement (GSMB). Collaborative strategies involving teachers, students, and parents have been shown to accelerate technology adoption and create a harmonious work culture. However, challenges in the form of digital divides and infrastructure limitations need to be addressed through ongoing training and infrastructure strengthening. This study emphasizes the importance of visionary leadership, digital literacy, and collaboration to create a technology-based education ecosystem that is relevant in the digital era.

Keywords: school principal leadership; digital literacy; digital transformation; collaborative approach

In the digital era, in the digital era, leadership faces major challenges in adjusting to the rapid development of technology. The main challenges include the lack of technological understanding among teachers, students and principals, and resistance to change. To overcome this, principals need to implement technology-based leadership, such as the use of digital platforms, digital competency training for teachers and the creation of innovative learning environments. Effective leadership is recognized as a key factor in supporting academic success (Maqbool et al., 2024). Principals, as leaders of educational institutions, are required to have proficient digital skills, flexibility in dealing with change, and the ability to manage the transformation of school culture towards the modern era. Leadership in the school environment is recognized as a key element in achieving educational success and effectiveness (Kafa, 2025). Leaders must ensure that their organizations develop a digital mindset and the necessary agility to respond to disruptions associated with digital technologies (Vial, 2021).

Meanwhile, from other research collaborative leadership is also important, where principals are not only decision makers, but also facilitators of change. Leadership also plays an important role in shaping school culture, improving teaching practices, and driving school improvement (Hayak et al., 2024). In addition, building digital literacy, both for oneself and the entire school ecosystem, is a priority for effective adaptation to technology. With this strategic approach, principals can lead their schools into the digital era more prepared and progressive.

The development of the times can change human civilization in a more complex direction (Fadli, 2021). Technological transformation has influenced various aspects of leadership, especially in the education sector. Transformative readiness in the face of radical waves of change from the dominance of the machine world to the reality of the virtual world fully requires the adaptive vision and resilience of a visionary leader (Gallos & Bolman, 2021). In the context of education, research by (Hasibuan et al., 2023) explains that education administration is now fully digital, including student attendance, assessment, supervision, financial accounting, inventory of facilities, to the national final exam, all done through an integrated system that is efficient, fast, and easily accessible. This condition requires education actors to master digital technology to improve the effectiveness, efficiency, and quality of education services that are adaptive to the times (Rosnaeni, 2021).

Without challenges, there will be no progress. Being an educational leader in the era of the Industrial Revolution 4.0 is a challenge in itself. Rapid changes in the times encourage civilization and science to develop rapidly, so that a leader who is tough, adaptive, visionary, and able to manage pressure, support personnel, and maintain the quality of education in a sustainable and professional manner is needed. (Sa'id et al., 2024) asserts that school principals often face obstacles such as lack of technology training, change resistance, and limited digital infrastructure. Therefore, strategic leadership development, such as digital literacy training, strengthening the vision of technology in education and participatory approaches, are relevant solutions to overcome these challenges. Relevant findings support the importance of adaptive leadership strategies in the digital era.

In contrast to these studies, this research focuses on developing a specific leadership model for principals in the digital era. In this context, the research offers a new perspective by integrating digital literacy, school culture transformation and collaborative leadership approaches as key components in facing the challenges of the technological era. In contrast to previous studies that mostly discuss technological challenges in general, this research emphasizes practical strategies, such as the implementation of technology in school management, the development of digital competencies, and the adaptation of an innovation-based mindset.

This research also explores the role of principals not only as managers, but also as change agents who build connectivity between technology and 21st century educational needs. Effective principals play a crucial role in building a constructive school culture and creating an environment that supports teaching and learning processes. They lead by setting clear goals, providing assistance and motivation, appreciating achievements, and providing opportunities for professional development (Werang et al.,

2023). This research offers a locally-based strategic framework that fits the Indonesian education context, especially in managing limited infrastructure and resources. This approach emphasizes the importance of balance between technology, organizational culture and individual competencies in facing the challenges of the digital era. Digitalization entails applying digital technologies to a variety of existing tasks and enabling new tasks to be performed (Valdez-Juárez et al., 2024) especially for school principals.

The purpose of this study is to formulate relevant and adaptive leadership development strategies for principals in dealing with the dynamics of technological transformation in the digital era. School principals are also required to play a greater role in accounting for student outcomes (Brauckmann et al., 2023). Digital leadership transcends conventional leadership models with a focus on implementing technology, flexibility in dealing with change, and a drive towards innovation (Türk, 2023). This goal is based on the argument that principals have a strategic role in building an educational ecosystem capable of integrating technology as part of the learning and management process. However, challenges such as limited digital competencies, resistance to change, and lack of technological infrastructure are often barriers for principals to maximize their role.

Therefore, this research is expected to provide strategic solutions that include strengthening digital literacy, developing a culture of innovation, and involving all school stakeholders in the technology adaptation process. With the right strategy, school principals are expected to become transformational leaders who not only manage change, but also utilize technology to improve the quality of education in the digital era (Ambawani et al., 2024).

MAN 2 Banyuwangi is one of the leading madrasahs in East Java that is known for actively integrating technology in its learning system. As a faith-based educational institution that is able to compete in digital innovation, MAN 2 Banyuwangi is a concrete example of how traditional institutions can adapt to the demands of the times. The uniqueness of this location lies in its ability to combine Islamic values with technological advancements, making it an ideal representation to illustrate the transformation of education in Indonesia. The existence of programs such as Digital Madrasah, Research Madrasah, and Madrasah Literacy are clear evidence of the seriousness of this institution in responding to the challenges of the digital era. Therefore, this location becomes very relevant as an object of research to explore collaborative leadership strategies that are adaptive and innovative amid the dynamics of educational digitalization.

METHOD

This research used a qualitative approach with a case study method to explore the leadership challenges in the digital era and the principal's leadership development strategy at MAN 2 Banyuwangi. The selection of participants used purposive sampling technique, which focuses on those who have direct involvement in school management, such as principals, senior teachers, and educational technology managers. The informant data obtained are as follows:

Table 1. Informants of Educators

Position	Male	Female
Principal	1	-
Teacher	32	23
Total	33	23

Based on the table above, the number of principals with the number of teachers is 33 people plus 23 people, namely there are 56 people, then there is data on MAN 2 Banyuwangi students, as follows:

Table 2. Student class informants

Category	IPA	IPS	Religion
Students	210	175	36

Based on the table above, the number of students with science majors is 210 students, social studies majors are 175 students and religion is 36 students. A qualitative approach with a case study method was chosen to enable an in-depth understanding of the principal's leadership dynamics in the context of a faith-based educational institution facing digital transformation. Data collection conducted in this research process is through observation, interviews, and document analysis.

This research aims to explore the experiences, views, and strategies that have been implemented in facing the challenges of digitalization, such as the implementation of technology in education management, decision-making, and communication with stakeholders, so a qualitative approach with a case study method is the technique used in the research. Direct observation was conducted in the school environment to identify how technology is applied in daily activities, including in learning management, administration and interaction with students. Observation also aims to understand the obstacles that arise in the field as well as the resolution strategies used by the principal and his team. Furthermore, data collection through semi-structured interviews was conducted with the principal, vice principal, teachers, and education personnel at MAN 2 Banyuwangi. And data collection through document analysis included a review of official documents such as internal policies in the school, human resource development programs, and reports on the implementation of educational technology.

The analysis technique used in this research data uses the Miles and Huberman model. Miles and Huberman have four flows in a data analysis, starting with the stages of data collection, data reduction, data presentation, and conclusion drawing. This data analysis process aims to identify patterns, main themes, and relationships between themes related to challenges and leadership development in the digital era. Data validity is ensured through data source triangulation, which compares the results of interviews, observations, and documents. The results of this study are expected to make a real contribution to the principal's leadership development strategy at MAN 2 Banyuwangi in facing the digital era and strengthening the institution's capacity to utilize technology to achieve educational goals.

RESULTS AND DISCUSSION

RESULT

The research results show that digital literacy has been used as a major competency in MAN 2 Banyuwangi. It supports excellence in literacy, research, and digitalization. It was found that programs such as the Madrasah Literacy Movement (GELEM), the Joint Outdoor Literacy Movement (GLOBE), and the School Writing Books Movement (GSMB) contributed to developing 21st-century skills. These skills include critical thinking, creativity, and collaboration. In addition, the digital literacy applied has a positive impact on students' educational quality and creativity.

Nevertheless, the data shows that there are still challenges. One of the main challenges is the digital gap and infrastructure limitations. This condition can hinder the optimal implementation of digital literacy programs. Studies have also found that students' digital skills are closely related to improving critical thinking ability. These skills also support students' readiness to face a technology-based world of work. In the context of leadership, principals have a very important role in driving digital transformation. This can be seen through the implementation of programs such as Madrasah Literacy, Madrasah Research, and Madrasah Digitalization. The principal's commitment is reflected in his efforts to build a technology-based education system.

The system was designed to adapt to the changing times. The principal also stressed the importance of integration between literacy, research, and digitalization. These three aspects are considered important to prepare students for the future. In addition, collaborative leadership strategies were also implemented in madrasahs. Teachers, students, and parents are actively involved in the planning and implementation of technology programs. The results of the interview show that such involvement fosters a sense of belonging. It also creates comfort in the learning process. One student even stated that he felt more passionate when choosing a learning application. Teachers also said that regular discussions with students and fellow teachers helped them find appropriate methods.

However, the success of this collaborative strategy depends on good communication and coordination. Without this, this strategy can fail due to differences in importance or lack of information. Documentation results show that consistent communication is essential for supporting digital programs. In addition, parental involvement also strengthens the implementation of technology programs, especially in the home environment. Overall, the success of digital transformation in MAN 2 Banyuwangi cannot be separated from the visionary leadership role. This is also supported by an innovative program structure and strong collaboration between stakeholders. Collaboration between principals, teachers, students, and parents has accelerated the adoption of technology. This collaboration also creates a learning environment that is adaptive to changes in the digital age.

DISCUSSION

Digital Literacy as a Key Competency

Digitalization in education can be defined as the process of using technology to support the teaching and learning process. It is known that principals need to have digital literacy which not only includes technical skills, but also strategic understanding to utilize technology in school management and learning. (Eyal & Te'eni-Harari, 2024) It shows that the application of digital media literacy in schools is related to various positive effects on students. In this review, there was an increased understanding of media content, a higher awareness of media influence, a more analytical attitude toward media, an influence on confidence and ability in media use, and success in producing media content.

MAN 2 Banyuwangi makes digital literacy a key competency to support madrasah excellence in literacy, research and digitalization. The digital literacy implemented has a positive impact on improving the quality of education and student creativity (Marpaung et al., 2023). To develop the literacy program, MAN 2 Banyuwangi runs several agendas including the Madrasah Literacy Movement (GELEM), the Joint Outdoor Literacy Movement (GLOBE), and the School Writing Book Movement (GSMB) that facilitate students to develop 21st century skills such as critical thinking, creativity, and collaboration. However, challenges such as digital and infrastructure gaps are potential dysfunctions in their implementation. This is explained by (Handayani, 2020) showing that digital literacy is able to improve students' critical thinking skills and learning outcomes. In addition, other studies underline the importance of digital skills in preparing students for the technology-based world of work (Gazali & Pransisca, 2021).

Meanwhile, MAN 2 Banyuwangi has successfully utilized digital literacy as a key competitive advantage. However, infrastructure development and training for educators need to be improved to ensure optimal implementation. The success of digital literacy at MAN 2 Banyuwangi correlates with the structure of the program and the support of national awards achieved by the madrasah. The award as a National Literacy Active School motivates MAN 2 Banyuwangi to continue innovating. Literacy programs such as GELEM and GLOBE not only support students academically but also build a strong digital literacy culture. Here is a picture of the award as the first winner of the national literacy active school.



Figure 1. 1st place in the National literacy active school

Based on the figure above, it states that institutional rewards and recognition can spur innovation and a spirit of achievement. In addition, the implementation of digital literacy-based programs is proven by the influence of learning literacy on critical thinking skills. The innovative program structure and the awards achieved by MAN 2 Banyuwangi support each other in creating an excellent learning environment. Digital literacy is not only a key competency but also the foundation for developing an educational culture in this madrasah (Halim, 2022). Digital skills include the ability to find and process information, think creatively, and create digital products by utilizing various digital tools. In addition, this skill also includes the ability to communicate and interact with others in a digital environment. Digital skills also involve the effective use of technology and are responsible for completing various practical activities. In addition, these skills include strengthening digital ethics through knowledge acquisition and development of appropriate strategies (Kure et al., 2025). With excellent digital literacy, students can improve and achieve critical thinking skills (Husaeni et al., 2023).

The Principal's Role as an Agent of Digital Transformation

The principal of MAN 2 Banyuwangi plays a key role in digital transformation through the innovation of excellent programs, such as Madrasah Literasi, Madrasah Riset, and Madrasah Digitalization. Transformative leaders prioritize sustainable values to create sustainable impact (Schiuma et al., 2024). With digital transformational leadership, principals can be interpreted as a leadership approach that utilizes digital communication technology to encourage teachers to change their perspective, perception, abilities, and spirit. The goal is to improve the quality of distance learning and prioritize school interests above personal interests (Berkovich & Hassan, 2023). The success of digital transformation requires the application of technology across all elements of the organization, the readjustment of internal structures, and the creation of a working culture that encourages continuous innovation. (Buonocore et al., 2024). The innovation shows how the leadership role of school principals can drive major changes in the educational environment, as well as build a learning culture that is

responsive to the demands of the digital era. It emphasizes the importance of leadership behavior in high-performance organizations, where leaders who encourage innovative spirit and flexibility can improve the sustainability of organizational performance. These studies as a whole highlight how crucial digital leadership is in dealing with the challenges and complex dynamics of the current digital era (Cheng et al., 2025). The implementation of the program has a positive impact on the ability of students and teachers to utilize technology as a learning tool. The following is the real evidence of the MAN 2 Banyuwangi school principal in the digital and literacy madrasah. The link can be clicked on the following link: <https://www.jurnaltinta.com/banyuwangi/44714195863/madrasah-digital-dan-literasi-man-2-banyuwangi-bukti-pendidikan-berkualitas>

Madrasah Digital dan Literasi, MAN 2 Banyuwangi Bukti Pendidikan Berkualitas

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Program Inovasi MAN 2 Banyuwangi: literasi, riset, digitalisasi, dan prestasi siswa ke PTN. (Tim Jurnal Tinta)

Figure 2. Inovation Program Principal of MAN 2 Banyuwangi

Based on the picture above, with the active role of the principal, MAN 2 Banyuwangi succeeded in creating a superior madrasa model and successfully developed various innovative programs to support quality education in this digital era. The principal plays an important role as an educational leader because of his direct involvement in the implementation of educational programs in schools. The achievement of educational goals depends on his skills and wisdom (Karim et al., 2025). However, for program sustainability, regular evaluation and strengthening the capacity of human resources in the madrasah environment are needed (Munib et al., 2024). The following is a statement from Mr. Drs. H. saeroji, M Ag. Principal of MAN 2 Banyuwangi, which is a leading madrasah in literacy, research, and digitalization.

“We are proud to be part of the students' journey to a bright future. This success is inseparable from the literacy, research and digitalization-based education that we develop. With a strong Islamic character, MAN 2 Banyuwangi students are ready to compete nationally and internationally.”

The information shows that the principal is integrating important elements of modern education. Through literacy, students are trained to think critically and creatively. The research approach gives students hands-on experience to explore science in depth. Meanwhile, digitalization ensures students

are able to adapt to rapid changes in the technological era (Muttaqien et al., 2023). This entire education system is supported by Islamic values that become the foundation of student character. With this combination, MAN 2 Banyuwangi has managed to score proud achievements in various fields, including academic and non-academic. This interview reflects the passion and dedication of an educational leader in preparing future generations who are not only intellectually intelligent, but also strong in character and spiritual values. Here is the real evidence of MAN 2 Banyuwangi's principal in digital and literacy madrasa.

The success of digital transformation in MAN 2 Banyuwangi correlates with the visionary leadership of school principals who are able to combine technological needs with the aim of madrasa education. Digital transformation, as part of this development, provides the means and platform for organizations to realize their social responsibilities more efficiently, while expanding their reach and influence (Van Veldhoven & Vanthienen, 2022). With this good and wise use of digital literacy, it will have a positive impact such as increasing the ability to analyze and evaluate information critically. Students can learn through different perspectives, share ideas, and work together on projects that involve critical thinking (Cynthia & Sihotang, 2023). Principals have a clear perception of educational opportunities in the field of digitalization, although many of their ideas have not yet been realized in schools (and likely will not be implemented in the near future). Interestingly, all school principals view digital technology as an opportunity to support teaching tailored to individual needs and self-study, regardless of their leadership style. (Ruloff & Petko, 2025). Moreover, principals who act as digital change agents can inspire the entire school community to adapt to digital transformation.

Principals act not only as managers but also as prime movers who understand the needs of modern technology and are able to implement relevant strategies. This creates an inclusive and effective technology-based education ecosystem. According to research by (Hasna, 2024) explained Leadership that understands technology has a crucial role in supporting digital transformation achievement in the school environment. This finding also highlights the importance of increasing professional capacity for school principals so that they can optimize their leadership influence in the current digital era. MAN 2 Banyuwangi's success in digital transformation proves the importance of the principal's role as an agent of change. With visionary leadership, this madrasah is able to balance technological innovation and student character development, making it a model of education that is relevant to the demands of the times (Nurjanah et al., 2024).

Collaborative Leadership Strategy in the Digital Age

The collaborative approach is proven to be effective in accelerating technology adoption in the school environment especially as implemented by the leadership of the principal at MAN 2 Banyuwangi. Leadership in the school environment is seen as a key element in realizing the success and effectiveness of educational institutions (Gurr et al., 2021). By involving all parties, namely teachers, students, and parents, the collaborative approach creates an environment that supports

technological innovation (Suryadi et al., 2023). This strategy increases active participation and a sense of shared responsibility for the success of digital transformation in madrasahs. However, without good coordination, this approach can become dysfunctional due to conflicts of interest or lack of communication.

One of the key points and reinforcing this finding is the effectiveness of principals', teachers' and students' involvement in supporting technology-based learning. One of the interview excerpts with the principal of MAN 2 Banyuwangi, Drs. H. Saeroji, M Ag. illustrates the importance of this strategy:

“In the face of technological change, we try to build a culture of collaboration, where teachers, students and parents are actively involved in discussions regarding the use of technology in the classroom. This makes it easier for us to find solutions together.”

School leaders were directly identified as critical in promoting teacher learning to achieve highly effective student learning (Lafferty et al., 2024). Teachers also gave similar responses, mentioning that educational leaders now need to be able to deal with rapid changes, manage technology, and create an inclusive collaborative environment as well as regular training initiated by school principals to improve their readiness in using technology for learning (Madiah & Cahyanto, n.d.). One of the MAN 2 Banyuwangi teachers Mr. Sugiono, S,Pd also said that:

“This approach changes the way we teach. With regular discussions with colleagues and students, we can find methods that work for everyone.”

However, it is also reinforced by an interview with one of the MAN 2 Banyuwangi students named Rina anggraini class X11 majoring in Science said:

“I feel more enthusiastic about learning when the teacher involves us in deciding which tools or applications to use. We feel heard and more comfortable.”

The information shows that the results of interviews with various parties at MAN 2 Banyuwangi confirmed the importance of the involvement of principals, teachers and students in supporting technology-based learning. This approach not only strengthens the application of technology, but also creates a collaborative and inclusive learning environment (Marpaung et al., 2023). The interviews also illustrate how effective communication plays an important role in the success of this collaborative strategy. An inclusive approach also builds trust with the school, creating a sense of ownership in every step of change in this digital era (Ambawani et al., 2024). Another study by (Maisaroh & Untari, 2024) showed that collaboration in school leadership increases the effectiveness of education policy implementation.

However, this success requires consistent communication and training for all parties involved (Jaya, 2021). The success of the collaborative leadership strategy at MAN 2 Banyuwangi correlates with open communication patterns and a clear shared vision in digital transformation. The principal leads through a participatory approach (Tanjung, 2020) that involves teachers in decision-making, students in program development, and parents in supporting technology implementation at home. This collaboration strengthens the sense of community and shared purpose.

Collaborative leadership is leadership management skills that always work together by designing constructively to work together by engaging stakeholders and facilitating and maintaining established interactions (Shaikh et al., 2022). Another study by (Sagala et al., 2024) states that cooperation between schools and communities results in faster and more comprehensive technological adaptations. The collaborative leadership strategy at MAN 2 Banyuwangi shows that the involvement of all stakeholders is the key to success in dealing with the digital era. Good communication patterns and shared vision need to be strengthened to ensure the sustainability of technology programs in madrasah (Anugerah, 2023). Ultimately, digital capabilities are the key to staying competitive, driving innovation, and ensuring sustainable growth in the digital age (Cheng et al., 2025).

CONCLUSIONS AND SUGGESTIONS

CONCLUSION

Digital literacy at MAN 2 Banyuwangi is the main foundation in supporting madrasah excellence in the digital era. The principal plays a central role as a visionary digital transformation agent, driving innovation through flagship programs such as the Madrasah Literacy Movement (GELEM), the Joint Outdoor Literacy Movement (GLOBE), and the School Writing Book Movement (GSMB). These programs not only improve students' digital literacy but also build 21st century skills, such as critical thinking, creativity and collaboration.

The successful implementation of these programs is supported by the principals' strategic leadership vision, regular training for teachers and national awards as motivation to continue innovating. However, challenges such as the digital divide and infrastructure remain a concern. To maintain the sustainability of digital transformation, regular evaluations, strengthening the capacity of human resources and developing adequate infrastructure are needed.

Open communication patterns, shared vision, and involvement of all parties are key elements in creating an effective technology-based education ecosystem. The success of MAN 2 Banyuwangi is clear evidence that the combination of digital literacy, research, and digitalization, with the foundation of Islamic values, can produce a generation that is intellectually smart and strong in character. The collaborative leadership strategy implemented by MAN 2 Banyuwangi.

SUGGESTION

The study of digital literacy at MAN 2 Banyuwangi has illustrated how this madrasah has successfully integrated technology in education, created an innovative learning environment and improved students' competitiveness. However, there are some aspects that could be improved to ensure the sustainability of this program. One possible criticism is the need for a more detailed explanation of the challenges faced in implementing digital literacy. While the digital and infrastructure gaps are mentioned, there is no specific description of the concrete steps that have been or will be taken to address these issues. In addition, the impact of digital literacy on students' academic outcomes could be

strengthened with quantitative data to make it more convincing. In terms of leadership, principals have played an active role in digital transformation. However, it is important to ensure that the innovations implemented depend not only on individual leadership but also on a sustainable system. Therefore, there is a need for regular training programs for educators and leadership regeneration to keep this innovation going in the long run. Another suggestion is to expand the scope of collaboration with external parties, such as universities, technology companies, and digital communities. This can open up opportunities for students to gain wider experience in the digital world. Overall, the digital literacy program at MAN 2 Banyuwani.

REFERENCES

- Ambawani, C. S. L., Saputra, I., Kusuma, T. M. M., Sumardjoko, B., & Fathoni, A. (2024). Building critical thinking skills of students through STEM-based digital literacy during the COVID-19 pandemic. *Journal of Education Research*, 5(4), 4810–4823.
- Anugerah, R. B. (2023). Madrasah Transformation in Facing Challenges in the Age of Society 5.0. *At-Tarbawi: Journal of Islamic Education Studies*, 8(2), 153–170.
- Berkovich, I., & Hassan, T. (2023). Principals' digital transformational leadership, teachers' commitment, and school effectiveness. *Education Inquiry*, 0(0), 1–18. <https://doi.org/10.1080/20004508.2023.2173705>
- Brauckmann, S., Pashiardis, P., & Ärlestig, H. (2023). Bringing context and educational leadership together: fostering the professional development of school principals. *Professional Development in Education*, 49(1), 4–15. <https://doi.org/10.1080/19415257.2020.1747105>
- Buonocore, F., Annosi, M. C., de Gennaro, D., & Riemma, F. (2024). Digital transformation and social change: Leadership strategies for responsible innovation. *Journal of Engineering and Technology Management*, 74, 101843. <https://doi.org/https://doi.org/10.1016/j.jengtecman.2024.101843>
- Cheng, Z., Jin, X., & Kwak, W. J. (2025). Using the new positive aspect of digital leadership to improve organizational sustainability: Testing moderated mediation model. *Acta Psychologica*, 255, 104963. <https://doi.org/https://doi.org/10.1016/j.actpsy.2025.104963>
- Cynthia, R. E., & Sihotang, H. (2023). Stepping together in the digital age: the importance of digital literacy to improve critical thinking ability and problem-solving ability of students. *Jurnal Pendidikan Tambusai*, 7(3), 31712–31723.
- Eyal, K., & Te'eni-Harari, T. (2024). Systematic review: Characteristics and outcomes of in-school digital media literacy interventions, 2010-2021. *Journal of Children and Media*, 18(1), 8–28. <https://doi.org/10.1080/17482798.2023.2265510>
- Fadli, M. R. (2021). The relationship between philosophy and science and its relevance in the era of the industrial revolution 4.0 (Society 5.0). *Jurnal Filsafat*, 31(1), 130–161.
- Gallos, J. V., & Bolman, L. G. (2021). *Reframing academic leadership*. John Wiley & sons.
- Gazali, M., & Pransisca, M. A. (2021). The importance of mastering information and communication technology literacy for madrasah ibtdaiyah teachers in preparing students to face the 4.0 industrial revolution. *Jurnal Ilmiah Global Education*, 2(1), 87–95.
- Gurr, D., Longmuir, F., & Reed, C. (2021). Creating successful and unique schools: Leadership, context and systems thinking perspectives. *Journal of Educational Administration*, 59(1), 59–76.
- Halim, A. (2022). THE SIGNIFICANCE AND IMPLEMENTATION OF CRITICAL THINKING IN THE PROJECTION OF THE 21st CENTER EDUCATIONAL WORLD AT THE Elementary School Level. *Jurnal Indonesia Sosial Teknologi*, 3(3).
- Handayani, F. (2020). Building critical thinking skills of students through STEM-based digital literacy during the COVID-19 pandemic. *Cendekiawan*, 2(2), 69–72.
- Hasibuan, A. T., Lubis, F. A., Amalia, N. R., & Awanis, D. (2023). Meaning and Function of Education Administration in the Digital Era at the MI/SD level. *ABDAU: Jurnal Pendidikan Madrasah Ibtidaiyah*, 6(1), 18–33.
- Hasna, M. (2024). Digitalization of Public Elementary School Management of Banjarmasin City:

- Review of SWOT Analysis in Digital School Development Strategy. *Journal of Modern Education*, 10(1), 32–42.
- Hayak, M., Avidov-Ungar, O., & Bitton, I. (2024). Circles of Support for Teacher Leadership Implementing Innovations at School: Point of View of Teachers and School Principals. *Leadership and Policy in Schools*, 0(0), 1–16. <https://doi.org/10.1080/15700763.2024.2327574>
- Husaeni, A. S., Hidayat, R., & Khadijah, I. (2023). The Role of Digital Literacy on Students' Critical Thinking Ability in Class V MI Indonesian Language Subjects. *JIP-Educational Science Journal*, 6(11), 8913–8918.
- Jaya, S. (2021). Strategies to establish effective communication to improve teacher performance in schools. *Pionir: Jurnal Pendidikan*, 10(2).
- Kafa, A. (2025). Exploring integration aspects of school leadership in the context of digitalization and artificial intelligence. *International Journal of Educational Management*, 39(8), 98–115. <https://doi.org/https://doi.org/10.1108/IJEM-11-2024-0703>
- Karim, A., Fathurohman, O., Sulaiman, S., Marliani, L., Muhammadun, M., & Firmansyah, B. (2025). How do principals act as leaders and managers in boarding and public schools in Indonesia? *Cogent Education*, 12(1), 2445354. <https://doi.org/10.1080/2331186X.2024.2445354>
- Kure, A. E., Blikstad-Balas, M., & Brevik, L. M. (2025). Digital ambitions vs. classroom reality in Norwegian lower secondary schools: What digital competencies are students developing over time? *Teaching and Teacher Education*, 153, 104843. <https://doi.org/https://doi.org/10.1016/j.tate.2024.104843>
- Lafferty, N., Sheehan, M., Walsh, C., Rooney, A. M., & McNamara, P. M. (2024). School leaders' perspectives of the continuous professional development of teachers. *Cogent Education*, 11(1), 2392422. <https://doi.org/10.1080/2331186X.2024.2392422>
- Madihah, H., & Cahyanto, I. (n.d.). *Education Quality Management: Practical Strategies Toward Quality and Sustainable Education*. Penerbit K-Media.
- Maisaroh, A. A., & Untari, S. (2024). Transformation of character education through government policies in Indonesia towards the golden generation of 2045. *Jurnal Kebijakan Pemerintahan*, 18–30.
- Maqbool, S., Zafeer, H. M. I., Maqbool, S., Zeng, P., Draissi, Z., & Javed, S. (2024). Stance of numerous leadership styles and their effect on teaching to sustain academic performance at the high school level. *Heliyon*, 10(16), e36438. <https://doi.org/https://doi.org/10.1016/j.heliyon.2024.e36438>
- Marpaung, F. N., Nadeak, B., & Naibaho, L. (2023). Educational quality improvement techniques. *Journal of Education and Counseling (JPDK)*, 5(1), 3761–3772.
- Munib, I. A., Yuwono, C., & Sujud, F. A. (2024). KPM Purwasana Village improves sustainable agricultural education. *Al-Ghobi Journal of Community Service*, 1(1), 13–24.
- Muttaqien, I. Z., Maryati, M., & Permana, H. (2023). Performance Management Strategies of Education Personnel in Facing the Digitalization Era of Islamic Educational Institutions. *Innovative: Journal Of Social Science Research*, 3(3), 6798–6811.
- Nurjanah, S., Bedi, F., & Fitri, T. A. (2024). Leadership Strategies in Improving the Competitiveness of Graduate Students in the Era of Digitalization. *Re-JIEM (Research Journal of Islamic Education Management)*, 7(2), 213–233.
- Rosnaeni, R. (2021). Characteristics and assessments of 21 st century learning. *Jurnal Basicedu*, 5(5), 4334–4339.
- Ruloff, M., & Petko, D. (2025). School principals' educational goals and leadership styles for digital transformation: results from case studies in upper secondary schools. *International Journal of Leadership in Education*, 28(2), 422–440. <https://doi.org/10.1080/13603124.2021.2014979>
- Sa'id, S., Hidayati, D., Suyatno, S., & Sukirman, S. (2024). Management of Digitalization of Independent Curriculum in Junior High School. *Manajemen Pendidikan*, 37–50.
- Sagala, K., Naibaho, L., & Rantung, D. A. (2024). Challenges of character education in the digital age. *Science and Technology Credentials Journal*, 6(01), 1–8.
- Schiama, G., Santarsiero, F., Carlucci, D., & Jarrar, Y. (2024). Transformative leadership competencies for organizational digital transformation. *Business Horizons*, 67(4), 425–437. <https://doi.org/https://doi.org/10.1016/j.bushor.2024.04.004>
- Shaikh, S. A., Lämsä, A.-M., & Heikkinen, S. (2022). Collaborative leadership in the institutions of higher education: a literature review. *EJBO-Electronic Journal of Business Ethics and*

Organization Studies, 1.

- Suryadi, I., Pamungkas, R. W. P., Wahyudi, F. S., & Setiawan, T. (2023). The role of leadership is effective in improving the quality of education management. *Journal of International Multidisciplinary Research, 1*(2).
- Tanjung, D. L. (2020). School Principal's Participatory Leadership Style to Improve the Performance of Man Binjai Teachers. *Elementary, Middle and High Education Management Journal [JMP-DMT], 1*(1), 1–9.
- Türk, A. (2023). Digital leadership role in developing business strategy suitable for digital transformation. *Frontiers in Psychology, 13*, 1066180.
- Valdez-Juárez, L. E., Ramos-Escobar, E. A., Hernández-Ponce, O. E., & Ruiz-Zamora, J. A. (2024). Digital transformation and innovation, dynamic capabilities to strengthen the financial performance of Mexican SMEs: a sustainable approach. *Cogent Business & Management, 11*(1), 2318635. <https://doi.org/10.1080/23311975.2024.2318635>
- Van Veldhoven, Z., & Vanthienen, J. (2022). Digital transformation as an interaction-driven perspective between business, society, and technology. *Electronic Markets, 32*(2), 629–644.
- Vial, G. (2021). Understanding digital transformation: A review and a research agenda. *Managing Digital Transformation, 13*–66.
- Werang, B. R., Agung, A. A. G., Jampel, I. N., Sujana, I. W., & Asaloei, S. I. (2023). Exploring the outside-the-box leadership of an Indonesian school principal: A qualitative case study. *Cogent Education, 10*(2), 2255091. <https://doi.org/10.1080/2331186X.2023.2255091>