International Journal of Sustainability and Advanced Integrated Research
Volume 2, Issue 2 (April-June 2026) | ISSN: 3107-7854
DOI: https://doi.org/10.65339/ijsair.V2.I2.281

Challenges, Opportunities, and Teachers' Perception of School Heads' Instructional Leadership in the Digital Era at Buenavista Integrated School

Jhon Ryan S. Villamor
Teacher III, Buenavista Integrated School, San Fernando, Masbate, Philippines

Publication history: Received: April 09, 2026; Revised: April 16, 2026; Accepted: April 22, 2026
Email of Corresponding Author: jhonryan.villamor@deped.gov.ph

Abstract

This study examined the challenges, opportunities, and teachers' perceptions of school heads' instructional leadership in the digital era at Buenavista Integrated School. It was anchored on Transformational Leadership Theory, Instructional Leadership Theory, and Technology Leadership Theory, and was framed conceptually through an input-process-output approach. Using a quantitative descriptive-correlational design, the study involved 30 teachers selected through convenience sampling. Data were gathered through a researcher-made structured questionnaire covering teachers' demographic profile, challenges encountered, opportunities experienced, and perceptions of school heads' instructional leadership in terms of instructional supervision, digital professional development, technology integration, instructional monitoring, innovation and collaboration, and digital learning environment. Data were analyzed using frequency count, percentage, weighted mean, ranking, and Pearson r Correlation Coefficient. The findings showed that most respondents were young, female, had master's units, and had moderate teaching experience. Teachers generally disagreed that they experienced major challenges in their school heads' instructional leadership in the digital era, although limited access to digital resources and infrastructure emerged as a notable concern. They strongly agreed that they experienced meaningful opportunities, particularly in technology integration, communication, continuous learning, and innovation. Teachers also positively perceived their school heads' instructional leadership across instructional supervision, technology integration, innovation and collaboration, and digital learning environment, while digital professional development and instructional monitoring were rated positively but indicated areas for further enhancement. The relationship between teachers' profile and their perceptions of school heads' instructional leadership was weak positive but not statistically significant. The study concludes that school heads generally demonstrated effective instructional leadership in the digital era, with resource access, monitoring, and professional development requiring continued improvement. It recommends strengthening feedback mechanisms, structured digital professional development, instructional monitoring, inclusive digital practices, and collaborative innovation. The study aligns with SDG 4, SDG 9, and SDG 16 by supporting quality education, educational innovation, and responsive school leadership. Its sustainability impact lies in strengthening educational, digital, institutional, and community-based school improvement in a rural public-school context.

Keywords: Challenges, Digital era, Digital Learning Environment, Instructional Leadership, Instructional Supervision, School Heads, Teachers' Perceptions, Technology Integration

1. Introduction

This study examines the challenges, opportunities, and teachers' perceptions of school heads' instructional leadership in the digital era at Buenavista Integrated School. The introduction situates the problem within the rapid digital transformation of education, the expanding leadership role of school heads, the increasing demand for teacher digital readiness, and the need for context-sensitive school leadership. It also synthesizes foreign and local literature, presents the local school context, anchors the study in established leadership theories, identifies the gap addressed by the research, and explains its relevance to sustainable educational and institutional development.

As education continues to evolve due to rapid technological advancements, the role of school principals has expanded to include not only instructional leadership but also digital and transformational leadership. This shift is also supported by Department of Education policies such as DepEd Order No. 42, s. 2017, which emphasize the importance of instructional leadership and continuous improvement in school management, (DepEd Order 2017)1. The study of Michael Fullan et al. (2024)2 emphasized that the integration of artificial intelligence in education presents both opportunities and challenges for school leaders; thus, principals are expected to adapt their leadership approaches to guide schools through digital transformation. Similarly, F. Siddiq et al. (2024)3 highlighted that digital competence and 21st-century skills have become essential components of modern education, and consequently, school leaders must ensure that teachers and students are equipped with these competencies to thrive in a technology-driven environment. This is aligned with DepEd Order No. 12, s. 2020, which underscores the integration of technology and flexible learning modalities in Philippine education, (DepEd

Order 2020)4. In support of this, A. Nurabadi et al. (2022)5 introduced the concept of digital instructional leadership, while N. G. Ugur and T. Koç (2019)6, F. A'mar and D. Eleyan (2022)7, J. Dasruth et al. (2024)8, and M. Ruloff and D. Petko (2025)9 collectively show that leadership support, digital competence, and clearly defined goals influence technology integration and instructional improvement. Leadership also affects teacher outcomes, as shown by M. E. Yohannes and T. A. Wasonga (2023)10 and Y. Liu et al. (2021)11, who link leadership to teacher job satisfaction, self-efficacy, collaboration, and supportive school culture. In addition, M. Fitrah et al. (2025)12 and M. Mustari and S. Nurhayati (2024)13 indicate that technological readiness, 21st-century competencies, academic outcomes, and student character formation remain central concerns in the digital era. Overall, the background of the study establishes that effective school leadership today must combine instructional, technological, and transformational dimensions in order to support teacher readiness and meaningful learning outcomes.

The reviewed literature consistently shows that digital instructional leadership is shaped by both promise and constraint. Berkovich, I. and Hassan, T. (2024) and Hassan, T. and Berkovich, I. (2023) found that digital instructional leadership improves teacher motivation and student outcomes, but its effectiveness varies across school contexts. Dasruth, J. et al. (2024) and Oguntoye, L. A. (2024) similarly suggest that teachers value digital leadership and digital pedagogy, although their confidence and perceptions depend heavily on the support they receive. Alkhawaldeh, M. A. and Khasawneh, M. A. S. (2023), Masrur, M. (2023), Lucas, M. and Vicente, P. N. (2023), and Derder, A. T. et al. (2024) point to recurring challenges such as limited resources, insufficient training, workload, resistance to change, and weak infrastructure. In contrast, Okunlola, J. O. and Naicker, S. R. (2025), Mushadi, M. et al. (2025), Rasdiana et al. (2024), Amemasor, S. K. et al. (2025), Antonopoulou, H. et al. (2025), Irawan, D. B. et al. (2024), and Sunu, I. G. K. A. (2022) emphasize that strong digital leadership competencies, empowerment strategies, e-supervision, digital culture, and sustained professional development strengthen teachers' digital competence and instructional effectiveness. Marrone, R. et al. (2025) and Cikusin, Y. and Mistar, J. (2024) further show that AI and digital tools create both opportunities and difficulties, depending on teacher readiness and institutional support. These insights establish digital instructional leadership as a multidimensional construct involving leadership behavior, teacher readiness, infrastructure, culture, and ongoing support.

Local literature reinforces these patterns. Tanucan, J. C. M. et al. (2022) and Subade, M. T. (2024) found that digital leadership improves teacher job satisfaction and technological proficiency. Bendanillo, A. C. (2025), Gading, S. J. L. (2024), Alde, A. S. (2024), Padolina-Alcantara, F. P. (2023), Maala, E. B. and Lagos, F. D. (2022), and Hero, J. L. (2020) all indicate that instructional, digital, and technological leadership are associated with better teaching performance, ICT integration, and school outcomes. At the same time, Prestoza, M. J. and Naldoza, N. (2025), Hungo, M. O. et al. (2023), and Ortiz Jr, O. et al. (2025) note that leadership implementation is affected by administrative and contextual challenges. Pitpit, G. M. (2020), Philip, R. et al. (2025), and Maryati, T. et al. (2025) emphasize the importance of adaptive, supervisory, and digitally competent leadership in improving teacher retention, principal effectiveness, and teaching quality. The related studies also broaden the discussion by linking school leadership with collaboration, crisis response, student outcomes, and AI integration. Anwar, S. and Saraih, U. N. (2024), Baroudi (2022), Baydar (2022), and Cox, J. S. and Mullen, C. A. (2023) show that digital leadership contributes to knowledge sharing, emotional intelligence, crisis management, digital citizenship, and student achievement. Tai, M. K. et al. (2022) and Yuting, Z. et al. (2022) connect leadership support to teacher competencies and openness to change. Hazzan-Bishara, A. et al. (2025), Cheng, E. C. K. and Wang, T. (2023), Ng, D. T. K. et al. (2025), Kafa (2025), Karakose, T. and Tülübas, T. (2024), Meng, N. and Sermsri, N. (2024), Msila (2022), Reis-Andersson (2024), Faizuddin, A. et al. (2022), Hathaway, D. M. et al. (2024), Aghaziarati, A., Nejatifar, S., and Abedi, A. (2023), and Mar, N. A. (2024) further demonstrate that digitalization and AI require new leadership competencies, professional development, readiness, and ethical awareness.

Similarly, local studies confirm that school leadership remains central to teacher development and school effectiveness in technology-rich contexts. Daing, C. A. and Mustapha, L. C. (2023), Magdaraog, R. B. (2025), Alayan, G. A. (2022), Rosa, D. and Agbuya, M. (2022), Paloma, M. A. S. (2023), Rodriguez, M. R. G. (2021), Ablasa, L. A. and Liwan, R. K. (2024), Macatuno-Nocom, N. (2019), and Adams, D. et al. (2023) collectively show that instructional and digital leadership influence teacher efficacy, motivation, ICT integration, digital literacy, and continuity of learning. Del Mundo, H. J. C. (2022) and Robosa, J. et al. (2021) identify workload, limited resources, and technological barriers as continuing challenges, while Jimeno, J. B. and Prado, N. (2024), Ventura, C. V. and Apellido, L. (2025), Joan, S. et al. (2025), Arombo, C. M. (2023), Cruz, M. M. D. and Blanco, R. M. (2023), and Ermita, L. and Baysa, M. L. (2025) show that leadership quality, contextual conditions, and transformational practices affect teacher motivation, work attitude, performance, and instructional outcomes. Taken together, the literature frames school heads' instructional leadership in the digital era as a balance of supervision, technological guidance, teacher support, adaptability, and institutional responsiveness.

Globally, educational leadership is being reshaped by digital transformation, artificial intelligence, and the demand for 21st-century competencies, as emphasized by Michael Fullan et al. (2024)2 and F. Siddiq et al. (2024)3. Nationally, the Philippine policy environment recognizes the importance of instructional leadership and technology-enabled learning through DepEd Order No. 42, s. 2017 and DepEd Order No. 12, s. 2020, (DepEd Order 2017)1; (DepEd Order 2020)4. Locally, the study is situated in Masbate Province, particularly in the Municipality of San Fernando on Ticao Island, with the research conducted at Buenavista Integrated School in Barangay Buenavista, a rural community where farming is the

main industry, as described in Wikipedia_Masbate14 and Wikipedia_San_Masbate15. Buenavista Integrated School offers Kindergarten to Grade 12 and serves a school population supported by 27 teaching staff and 5 non-teaching staff, with a total enrolment of 545. This local context is important because it places digital instructional leadership within an actual rural public-school setting where issues of leadership, support, access, teacher readiness, and technology integration must be understood not only at the policy and theoretical level but also in a specific school environment.

The study is anchored on Transformational Leadership Theory by Burns (1978) and Bass (1985), Instructional Leadership Theory by Hallinger (1985), and Technology Leadership Theory by Anderson and Dexter (2005). Transformational Leadership Theory ((Burns, 1978; Bass, 1985) explains that leaders inspire, motivate, and influence followers to achieve shared goals and improve performance. In this study, it supports the view that school heads shape teachers' motivation, commitment, and professional growth while addressing challenges and creating opportunities in the digital era. Instructional Leadership Theory (1985), introduced by Hallinger (1985)69, emphasizes the direct influence of school leaders on teaching and learning through supervision, curriculum guidance, monitoring, and teacher support. In the present study, this explains how school heads affect teachers' perceptions and instructional experiences in digitally mediated schooling. Technology Leadership Theory (2005), proposed by Anderson and Dexter (2005)70, highlights the role of school leaders in promoting the effective integration of technology in teaching, learning, and school management. In this study, it explains how school heads support ICT skills development, digital literacy, and technology use in instruction. Conceptually, the study follows an IPO system approach in which the inputs include teachers' demographic profile, challenges, opportunities, and perceptions; the process involves survey-based data gathering, presentation, analysis, and interpretation; and the outputs consist of the identified profile, determined challenges and opportunities, measured perceptions, and the established relationship between teacher profile and perceptions. Together, these theoretical and conceptual bases provide a comprehensive explanation of how school heads' leadership practices shape teacher experience and school functioning in the digital era.

Despite extensive research on instructional and digital leadership, most existing studies focus only on specific aspects such as leadership practices, teacher performance, or technology integration in isolation. Limited studies examine the combined challenges, opportunities, and teachers' perceptions of school heads' instructional leadership in the digital era within a single local school context. This creates a need for a more comprehensive and contextualized inquiry that looks at leadership not only as a set of practices but also as something experienced by teachers in terms of support, supervision, innovation, digital environment, and professional development. The rationale of the present study, therefore, lies in its attempt to examine these dimensions together at Buenavista Integrated School and to determine whether teachers' demographic profile is significantly related to their perceptions of school heads' instructional leadership in the digital era.

This study most directly aligns with SDG 4 – Quality Education because it focuses on improving instructional leadership, teaching effectiveness, teacher readiness, and the digital learning environment. It also aligns with SDG 9 – Industry, Innovation and Infrastructure because the study addresses technology integration, digital competence, and school capacity to respond to educational innovation. In addition, the study has relevance to SDG 16 – Peace, Justice, and Strong Institutions because it examines leadership practices, school management, support systems, and institutional responsiveness in a public-school setting. The emphasis on professional development, instructional supervision, and leadership improvement shows that the study supports a more resilient, responsive, and quality-oriented educational system.

The study contributes to educational sustainability by identifying how school heads can better support teachers and improve instruction in the digital era. It contributes to technological and digital sustainability by examining technology integration, digital professional development, and digital learning environments as continuing institutional concerns rather than temporary responses. It also contributes to institutional and policy sustainability because the findings may serve as a basis for leadership enhancement, professional development programs, and policy interventions aligned with DepEd goals. At the same time, the study supports community and socio-educational sustainability by strengthening the quality of teaching and learning in a rural public-school context where leadership effectiveness can influence not only teacher performance but also the educational experience of learners. In this sense, the study is multidisciplinary because it connects leadership, education, technology, governance, and local school development in one integrated inquiry.

The study specifically seeks to determine the demographic profile of teachers in terms of age, sex, educational attainment, length of teaching experience, and grade level taught; the challenges encountered by teachers in relation to school heads' instructional leadership in the digital era; the opportunities experienced by teachers; the teachers' perceptions of school heads' instructional leadership in terms of instructional supervision, digital professional development, technology integration, instructional monitoring, innovation and collaboration, and digital learning environment; and the significant relationship between teacher profile and perceptions. Its findings are intended to benefit students, teachers, school heads, school administrators and policy makers (DepEd), future researchers, and the researcher by providing evidence that can improve instructional leadership practices and strengthen digital-era teaching and learning.

2. Material and methods

2.1 Research Design

The study used a quantitative descriptive–correlational research design. The descriptive component was intended to present the demographic profile of the teachers in terms of age, sex, educational attainment, length of teaching experience, and grade level taught, and to describe the challenges encountered, opportunities experienced, and perceptions of school heads' instructional leadership in the digital era. The correlational component was used to determine whether a significant relationship existed between the teachers' profile and their perceptions of school heads' instructional leadership. This design was considered appropriate because it allowed the researcher to objectively and systematically describe existing conditions and examine relationships among variables without manipulating them. According to Creswell and Creswell (2018), quantitative descriptive research designs are appropriate when the objective is to systematically describe existing conditions and perceptions as they naturally occur, while correlational designs are suitable for determining the degree of relationship between variables. Similarly, Ary et al. (2019) emphasized that descriptive– correlational research is appropriate in educational and social research when the purpose is to describe variables and examine associations without manipulating them.

2.2 Locale of the Study

The study was conducted at Buenavista Integrated School located in Barangay Buenavista, San Fernando, Masbate. Masbate is an island province in the Philippines situated near the midsection of the archipelago and composed of the major islands of Masbate, Ticao, and Burias. San Fernando is a municipality in Masbate located on Ticao Island, and Buenavista is one of its barangays. The barangay is rural in character, with farming as its main industry. Buenavista Integrated School evolved from Buenavista Elementary School and now offers Kindergarten to Grade 12. At the time described in the manuscript, the school had 27 teaching staff, 5 non-teaching staff, and a total enrolment of 545. This setting provided the institutional context for examining instructional leadership in a digital learning environment.

2.3 Respondents of the Study

The respondents of the study were thirty (30) teachers from Buenavista Integrated School in Buenavista, San Fernando, Masbate. These teacher-respondents served as the primary source of data regarding the challenges they encountered, the opportunities they experienced, and their perceptions of their school heads' instructional leadership in the digital era. Their demographic profile included age, sex, educational attainment, length of teaching experience, and grade level taught.

2.4 Sample and Sampling Procedure

The study used convenience sampling. The respondents were selected based on their availability during the data collection period and their relevance to the objectives of the research. This approach was chosen because it enabled the researcher to gather data efficiently from participants who were readily accessible and willing to participate, given the limited time and resources available for the study. Although this sampling technique does not ensure a fully representative sample, it was considered suitable for obtaining insights from individuals directly involved in the context being examined.

2.5 Research Instrument

The primary data-gathering instrument was a researcher-made structured survey questionnaire designed to determine the challenges, opportunities, and teachers' perceptions of school heads' instructional leadership in the digital era at Buenavista Integrated School. The instrument was developed from the objectives of the study, a review of related literature on instructional leadership, digital leadership, and technology integration, and existing instruments relevant to teachers' perceptions of school leadership in the digital era. It was organized into major parts covering the demographic profile of the respondents, the challenges encountered, the opportunities experienced, and the teachers' perceptions of school heads' instructional leadership in terms of instructional supervision, digital professional development, technology integration, instructional monitoring, innovation and collaboration, and digital learning environment. The instrument used a four-point Likert scale consisting of 4 – Strongly Agree, 3 – Agree, 2 – Disagree, and 1 – Strongly Disagree. Before administration, the questionnaire underwent content validation by experts in education, social work, and research methodology to ensure clarity, relevance, and alignment with the objectives of the study, and the validators' comments were incorporated in the final version.

2.6 Data Gathering Procedure

The conduct of the study followed a systematic process composed of five phases. First, the researcher developed and sought approval of the research title through the submission of a research capsule to the adviser, which included the proposed title, statement of the problem, theoretical background, respondents and sampling plan, research design, and possible sources of data. Second, after the title and proposal were approved, the researcher developed the structured questionnaire and submitted it for expert validation, after which revisions were made based on the validators' feedback. Third, the researcher prepared a permission letter, noted by the adviser, and submitted it to the Office of the School Division Superintendent for approval. Fourth, once permission was granted, the researcher personally administered the validated questionnaires to the

selected respondents, explained the instructions clearly, allotted sufficient time for completion, and retrieved all questionnaires on the same day, resulting in a 100% retrieval rate. Fifth, the responses were encoded, recorded, and tabulated, and an expert statistician assisted in the analysis and interpretation of the data. The manuscript was then prepared and submitted to the research adviser for review and revision. The study also noted that the process was conducted with adherence to ethical research standards throughout data collection and analysis.

2.7 Data Analysis Techniques

The data were analyzed using frequency count, percentage, weighted mean, ranking, and Pearson r Correlation Coefficient (r). Frequency count and percentage distribution were used to describe the demographic profile of the respondents. Weighted mean and ranking were employed to determine the challenges encountered by teachers, the opportunities they experienced, and their perceptions of school heads' instructional leadership in the digital era. To determine the significant relationship between the teachers' profile and their perceptions of school heads' instructional leadership in the digital era, the Pearson r Correlation Coefficient (r) was computed at a 0.05 level of significance. These statistical tools enabled the researcher to systematically organize, describe, and interpret the gathered data.

3. Results and Discussion

3.1 Demographic Profile of the Teachers

3.1.1 Age

The age profile showed that most respondents were relatively young. Out of 30 teachers, 13 or 43.33% were 21–30 years old, 12 or 40.00% were 31–40 years old, 4 or 13.33% were 41–50 years old, and 1 or 3.33% was 51 years old and above, while no respondent was 20 years old and below. These results indicate a youthful and dynamic teaching workforce, with the largest group belonging to the 21–30 age bracket and a substantial number also in the 31–40 range. The presence of smaller groups from older age categories suggests a mix of emerging and experienced educators within the school. Joan et al. (2025) found that teachers' perceptions of leadership may vary across age groups.

3.1.2 Sex

The sex distribution showed that 22 or 73.33% of the respondents were female, while 8 or 26.67% were male. This means that female teachers formed the majority of the respondents. This result reflects the usual pattern in many educational institutions where women comprise a larger share of the teaching workforce. It also suggests that the respondents' perceptions of school heads' leadership emerged largely from a predominantly female teaching population. Yohannes and Wasonga (2023) revealed that differences in leadership perception and job satisfaction can be influenced by gender.

3.1.3 Highest Educational Attainment

In terms of highest educational attainment, 17 or 56.67% of the respondents had Master's units, 9 or 30.00% were BS graduates, and 4 or 13.33% had earned a Master's degree. No respondent had doctoral units or a doctoral degree. These findings show that most teachers were already pursuing graduate studies, indicating professional commitment and academic advancement, although none had yet reached the doctoral level. The pattern suggests room for further educational development among the teaching personnel. Padolina-Alcantara (2023) emphasized that higher educational qualifications are associated with better understanding of leadership practices in the digital era.

3.1.4 Length of Teaching Experience

The length-of-service profile showed that 18 or 60.00% of the respondents had served for 6–10 years, 9 or 30.00% had 0–5 years of service, 2 or 6.67% had 11–15 years of service, and 1 or 3.33% had served for 16 years and above. Most respondents therefore had moderate teaching experience. This result suggests that the school has a relatively experienced workforce, while still maintaining a notable group of newer teachers. The distribution reflects a balance between established and emerging educators in the institution. Liu et al. (2021) found that experienced teachers tend to exhibit stronger self-efficacy and perception of leadership support.

3.1.5 Grade Level Taught

As reported in the study, the highest reported teaching assignments were in Grade 8 and Grade 10, with 11 or 18.97% each, followed by Grade 7 and Grade 9 with 8 or 13.79% each. Grade 11 and Grade 12 each had 5 or 8.62%, Grades 4, 5, and 6 each had 2 or 3.45%, and Kinder, Grades 1, 2, and 3 each had 1 or 1.72%. These results indicate that a larger share of teaching assignments was concentrated in the higher grade levels, particularly Grades 7–10, while fewer teachers handled the lower grade levels. This suggests varied instructional demands across the institution. Joan et al. (2025) highlighted that teaching assignments and contexts influence how teachers perceive instructional leadership.

3.2 Challenges Encountered by Teachers in School Heads' Instructional Leadership in the Digital Era

The results showed an overall weighted mean of 2.17, verbally interpreted as "disagree," indicating that teachers generally did not perceive major challenges in school heads' instructional leadership in the digital era. Only one indicator was rated

"agree," namely limited access to digital resources and infrastructure, which had the highest weighted mean of 2.53. The next highest concerns were limited support for addressing teachers' digital skill gaps at 2.43 and lack of timely feedback on digital instructional performance at 2.30, while insufficient technical support for digital teaching challenges obtained the lowest weighted mean of 1.97. These findings suggest that although digital instructional leadership was not generally viewed as problematic, access to resources and certain support mechanisms remained notable concerns. Overall, the low challenge ratings imply that leadership support and digital integration were largely functioning, but improvements in resource accessibility, technical assistance, and feedback systems could further strengthen digital teaching practices. Masrur (2023) emphasized that educators face difficulties in adjusting to online-based leadership and innovation.

3.3 Opportunities Experienced by Teachers Under School Heads' Instructional Leadership in the Digital Era

The opportunity indicators produced an overall weighted mean of 3.33, verbally interpreted as "strongly agree." The highest-rated opportunity was empowerment to integrate technology into classroom instruction, with a weighted mean of 3.60. This was followed by support for continuous learning in educational technology at 3.47, increased support for digital teaching strategies and enhanced communication with school heads using digital technologies at 3.43 each, and encouragement to explore innovative digital teaching practices at 3.37. Lower-rated but still positive indicators included availability of professional development related to digital instruction at 3.23, improved access to digital tools and learning platforms at 3.20, and recognition of teachers' efforts in digital innovation at 3.03. These results indicate that teachers experienced substantial opportunities under digital-era instructional leadership, particularly in technology use, communication, support, and learning. The strong agreement across the indicators suggests that digital leadership practices created favorable conditions for instructional innovation and professional growth. Sunu (2022) revealed that digital leadership supports teachers' acceptance and use of technology in instruction.

3.4 Teachers' Perception of School Heads' Instructional Leadership in the Digital Era

3.4.1 Instructional Supervision

In instructional supervision, the respondents registered an overall weighted mean of 3.29, verbally interpreted as "strongly agree." The highest-rated item was support for improvement of digital teaching competencies at 3.47, followed by the use of digital tools for instructional supervision and promotion of quality instruction in digital learning environments at 3.43 each, and clear guidance on digital instructional practices at 3.37. Lower-rated indicators were giving constructive feedback on digital teaching performance at 3.13, encouraging reflective teaching using digital data at 3.17, maintaining regular supervisory communication through digital means at 3.17, and addressing instructional concerns related to technology use at 3.20. These findings show that school heads were perceived as effective in supervising instruction within digital contexts, especially in strengthening teachers' digital teaching competencies and using digital tools in supervision. At the same time, the lower ratings for feedback and technology-related instructional concerns suggest areas that still require improvement. Rasdiana et al. (2024) emphasized that effective instructional e-supervision enhances teaching quality.

3.4.2 Digital Professional Development

For digital professional development, the overall weighted mean was 3.16, verbally interpreted as "agree." The highest-rated indicators were encouragement to participate in online professional development and promotion of sharing digital best practices among teachers, both with a weighted mean of 3.30. Alignment of professional development with instructional technology needs followed at 3.27. Other indicators such as support for continuous upgrading of teachers' digital skills and sustaining professional growth in digital pedagogy were rated 3.20, while organization of training related to digital teaching and learning received the lowest weighted mean of 3.00. These results indicate that school heads were seen as supportive of digital professional learning, particularly through encouragement and sharing of good practices, but more formal and structured training arrangements were less strongly perceived. This suggests that professional development was present, though certain aspects such as organized training and resource support could still be improved. Antonopoulou et al. (2025) highlighted that leadership support strengthens teachers' digital competencies.

3.4.3 Technology Integration

Technology integration obtained an overall weighted mean of 3.37, verbally interpreted as "strongly agree." The highest-rated indicator was encouragement to use technology in daily instruction at 3.63, followed by support for selecting appropriate digital tools at 3.53 and promotion of integration of technology with curriculum objectives at 3.47. Guidance on effective technology use and ensuring availability of instructional technology resources both received 3.40, while support for blended and online learning approaches reached 3.37. The lowest-rated indicators were addressing challenges related to technology integration at 3.13 and monitoring the effectiveness of technology-enhanced instruction at 3.17. These results show that school heads were strongly perceived as actively supporting technology integration in teaching. The strongest areas involved encouraging classroom use of technology and aligning digital tools with instructional goals, although continued attention is needed in addressing integration problems and in monitoring technology-enhanced instruction. Dasruth et al. (2024) revealed that teachers perceive principals' digital leadership as essential in improving instruction.

3.4.4 Instructional Monitoring

Instructional monitoring registered an overall weighted mean of 3.14, verbally interpreted as "agree." The highest-rated indicators were ensuring alignment of instruction with digital standards at 3.30 and using online reports and records for monitoring purposes at 3.27. Providing feedback based on monitoring results and supporting improvement based on monitoring outcomes both had 3.23. Lower-rated indicators included identifying instructional gaps through digital monitoring at 3.10, using data from digital platforms to assess instruction at 3.07, regularly monitoring teaching practices using digital tools at 3.00, and tracking teachers' progress in digital instruction at 2.90. These findings indicate that teachers generally agreed that school heads conduct instructional monitoring in the digital era, especially in maintaining standards and using online records. However, the lower ratings for tracking progress and consistent digital monitoring suggest that monitoring systems can still be strengthened for better continuity and follow-up. Berkovich and Hassan (2024) found that leadership practices significantly influence teaching effectiveness and student outcomes.

3.4.5 Innovation and Collaboration

Innovation and collaboration yielded an overall weighted mean of 3.30, verbally interpreted as "strongly agree." The highest-rated indicator was encouragement of innovative teaching practices using technology at 3.43. Support for collaborative planning through digital platforms and the use of technology to strengthen professional collaboration both had 3.40, while promotion of sharing innovative instructional ideas reached 3.37. Recognition of teachers who implement digital innovations and encouragement of teamwork in developing digital learning materials each had 3.33. The lowest-rated indicators were support for cross-department digital collaboration at 3.07 and fostering a culture of innovation in instruction at 3.20. These results suggest that school heads were viewed as promoting collaboration and innovation in meaningful ways, particularly through technology-supported planning, idea-sharing, and teamwork. Even so, the lower ratings for broader cross-department collaboration and sustained innovation culture imply that these areas deserve additional attention. Oguntoye (2024) emphasized the importance of collaborative digital pedagogy in enhancing learning.

3.4.6 Digital Learning Environment

The digital learning environment dimension had an overall weighted mean of 3.36, verbally interpreted as "strongly agree." The highest-rated indicators were promotion of responsible and ethical use of technology and support for continuous improvement of the digital learning environment, both at 3.50. Promotion of a safe and supportive digital learning environment and ensuring accessibility of digital learning resources both obtained 3.43, while support for the use of learning management systems had 3.40. Lower-rated indicators were support for inclusive digital learning practices at 3.23 and maintenance of clear policies for digital classroom management at 3.20. These findings indicate that teachers strongly perceived school heads as fostering supportive, ethical, and functional digital learning spaces. The results also suggest that digital instructional leadership was effective in encouraging engagement and maintaining digital learning systems, although inclusivity and policy clarity still need further strengthening. Irawan et al. (2024) noted that school leadership plays a crucial role in managing digital transformation and creating supportive learning environments.

3.5 Relationship Between Teachers' Profile and Their Perceptions of School Heads' Instructional Leadership in the Digital Era

The Pearson r analysis produced a computed r-value of 0.25, interpreted as a weak positive linear relationship, with 28 degrees of freedom at the 0.05 level of significance. Since the computed r-value was lower than the critical r-value of ±0.3610, the null hypothesis was accepted, indicating that the relationship between teachers' profile and their perceptions of school heads' instructional leadership in the digital era was not statistically significant. This result implies that teachers' perceptions of school heads' instructional leadership were not strongly influenced by demographic or professional profile variables. It further suggests that other factors beyond age, sex, educational attainment, length of service, and grade level taught may have played a greater role in shaping teachers' views of instructional leadership in the digital context.

4. Conclusion & Recommendations

The study concludes that teachers at Buenavista Integrated School generally perceived their school heads' instructional leadership in the digital era positively. Most respondents were young, predominantly female, had master's degree units, and had moderate teaching experience. Teachers generally disagreed that they encountered significant challenges, although limited access to digital resources and infrastructure remained a notable concern. They strongly agreed that they experienced meaningful opportunities, particularly in technology integration, communication, continuous learning, and collaboration. They also rated school heads' instructional leadership as effective across instructional supervision, technology integration, innovation and collaboration, and digital learning environment, while digital professional development and instructional monitoring were evident but still needed further enhancement. Finally, the relationship between teachers' profile and their perceptions of school heads' instructional leadership was weak positive but not statistically significant, indicating that demographic characteristics did not significantly influence their perceptions.

Based on the findings and conclusions, it is recommended that school heads enhance instructional supervision by providing timely, specific, and constructive feedback to teachers and by strengthening communication and follow-through in digital instructional practices. They should also strengthen structured digital professional development programs by organizing regular training, aligning these with teachers' needs, allocating sufficient time for learning, and evaluating program impact. Instructional monitoring should be improved through greater use of digital tools and data-driven approaches to track teachers' progress and address instructional gaps. In addition, school heads should enhance inclusive digital learning practices, clearly communicate policies for digital classroom management, promote stronger cross-department collaboration, and foster a sustained culture of innovation to support technology integration in teaching and learning. Future school-based programs and interventions should likewise remain inclusive and responsive to the diverse needs of teachers, even if teachers' profile does not significantly influence perceptions of instructional leadership in the digital era.

The study was limited to teachers of Buenavista Integrated School, and the data were gathered through a questionnaire based on their experiences and perceptions. It was confined to the identified variables and did not include other factors such as student performance or external influences. Therefore, the findings are limited to the said school and may not be generalized to other settings.

Compliance with ethical standards

This study was conducted in accordance with institutional ethical standards and the ethical requirements observed in educational research. Prior to data collection, the researcher secured the necessary administrative permission to conduct the study and ensured that the research instrument underwent expert validation for clarity, relevance, and appropriateness. Participation of the teacher-respondents was voluntary, and they were properly informed of the purpose and nature of the study before the administration of the questionnaire, thereby upholding informed consent.

REFERENCES

A'mar, F., & Eleyan, D. (2022). Effect of principal's technology leadership on teacher's technology integration. *International Journal of Instruction, 15*(1), 781–798. https://doi.org/10.29333/iji.2022.15145a

Ablasa, L. A., & Liwan, R. K. (2024). The role of school leaders in enhancing digital literacy: For teachers and students. *Ignatian International Journal for Multidisciplinary Research, 8*(2), 1031–1036.

Adams, D., Namoco, S. O., Ng, A. Y. M., & Cheah, K. S. (2023). Leading schools during a pandemic and beyond: Insights from principals in the Philippines. *Management in Education*, 08920206231177375.

Aghaziarati, A., Nejatifar, S., & Abedi, A. (2023). *Artificial intelligence in education: Investigating teacher attitudes*.

Alayan, G. A. (2022). School heads' technological leadership and teachers' ICT integration in instruction in the public elementary schools in the Division of Quezon. *Psychology and Education: A Multidisciplinary Journal, 3*(2), 2–15.

Alde, A. S. (2024). Digital leadership and school management capabilities of school administrators and teachers digital teaching performance: Basis for professional development program. *International Journal for Multidisciplinary Research*.

Alkhawaldeh, M. A., & Khasawneh, M. A. S. (2023). Understanding the perceptions and challenges of teachers in the age of technology. *Journal of Namibian Studies, 37*.

Amemasor, S. K., Oppong, S. O., Ghansah, B., Benuwa, B. B., & Essel, D. D. (2025, May). A systematic review on the impact of teacher professional development on digital instructional integration and teaching practices. In *Frontiers in Education* (Vol. 10, Article 1541031). Frontiers Media SA.

Anderson, R. E., & Dexter, S. (2005). School technology leadership: An empirical investigation of prevalence and effect. *Educational Administration Quarterly, 41*(1), 49–82. https://doi.org/10.1177/0013161X04269517

Anwar, S., & Saraih, U. N. (2024). Digital leadership in the digital era of education: Enhancing knowledge sharing and emotional intelligence. *International Journal of Educational Management, 38*(6), 1581–1611.

Antonopoulou, H., Matzavinou, P., Giannoukou, I., & Halkiopoulos, C. (2025). Teachers' digital leadership and competencies in primary education: A cross-sectional behavioral study. *Education Sciences, 15*(2), 215. https://doi.org/10.3390/educsci15020215

Arombo, C. M. (2023). Master teachers-school heads designate's instructional competencies, instructional leadership practices and challenges. *Psychology and Education: A Multidisciplinary Journal, 15*(9), 1–1.

Baroudi, S. (2022). Leading in times of crisis: Evidence of digital transformational leadership among Arab female educational leaders. *International Journal of Leadership in Education*, 1–22.

Bass, B. M. (1985). *Leadership and performance beyond expectations*. Free Press.

Baydar, F. (2022). The role of educational leaders in the development of students' technology use and digital citizenship. *Malaysian Online Journal of Educational Technology, 10*(1), 32–46.

Bendanillo, A. C. (2025). *Instructional leadership skills of school head, teachers' use of technology for classroom management and academic performance of Grade 2 learners*.

Berkovich, I., & Hassan, T. (2024). Principals' digital instructional leadership during the pandemic: Impact on teachers' intrinsic motivation and students' learning. *Educational Management Administration & Leadership, 52*(4), 934–954. https://doi.org/10.1177/17411432221113411

Burns, J. M. (1978). *Leadership*. Harper & Row.

Cheng, E. C. K., & Wang, T. (2023). Leading digital transformation and eliminating barriers for teachers to incorporate artificial intelligence in basic education in Hong Kong. *Computers and Education: Artificial Intelligence, 5*, 100171. https://doi.org/10.1016/j.caeai.2023.100171

Cikusin, Y., & Mistar, J. (2024). Challenges and strategies in adopting Google Workspace for education: Perspectives from educational leaders in Indonesia. *Available at SSRN 4758623*.

Cox, J. S., & Mullen, C. A. (2023). Impacting student achievement: Principals' instructional leadership practice in two Title I rural schools. *Journal of School Leadership, 33*(1), 3–25.

Cruz, M. M. D., & Blanco, R. M. (2023). Master teachers as instructional leaders amidst the challenges of 21st century teaching learning. *Lunday: Research Journal of the Graduate School of Bulacan State University, 5*(1), 12–12.

Daing, C. A., & Mustapha, L. C. (2023). School administrators' instructional leadership skills and teachers' performance and efficacy in senior high schools in the national capital region, Philippines. *International Journal of Educational Policy Research and Review, 11*(1), 1.

Dasruth, J., Naicker, S. R., & Smith, C. (2024). Teachers' perceptions of principals' digital leadership practices in a school district in a developing country. *Social Sciences & Humanities Open, 10*, 101192. https://doi.org/10.1016/j.ssaho.2024.101192

Del Mundo, H. J. C. (2022). 21st century digital skills, technology integration in instruction and challenges encountered by senior high school teachers in Muntinlupa National High School. *International Journal of Multicultural Research and Analysis, 5*, 1159–1172.

Department of Education. (2017). *DepEd Order No. 42, s. 2017: National adoption and implementation of the Philippine Professional Standards for Teachers (PPST)*. Department of Education.

Department of Education. (2020). *DepEd Order No. 12, s. 2020: Adoption of the Basic Education Learning Continuity Plan for School Year 2020–2021 in the light of the COVID-19 public health emergency*. Department of Education.

Derder, A. T., Sudaria, R. V., & Paglinawan, J. L. (2024). Digital infrastructure on teaching effectiveness of public-school teachers. *Enhancing Equity and Excellence in Education, 62*, 1–16.

Ermita, L., & Baysa, M. L. (2025). Transformational leadership practices of school heads: Teachers' motivation and school performance. *Jurnal Inovasi Pendidikan, 3*(3), 178–202. https://doi.org/10.60132/jip.v3i3.499

Faizuddin, A., Azizan, N. A., Othman, A., & Ismail, S. N. (2022, October). Continuous professional development programmes for school principals in the 21st century: Lessons learned from educational leadership practices. In *Frontiers in Education* (Vol. 7, Article 983807). Frontiers Media SA.

Fitrah, M., Sofroniou, A., Yarmanetti, N., Ismail, I. H., Anggraini, H., Nissa, I. C., ... & Setiawan, D. (2025). Are teachers ready to adopt deep learning pedagogy? The role of technology and 21st-century competencies amid educational policy reform. *Education Sciences, 15*(10), 1344. https://doi.org/10.3390/educsci15101344

Fullan, M., Azorín, C., Harris, A., & Jones, M. (2024). Artificial intelligence and school leadership: Challenges, opportunities and implications. *School Leadership & Management, 44*(4), 339–346. https://doi.org/10.1080/13632434.2023.2246856

Gabato, M. A. E. (2025). *Digital integration and instructional leadership of school heads: Basis for an enhancement plan*.

Gading, S. J. L. (2024). Instructional leadership practices of the school heads to improve teachers' performance. *United International Journal for Research & Technology, 5*(6), 89–119.

Hallinger, P. (1985). Assessing the instructional management behavior of principals. *The Elementary School Journal, 86*(2), 217–247.

Hassan, T., & Berkovich, I. (2023). Digital instructional leadership in schools facing different levels of challenging contexts: A survey study during the COVID-19 pandemic. *Management in Education*. https://doi.org/10.1177/08920206231207586

Hathaway, D. M., Gudmundsdottir, G. B., & Korona, M. (2024). Teachers' online preparedness in times of crises: Trends from Norway and US. *Education and Information Technologies, 29*(2), 1489–1517. https://doi.org/10.1007/s10639-023-11733-5

Hazzan-Bishara, A., Kol, O., & Levy, S. (2025). The factors affecting teachers' adoption of AI technologies: A unified model of external and internal determinants. *Education and Information Technologies, 30*(11), 15043–15069. https://doi.org/10.1007/s10639-025-13393-z

Hero, J. L. (2020). *Exploring the principal's technology leadership: Its influence on teachers' technological proficiency*.

Hungo, M. O., Casinillo, L., & Madrigal, D. V. (2023). Leadership and challenges: A phenomenological exploration of teacher-principals in the Philippines. *Philippine Social Science Journal, 6*(4), 72–84.

Irawan, D. B., Marisya, F., Hatidah, H., & Purwanto, M. B. (2024). Changing principal leadership in the age of digitalization. *INTERACTION: Jurnal Pendidikan Bahasa, 11*(1), 218–232. https://doi.org/10.36232/jurnalpendidikanbahasa.v11i1.6033

Jimeno, J. B., & Prado, N. (2024). Quality leadership and management, technology based instruction, work attitude and teachers performance in the new normal. *International Journal of Multidisciplinary: Applied Business and Education Research, 5*(1), 251–284.

Joan, S., Jennifer, V., Medalla, P., & Iris, G. (2025). Instructional leadership among elementary school heads: Examining the relationships of demographic profiles, leadership practices and associated challenges. *CTU Journal of Innovation and Sustainable Development, 17*(3), 74–87.

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.

Karakose, T., & Tülübas, T. (2024). School leadership and management in the age of artificial intelligence (AI): Recent developments and future prospects. *Educational Process: International Journal, 13*(1), 7–14.

Liu, Y., Bellibaş, M. Ş., & Gümüş, S. (2021). The effect of instructional leadership and distributed leadership on teacher self-efficacy and job satisfaction: Mediating roles of supportive school culture and teacher collaboration. *Educational Management Administration & Leadership, 49*(3), 430–453. https://doi.org/10.1177/1741143220910438

Lucas, M., & Vicente, P. N. (2023). A double-edged sword: Teachers' perceptions of the benefits and challenges of online teaching and learning in higher education. *Education and Information Technologies, 28*(5), 5083–5103. https://doi.org/10.1007/s10639-022-11363-3

Maala, E. B., & Lagos, F. D. (2022). Technological leadership of school heads and teachers' technology integration: Basis for the development of a training program. *International Journal of Multidisciplinary: Applied Business and Education Research, 3*(10), 2074–2089. https://doi.org/10.11594/ijmaber.03.10.19

Macatuno-Nocom, N. (2019). Digital leadership practices of select deans in Philippine state universities and colleges: Implications on the 21st century education. *International Journal of Global Community, 2*(1), 1–22.

Magdaraog, R. B. (2025). Influence of instructional leadership practices of school heads on teachers' motivation and competence. *United International Journal for Research & Technology, 6*(4), 10–34.

Mar, N. A. (2024). Integration of technology and Islamic education in the digital era: Challenges, opportunities and strategies. *Journal of Scientific Insights, 1*(1), 1–8.

Marrone, R., Fowler, S., Bathakur, A., Dawson, S., Siemens, G., & Singh, C. (2025). Perceptions and perspectives of Australian school leaders on the integration of artificial intelligence in schools. *School Leadership & Management, 45*(1), 30–52. https://doi.org/10.1080/13632434.2024.2425019

Maryati, T., Lapasau, M., & Wahid, S. A. (2025). Enhancing principal effectiveness: A meta-analysis on the roles of academic supervision and instructional leadership. *Jurnal Penelitian Pendidikan IPA, 11*(9), 146–156.

Masrur, M. (2023). The challenges of implementing online-based leadership in the application of education innovations. *Nidhomul Haq: Jurnal Manajemen Pendidikan Islam, 8*(2), 227–241.

Meng, N., & Sermsri, N. (2024). Integration of big data and AI in educational leadership practices: Opportunities and challenges. *Eurasian Journal of Educational Research (EJER)*, (111).

Msila, V. (2022). Higher education leadership in a time of digital technologies: A South African case study. *International Journal of Information and Education Technology, 12*(10), 1110–1117.

Mushadi, M., Usman, N., & Bahrun, B. (2025). Empowering teachers in the digital age: Leadership strategies for enhancing pedagogic competencies in high schools. *Journal of Educational Management and Learning, 3*(1), 32–43.

Mustari, M., & Nurhayati, S. (2024). Multifaceted instructional leadership of school principals to improve student character in the digital era. *Al-Hayat: Journal of Islamic Education, 8*(2), 488–504. https://doi.org/10.35723/ajie.v8i2.459

Ng, D. T. K., Chan, E. K. C., & Lo, C. K. (2025). Opportunities, challenges and school strategies for integrating generative AI in education. *Computers and Education: Artificial Intelligence, 8*, 100373. https://doi.org/10.1016/j.caeai.2025.100373

Nurabadi, A., Suhariadi, F., Mardiyanta, A., Triwiyanto, T., & Adha, M. A. (2022). Digital principal instructional leadership in new normal era. *International Journal of Evaluation and Research in Education, 11*(3), 1090–1098. https://doi.org/10.11591/ijere.v11i3.22483

Oguntoye, L. A. (2024). *Teachers' perceptions of teacher leadership and teacher digital pedagogy in a digital learning environment: A qualitative descriptive study* (Doctoral dissertation, Trident University International).

Okunlola, J. O., & Naicker, S. R. (2025). Principals' digital leadership competencies in the Fourth Industrial Revolution: Teachers' perspectives. *Education Sciences, 15*(6), 656.

Ortiz Jr, O., Blancia, H., Pamittan-Gabaran, M., Corpin-Garcia, V. L., & Cruz, J. M. M. D. (2025). School heads' instructional leadership styles and administrative challenges as perceived by school heads and teachers in the Philippines. *Pedagogy Review: An International Journal of Educational Theories, Approaches and Strategies, 4*(2), 114–121.

Padolina-Alcantara, F. P. (2023). Digital era readiness and leadership and management competencies of school heads in the schools division of Marinduque. *International Journal for Research in Applied Science and Engineering Technology, 11*(5), 2886–2903.

Paloma, M. A. S. (2023). Technology leadership standards of education leaders, teachers' technological adoption and the integration of technologies in the classroom. *International Journal of Research Publications, 124*(1).

Philip, R., Patiam, A. M. C., Agpaoa, M. K. A. B., Villanueva, E. R., Kreisler, I., Leonora, V., & Pelayo, R. (2025). Digital leadership pioneers: Navigating outstanding school principals' successes in the evolving educational landscape. *IJLTER.org, 24*(4), 154–177.

Pitpit, G. M. (2020). *Elementary school principals' instructional leadership practices to retain novice teachers in the Philippines*. Walden University.

Prestoza, M. J., & Naldoza, N. (2025). Challenges and practices of instructional leadership: A qualitative inquiry of principals' and teachers'. *The Normal Lights, 19*(1).

Rasdiana, Wiyono, B. B., Imron, A., Rahma, L., Arifah, N., Azhari, R., ... Maharmawan, M. A. (2024). Elevating teachers' professional digital competence: Synergies of principals' instructional e-supervision, technology leadership and digital culture for educational excellence in digital-savvy era. *Education Sciences, 14*(3), 266.

Reis-Andersson, J. (2024). Leading the digitalisation process in K–12 schools: The school leaders' perspective. *Education and Information Technologies, 29*(3), 2585–2603.

Robosa, J., Paras, N., Perante, L., Alvez, T., & Tus, J. (2021). The experiences and challenges faced of the public school teachers amidst the COVID-19 pandemic: A phenomenological study in the Philippines. *International Journal of Advance Research and Innovative Ideas in Education, 7*(1), 1342–1361.

Rodriguez, M. R. G. (2021). Technology leadership: Assessing the competency level of high school administrators and teachers in the use of ICTs. *Journal of Educational Management and Social Sciences, 1*(1), 1–13.

Rosa, D., & Agbuya, M. (2022). Digital leadership and teachers' performance: Basis for a proposed training program. *International Journal of Multidisciplinary: Applied Business and Education Research, 3*(12), 2669–2685.

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

Siddiq, F., Olofsson, A. D., Lindberg, J. O., & Tomczyk, L. (2024). What will be the new normal? Digital competence and 21st-century skills: Critical and emergent issues in education. *Education and Information Technologies, 29*(6), 7697–7705. https://doi.org/10.1007/s10639-023-12067-y

Subade, M. T. (2024). Digital leadership of school heads and teachers' technological proficiency on school outcomes, Schools Division Office of Laguna. *International Journal of Research Publications, 148*(1). https://doi.org/10.47119/ijrp1001481520246419

Sunu, I. G. K. A. (2022). The impact of digital leadership on teachers' acceptance and use of digital technologies. *Mimbar Ilmu, 27*(2), 311–320. https://doi.org/10.23887/mi.v27i2.52832

Tai, M. K., Omar, A. K., Musa, K., & Ghouri, A. M. (2022). Leading teaching and learning in the era of education 4.0: The relationship between perceived teacher competencies and teacher attitudes toward change. *Asian Journal of University Education, 18*(1), 65–80.

Tanucan, J. C. M., Negrido, C. V., & Malaga, G. N. (2022). Digital leadership of school heads and job satisfaction of teachers in the Philippines during the pandemic. *International Journal of Learning, Teaching and Educational Research, 21*(10), 1–18. https://doi.org/10.26803/ijlter.21.10.1

Ugur, N. G., & Koç, T. (2019). Leading and teaching with technology: School principals' perspective. *International Journal of Educational Leadership and Management, 7*(1), 42–71. https://doi.org/10.17583/ijelm.2019.3758

Ventura, C. V., & Apellido, L. (2025). School heads 21st century instructional leadership and teachers' performance management in Lambayong 3 District. *Psychology and Education: A Multidisciplinary Journal, 36*(7), 1–1.

Yohannes, M. E., & Wasonga, T. A. (2023). Leadership styles and teacher job satisfaction in Ethiopian schools. *Educational Management Administration & Leadership, 51*(5), 1200–1218. https://doi.org/10.1177/17411432211041625

Yuting, Z., Adams, D., & Lee, K. C. S. (2022). The relationship between technology leadership and teacher ICT competency in higher education. *Education and Information Technologies, 27*(7), 10285–10307. https://doi.org/10.1007/s10639-022-11037-0