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by Sri Astuti

Implementation of Digital-Based Approaches in Early Childhood Education Supervision Amidst the COVID-19 Pandemic

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Abstract

In the context of early childhood education, education plays a crucial role in shaping a child's development. The COVID-19 pandemic has transformed the education landscape entirely, including early childhood education. School principals and early childhood educators have faced challenges in providing effective supervision, guidance, and evaluation in digital-based learning environments. This research aims to analyze the implementation of digital-based approaches in early childhood education supervision during the COVID-19 pandemic. Employing a survey method with a mixed-method approach, the results indicate that digital-based supervision in early childhood education exhibits limited effectiveness due to educators' lack of digital literacy, institutional unpreparedness, and suboptimal communication channels. Emphasizing digital literacy training, ensuring digital infrastructure, establishing continuous communication, and adopting user-friendly applications are crucial to enhancing educator competencies and enriching children learning experience.

Keywords: *covid-19 pandemic; early childhood education supervision; digital-based approaches*

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Introduction

The world is grappling with the ongoing COVID-19 pandemic, the duration of which remains uncertain. It has been two years since the global community began navigating life amid the challenges posed by the COVID-19 virus. The consequences of this pandemic have significantly affected various sectors, with education being one of the most profoundly impacted areas (Lades et al., 2020; Lenzen et al., 2020; Nicola et al., 2020; Nurhayati et al., 2022; Nurhayati, Hidayat, et al., 2023; Ratten, 2020; Suharyat et al., 2022).

The education sector has encountered multifaceted challenges that have reshaped the traditional teaching and learning paradigms. The abrupt closure of schools to curb the spread of the virus has disrupted the conventional methods of delivering education (Adedoyin & Soykan, 2023; Al Lily et al., 2020; Khlaif et al., 2021; Maqsood et al., 2021; Musa et al., 2022; Nurmalia et al., 2022). This closure interrupted the continuity of learning for millions of students worldwide and posed challenges for educators, administrators, and parents.

One prominent challenge has been the swift transition from in-person to remote learning, necessitating a paradigm shift in instructional strategies. The sudden adoption of distance education exposed disparities in digital access among students, creating an uneven playing field regarding technological resources. Students in resource-poor environments faced difficulties accessing online classes, exacerbating educational inequalities (Barrot et al., 2021; Joshi et al., 2020; Qudsi & Nurhayati, 2023).

Moreover, the shift to remote learning highlighted the importance of adapting pedagogical approaches to suit virtual environments. Educators had to grapple with reimagining lesson plans, incorporating digital tools, and ensuring that learning objectives were effectively communicated through online platforms. This shift also underscored the significance of teacher training in digital literacy to facilitate a smoother transition to virtual classrooms (Aril Barnett, 2021; Ganguly, 2023; Marsegi et al., 2023; Nurhayati, 2021b; Ravi et al., 2021; Winarti et al., 2022).

The closure of physical schools presented a unique set of challenges for parents who found themselves thrust into supporting their children's education at home (Bagnall et al., 2022; Buchanan et al., 2023; Flynn et al., 2021; Harmey & Moss, 2023; Latif et al., 2023; Lismayanti et al., 2021; Nurhayati, Qudsi, et al., 2023; Suharyat et al., 2023). Balancing work responsibilities with the newfound role of facilitating learning became a juggling act for many parents, shedding light on the intricate relationship between home and school environments.

Furthermore, the closure of educational institutions impacted the holistic development of students. Beyond academic education, schools play a vital role in fostering social interactions, extracurricular activities, and emotional well-being. The absence of these aspects in the virtual learning environment has raised concerns about the overall educational experience and its long-term effects on students' social and emotional development.

The government of Indonesia responded to the crisis by issuing Circular Policy Number 4 of 2020, which outlined educational policies for the COVID-19 emergency period. Due to this directive, distance learning had to replace traditional in-person instruction, necessitating the adoption of numerous strategies (Cahyadi et al., 2022; Ghofur & Nurhayati, 2023; Nuraeni & Nurhayati, 2023; Nurhadi et al., 2023; Wajdi et al., 2020).

In response to the imperative of distance learning, educational institutions swiftly implemented various strategies to ensure the continued delivery of quality education despite the challenges posed by the pandemic. Firstly, schools embraced online learning platforms like Learning Management Systems (LMS) like Google Classroom, Moodle, and Microsoft Teams. These platforms provided a centralized space for teachers to share resources, conduct virtual classes, and engage with students in real-time (Abu Talib et al., 2021; Almpanis & Joseph-Richard, 2022; Hudri & Nurhayati, 2020; Noor et al., 2020).

Additionally, integrating video conferencing tools, including Zoom and Microsoft Teams, became crucial to the distance learning landscape. These tools facilitated live virtual classes, enabling teachers to interact with students synchronously, replicating aspects of traditional in-person instruction. Real-time communication through video conferencing enhanced teacher-student engagement and allowed for peer interactions, fostering a sense of community among students (Andujar & Franco Rodriguez, 2019; Belt & Lowenthal, 2023; Vlachopoulos & Makri, 2019).

Schools use asynchronous learning methods to cater to diverse learning needs. This involved creating pre-recorded video lessons, interactive e-learning modules, and digital assignments accessible through the platforms mentioned above. Asynchronous learning offered flexibility, allowing students to engage with educational content at their own pace, mitigating challenges associated with varying internet connectivity and time zone differences (Lemke, 2022; Meng & Dan-Dan, 2022; Phillips, 2021).

Recognizing the importance of continuous assessment, schools leveraged online assessment tools and platforms. These tools facilitated the creation, distribution, and grading of quizzes and exams, ensuring a seamless evaluation process even in a virtual setting. Digital

assessments also provide valuable data for teachers to gauge students' progress and tailor their instructional approaches accordingly.

To address the digital divide and ensure equitable access to education, schools collaborated with telecommunication companies and local authorities to provide internet connectivity and devices to needy students. This inclusive approach aimed to bridge the gap in digital access, ensuring that all students could participate in remote learning activities.

As a result of the shift to remote learning, parents now bear greater responsibility for supporting their children's at-home education. Parental involvement is crucial to achieving the curriculum's educational goals because it fosters a cooperative relationship between schools and parents that greatly aids in achieving these objectives.

Parents assume several crucial roles in supporting at-home education. They play a pivotal role in establishing a conducive learning environment by designating a dedicated study space, ensuring access to necessary learning materials, and minimizing distractions during virtual classes. Additionally, parents provide essential technical assistance, aiding students in navigating online platforms and digital tools to ensure seamless participation in virtual classes and effective utilization of educational resources (Budhrani et al., 2021; Milyane et al., 2023; Rousoulioti et al., 2022; Thomas et al., 2021).

Furthermore, parents assist in structuring their children's daily schedules, helping them balance academic tasks with breaks and recreational activities. This guidance proves instrumental in aiding students to manage their time effectively in a remote learning setting. Regular communication between parents and teachers becomes essential in remote learning, with parents acting as liaisons, conveying concerns or challenges faced by their children and collaborating with educators to address specific learning needs.

Research indicates that face-to-face instruction is more effective than online instruction, with a 90.5% effectiveness rate compared to online instruction's 70.6%. This discrepancy is largely attributed to parental support and involvement. In traditional classrooms, parental involvement extends to active participation in school-related activities, such as parent-teacher conferences, volunteering, and extracurricular events, positively influencing students' attitudes toward learning (Handayani & Utami, 2020; Musa & Nurhayati, 2020; Nurhayati, 2021a; Nursa'adah et al., 2022; Ratningsih et al., 2021; Rumsari & Nurhayati, 2020).

The implications for online instruction are significant. Replicating the level of parental involvement seen in traditional settings becomes essential to enhance the effectiveness of virtual education. This involves active participation in virtual parent-teacher meetings, online workshops, and collaborative initiatives that bridge the gap between home and virtual classrooms. Online educational platforms should incorporate features that facilitate seamless communication between parents, teachers, and students, including real-time progress tracking, virtual parent-teacher conferences, and accessible resources for parents to aid their children's learning.

Furthermore, access to adequate facilities and infrastructure is a key factor in the success of online education, so the quality of learning is closely related to the living conditions of the students (Iskandar et al., 2023; Ramli et al., 2020). The quality of learning in an online education setting is intricately tied to students' living conditions. Adequate facilities and infrastructure encompass access to a reliable internet connection, suitable digital devices, and a conducive learning environment. Students in well-equipped environments with high-speed internet and modern devices are better positioned to engage with online content, participate in virtual classes, and submit assignments promptly. Conversely, students facing challenges such as poor internet connectivity or inadequate devices may experience disruptions in their learning, hindering their ability to benefit from online education fully.

The way school principals manage supervision has changed due to the changes to Indonesia's educational landscape. Previously conducted mostly in person, supervision is now digitalized and based online. The shift to digitalized and online supervision has brought about notable changes in the traditional supervision process. Previously conducted in person,

supervision now leverages digital tools and remote monitoring and evaluation platforms. Principals can use video conferencing, observation tools, and data analytics to assess teaching methods, provide feedback, and track teacher performance. Digitalization has increased the efficiency of the supervision process by allowing for real-time interactions, reducing logistical constraints, and providing a more comprehensive overview of educators' practices. This has streamlined the supervision process, making it more adaptable to the dynamic nature of online education (Suparman, 2021; Zuhairi et al., 2020).

This adaptation is crucial to ensure that students receive proper guidance from teachers and the necessary support from parents, enabling them to meet predetermined educational objectives. Predetermined educational objectives refer to specific learning outcomes and goals set by educational institutions. Digital-based supervision contributes to achieving these objectives by ensuring that teachers are aligned with the educational goals. Through digital tools, principals can monitor whether instructional strategies align with the curriculum, assess student progress, and provide targeted support where needed. This form of supervision enables a more data-driven and individualized approach to education, helping to meet the unique needs of each student and ensuring that overall educational objectives are met.

Digital-based supervision has been successfully implemented in several schools, offering the flexibility of conducting supervisory activities anywhere and anytime, facilitating smooth interactions and discussions between principals and teachers, all integrated with technology (Habibi et al., 2020). Successful implementation of digital-based supervision involves the integration of various technologies. Video conferencing platforms, observation tools, and data analytics software are commonly used. These technologies allow principals to conduct virtual classroom observations, provide real-time feedback, and analyze data on teaching practices. Integration with technology has improved the supervision process by increasing accessibility, providing flexibility in scheduling, and enabling more efficient data collection and analysis. Technology has facilitated smoother interactions and discussions between principals and teachers, fostering a collaborative and supportive learning environment.

However, despite the advancements of the Fourth Industrial Revolution, th technology's equitable and efficient utilization remains a challenge. Issues include limited facilities and infrastructure and a shortage of human resources proficient in technology.

Several challenges impede the equitable and efficient use of technology in education. Limited facilities and infrastructure encompass inadequate internet access, insufficient availability of digital devices, and outdated technological resources. A shortage of human resources proficient in technology refers to the scarcity of educators and administrators well-versed in utilizing digital tools for effective teaching and management. To address these challenges, local government bodies and relevant agencies can play a pivotal role. They can allocate funds to improve technological infrastructure in educational institutions, provide subsidies or incentives for students to access digital devices, and offer training programs for educators and administrators to enhance their proficiency in technology. Additionally, partnerships with technology companies and collaborations with educational experts can contribute to overcoming these challenges.

Support from local government bodies and relevant agencies is crucial to sustaining educational evaluations. Research has shown that supportive leadership significantly enhances subordinates' performance (Wahida et al., 2020). Supportive leadership in the context of digital-based education profoundly impacts the performance of educators and administrators. It involves providing guidance, resources, and encouragement to navigate the challenges of incorporating technology into teaching and administrative processes. Supportive leaders foster a positive work environment, encouraging experimentation, innovation, and continuous learning. This leadership style helps alleviate the fear of failure, enabling educators and administrators to embrace new technologies confidently. Additionally, supportive leaders facilitate professional development opportunities, ensuring the workforce has the necessary

skills and knowledge to leverage digital tools effectively. By promoting a culture of support, leaders contribute to the overall success of digital-based education initiatives, fostering a collaborative and forward-thinking educational environment.

Online learning is a new experience for teachers, and many face challenges in utilizing technology effectively (Gómez-Rey et al., 2016). These challenges include creating PowerPoint videos, converting materials to online formats, and managing files using tools such as Google Drive and Google Sheets.

Teachers encounter various challenges in adapting to online learning, such as a lack of familiarity with digital content creation tools, difficulties in converting traditional teaching materials to online formats, and challenges in file management using platforms like Google Drive and Google Sheets. These challenges impact the overall effectiveness of online learning by potentially leading to a less engaging learning experience for students. The learning materials may not be optimized for online delivery, hindering student comprehension and participation. Additionally, teachers may struggle to maintain an organized and efficient online classroom environment, affecting the flow of lessons and communication with students.

Hence, it is imperative to provide gradual assistance, training, and education to teachers, guiding them through these digital aspects. Supporting teachers in overcoming digital challenges involves offering comprehensive assistance, training, and education. Gradual assistance can include mentorship programs where experienced educators guide their peers in adopting effective online teaching practices. Training sessions should cover digital content creation tools, strategies for converting materials to online formats, and best practices for file management. Educational programs should be designed to enhance teachers' digital literacy, focusing on pedagogical strategies that align with online learning environments. Providing ongoing support, access to resources, and opportunities for collaboration can further empower teachers to navigate the digital landscape confidently.

This type of supervision is an integral part of what principals can achieve through digital means (Beetham & Sharpe, 2019). Digital supervision supports teachers by providing real-time feedback, monitoring online classrooms, and offering targeted guidance. Through digital platforms, principals can observe online teaching sessions, assess the effectiveness of digital content creation, and identify areas for improvement. They can leverage video conferencing tools to conduct virtual meetings, address teachers' concerns, and provide timely support. Digital supervision also enables the sharing of best practices, collaborative planning, and dissemination of relevant resources. By utilizing technology, principals can efficiently oversee the implementation of online teaching strategies and tailor their support to meet the evolving needs of teachers in the digital learning environment.

In summary, while the perception of traditional classrooms as the sole venue for learning persists among the public, the COVID-19 pandemic has accelerated the education sector's entry into the digital age. This transition has necessitated using technology, such as mobile phones, laptops, and internet connectivity, for learning (Hertiavi, 2020; Sørensen & Levinsen, 2015).

The perception of traditional classrooms has influenced the adoption of digital learning tools by challenging the conventional notion of learning spaces. With the shift towards online education, video conferencing platforms, interactive learning applications, and virtual classrooms have become integral. The perception of classrooms has evolved to include virtual environments where learning can occur seamlessly, fostering the integration of various digital tools to enhance the educational experience.

As we embrace the Fourth Industrial Revolution, technological advancements have significantly impacted educational institutions, particularly teachers and students. As educational policymakers, school principals are responsible for cultivating teachers' professionalism to enhance the quality of education.

Technological advancements have transformed the educational landscape by offering innovative teaching methods, personalized learning experiences, and increased accessibility to information. Teachers and students have had to adapt to new tools and modes of instruction, requiring continuous professional development. School principals contribute to cultivating professionalism by fostering a culture of adaptability, providing training opportunities, and supporting teachers in integrating technology effectively. They play a pivotal role in aligning technological advancements with educational goals, ensuring a seamless integration that enhances the overall quality of education.

Even in an online learning environment, principals must continue to fulfill their obligations by providing guidance and supervision, albeit through digital means (Ganon-Shilon & Schechter, 2017; Watkins, 2022). Principals in an online learning environment have obligations that include ensuring the effective implementation of digital curriculum, monitoring the performance of educators in the digital space, and providing ongoing support to address challenges. They must guide teachers in utilizing digital tools, facilitate collaboration among educators, and maintain a positive online learning environment. Through digital means, principals can conduct virtual meetings, observe online classes, and offer timely feedback to ensure the continued professional development of educators.

The unfolding COVID-19 pandemic, persisting over two years, has significantly impacted various sectors worldwide, with education emerging as one of the most profoundly affected domains. Research in digital-based approaches in early childhood education during this pandemic has provided essential insights. Studies have elucidated the challenges faced by educational institutions, such as the abrupt shift to remote learning and the disparities in digital access among students, revealing the need for innovative strategies and comprehensive support systems.

These prior investigations have predominantly concentrated on discerning the roles of teachers, students, and the technological tools employed in this transitional phase. They have underscored the importance of adapting pedagogical approaches, teacher training in digital literacy, and the imperative for continuous assessment methods in virtual environments. However, a discernible gap exists in understanding the intricate dynamics of parental involvement, the specific strategies schools adopt to ensure continuity in education, and the effectiveness of digital-based principal supervision in early childhood education settings.

While previous research has provided invaluable insights, it often falls short in exploring the nuanced aspects of parental roles, school strategies during the crisis, and the impact of digital supervision on the early childhood education sector. This study aims to bridge these gaps by delving into the unexplored facets of digital-based principal supervision in DKI Jakarta during the COVID-19 pandemic.

DKI Jakarta, as the capital of Indonesia and one of the regions most affected by COVID-19, has also witnessed a shift to online learning. This research was conducted across five areas of DKI Jakarta: Central Jakarta, South Jakarta, East Jakarta, North Jakarta, and West Jakarta. The study was carried out by distributing questionnaires to schools implementing digital-based academic supervision in the early childhood education sector. The sample of schools was selected using a purposive sampling method, considering factors such as geographical representation, socioeconomic diversity, and the extent of digital infrastructure. Criteria for determining the areas of DKI Jakarta included in the research involved ensuring a balanced representation of central, south, east, north, and west regions. This approach aimed to capture a comprehensive view of the diverse challenges and successes in implementing digital-based academic supervision across different areas of the capital.

In light of the challenges outlined above, this study aims to investigate the implementation of digital-based principal supervision in early childhood education settings within DKI Jakarta during the COVID-19 Pandemic. The study seeks to evaluate the effectiveness of digital-based principal supervision methods in addressing challenges early childhood educators face during the COVID-19 pandemic. This involves examining how

digital supervision contributes to overcoming obstacles such as digital literacy issues, infrastructure readiness, and effective communication. By investigating the implementation of digital-based supervision, the research aims to identify innovative practices and strategies that have successfully mitigated challenges specific to the early childhood education sector. This includes exploring how technology is leveraged to enhance the guidance and support provided by school principals. The study aims to provide insights into the effective integration of digital-based supervision in early childhood education. This involves offering practical recommendations for policymakers to enhance the overall quality of education in the digital era.

Methodology

The research methodology employed in this study is informed by mixed-method research, a methodological approach utilized when researchers aim to investigate questions related to both outcomes and processes. This approach integrates quantitative and qualitative methods within a single study, as Sugiono (2013) outlined. The study collected data from a diverse group of participants, comprising researchers, teachers, and principals, totaling 65 individuals. The research procedure involved three key phases: problem identification, data collection, and analysis of digital-based supervision (Arikunto, 2015).

The research design involves a mixed-method approach, combining quantitative and qualitative methods to investigate the impact of digital-based supervision. The design encompasses the collection of quantitative data through surveys and statistical analysis and qualitative data through interviews, observations, and document analysis.

Data collection techniques were executed online, utilizing Google Forms, and directed towards teachers and school principals. Data was gathered using various techniques, including observations, interviews, and documentation. The interview guide utilized in this research has undergone a validation process to ensure clarity, relevance, and alignment of questions with the research objectives. This validation process was conducted by individuals possessing expertise and an in-depth understanding of the research field.

The methodology for data analysis was based on Miles and Huberman's framework, which calls for data reduction, data visualization, and conclusion drawing. (Sugiono, 2013). With a focus on the dimensions of Academic Supervision and Teacher Competence, the results of statistical calculations using SPSS were combined with information gained from interviews and questionnaires. These parameters include at table 1.

Table 1. Variable Dimension Instruments

VARIABLES	DIMENSIONS
TEACHER COMPETENCE	PEDAGOGIC
	SOCIAL
	PERSONALITY
	PROFESSIONAL
ACADEMIC SUPERVISION	PLANNING
	SUPERVISION-IMPLEMENTATION
	DATA ANALYSIS
	FEEDBACK
	REPORTING

Table 1 presents the different variables and dimensions and the associated instruments used in the study. **Teacher Competence** is divided into four dimensions: a) **Pedagogic**: This dimension assesses the teacher's teaching methods and strategies, b) **Social**: It evaluates the teacher's ability to interact and engage with students socially, c) **Personality**: This dimension focuses on the teacher's personality traits and characteristics, d) **Professional**: It examines the teacher's professional qualifications and competence.

Academic Supervision is also divided into five dimensions, which are part of the supervision process: a) **Planning**: This dimension evaluates the planning stage of supervision, where objectives and criteria are set, b) **Supervision-Implementation**: It assesses the actual execution of the supervision process, c) **Data Analysis**: This dimension involves analyzing the data collected during supervision, d) **Feedback**: It evaluates the feedback provided to teachers based on the supervision findings, e) **Reporting**: This dimension assesses the reporting stage, where the supervision results are documented and communicated.

Result and Discussion

Academic supervision is crucial in shaping the quality of education, particularly within the context of early childhood education. The effectiveness of the learning process heavily relies on the presence of skilled and professional teachers (Cantor et al., 2021; Cousin, 2020; Ford et al., 2021). Nurturing professionalism among these educators is achievable through the effective implementation of academic supervision. In the realm of early childhood education, teachers take on central roles in the learning journey, and their level of professionalism significantly influences the achievement of educational objectives (Cheng et al., 2016; Jess et al., 2016; Yi & Wen, 2023).

This research focuses on the distribution of data related to implementing digital-based academic supervision in early childhood education settings across various regions of DKI Jakarta. The study involves a sample of 50 teachers and 15 principals from different areas within DKI Jakarta, including the eastern, western, southern, northern, and central regions.

The research analysis involves a comparative examination of conventional supervision methods against digital-based supervision in early childhood education.

Table 2. Teacher Competence Comparison: Face-to-Face vs. Online/Digital

Teacher Competence	Face to Face	Online/Digital	Percentage Gap
Pedagogic	86	78	8%
Social	90	74	16%
Personality	91	76	15%
Professional	84	74	10%
Number of Gaps	87.75%	75.5%	12.25%

The quantitative analysis revealed that face-to-face supervision achieved an average effectiveness score of 87.75%, while online supervision scored 75.5%. This numerical assessment provides insights into the evaluation of teacher competencies, specifically those assessed through online-based academic supervision. The results suggest that teacher competencies in the online realm can be categorized as 'sufficient.'

An unexpected revelation surfaced during the analysis, indicating a decline in the implementation of face-to-face supervision, resulting in a noticeable gap of 12.25%. This unanticipated trend underscores the importance of school principals demonstrating a robust commitment to improving teacher competencies, particularly within the evolving landscape of online learning (Lie et al., 2020; Warren & Venzant Chambers, 2020).

The findings point toward the need for a holistic approach to improving teacher competencies, emphasizing adapting to the demands of online education. School principals play a pivotal role in this transformation, necessitating reevaluating strategies to ensure a balanced implementation of face-to-face and online-based academic supervision. Amidst the formidable challenges posed by the COVID-19 pandemic, this research unveils a resounding commitment among educators in early childhood education. These educators display exceptional dedication and unwavering motivation, even amid adversity. Their commitment is fortified by a robust spirit of collaboration among teachers, parents, and the broader community in online learning. Nevertheless, it is imperative to provide the requisite support,

with a particular focus on ensuring the availability of adequate infrastructure. This entails not only guaranteeing the functionality of learning materials employed by teachers but also addressing the accessibility and functionality of facilities and infrastructure used by students.

The importance of academic supervision in molding the quality of education cannot be underestimated. It stands as a pivotal mechanism for nurturing teacher professionalism, a factor that profoundly affects the efficacy of the learning process. Within the domain of early childhood education, where teachers occupy a central and influential position, the role of academic supervision in shaping teacher competence is of paramount significance (Göker, 2020; Price, 2012).

These findings contribute to previous studies by reinforcing that academic supervision is essential for maintaining teaching standards and instrumental in adapting to the challenges brought by the digital shift, as observed during the COVID-19 pandemic. The collaborative commitment among educators further accentuates the need for ongoing support and professional development initiatives.

In the pursuit of improved teacher competence, academic supervision encompasses four key areas of competence, namely: 1) Pedagogic Competence; The emphasis on pedagogic competence underscores the significance of effective teaching methods and strategies. Digital-based academic supervision, with its structured cycle, provides a platform for refining pedagogic skills. This aligns with the broader educational landscape, where adapting teaching methodologies to digital platforms is essential. 2) Social Competence; In the realm of online learning, social competence takes on a new dimension, involving the ability of teachers to engage and connect with students virtually. The digital-based supervision process, overseen by school principals, should address the development of social competence, ensuring that teachers can effectively foster a supportive online learning community. 3) Personality Competence; Personality competence, focusing on the traits and characteristics of teachers, gains prominence in the digital environment. The discussion should explore how the structured cycle of digital-based academic supervision contributes to developing positive teacher traits creating an environment conducive to effective online education. 4) Professional Competence; Professional competence encompasses qualifications and overall professional acumen. The discussion should analyze how digital-based academic supervision supports continuous professional development. It should address whether the cycle enhances teachers' professional qualifications and competence in the context of evolving educational technologies.

The identified competencies and the structured cycle of digital-based academic supervision contribute to the ongoing discourse on teacher competence and the evolving landscape of education. By providing a comprehensive framework, this research sheds light on how digital platforms can be effectively leveraged to enhance various dimensions of teacher competence.

These findings strengthen the results by highlighting the practical implications of the identified competencies within the digital supervision context. It bridges the study's specific findings and the broader landscape of educational research, emphasizing the relevance of digital-based approaches in fostering teacher excellence.

The process of digital-based academic supervision adheres to a meticulously structured cycle overseen by school principals. The cyclic nature of this process is designed to facilitate ongoing enhancements in teacher competence, ultimately resulting in an elevated quality of early childhood education.

Implementing academic supervision is best represented as a cyclical framework that can be effectively executed in a digital format. This cycle can be illustrated as figure 1.

Figure 1. Cycle of Digital-Based Supervision

The digital-based academic supervision process in early childhood education encompasses several key stages: 1) **Supervision Planning**: During the planning stage, principals within early childhood education settings collaborate with teachers to craft a well-structured academic supervision plan that ensures effectiveness and efficiency. This planning process encompasses various critical components, including the scheduling of virtual face-to-face meetings facilitated through platforms such as Zoom Meeting. Within this stage, objectives and criteria for supervision are thoughtfully defined, focusing on establishing clear, logical, and measurable benchmarks for evaluating success. The collaborative planning stage, involving principals and teachers, enhances shared commitment and innovation. Virtual face-to-face meetings are pivotal for effective communication, positively influencing subsequent supervision stages. Thoughtfully defined objectives and criteria guide a purposeful approach, leading to measurable improvements. Clear benchmarks facilitate systematic success evaluation, contributing to overall supervision effectiveness. The adaptability of the planning process and continuous improvement loops reinforce efficiency and positive outcomes. 2) **Supervision Implementation**: School principals conduct the academic supervision process following the meticulous planning phase. Within this stage, they systematically assess the competencies and performance of teachers in delivering online education to young children. This evaluation process involves the identification of both strengths and areas requiring improvement. The resulting findings serve as a valuable reference point for providing constructive feedback and formulating targeted solutions to enhance the educational experience. The meticulous implementation stage, led by school principals, signifies a crucial transition from planning to action. Principals systematically evaluate teacher competencies in online education delivery, emphasizing identifying strengths and areas for improvement. The resulting findings become a valuable reference for targeted solutions and constructive feedback. This process shapes individual teacher development and enhances the overall educational experience. 3) **Data Analysis**: After the implementation phase, the data collected undergoes meticulous analysis. This pivotal stage is critical in guiding decision-making processes and formulating tangible solutions to resolve issues identified during the academic supervision process. The outcomes of this thorough analysis serve as an informed basis for initiatives to enhance teacher competencies and, consequently, the overall effectiveness of the educational endeavor. The critical stage of data analysis post-implementation is pivotal in informing decision-making and devising tangible solutions. This analysis serves as a foundation for initiatives aimed at improving teacher competencies and, subsequently, enhancing the overall effectiveness of the educational endeavor. 4) **Feedback and Follow-Up**: Subsequently, school principals engage in a feedback and follow-up stage of the academic supervision process. Principals offer comprehensive feedback during this phase, providing valuable comments and insightful observations. This feedback is thoughtfully communicated through online platforms such as Zoom meetings, facilitating efficient and meaningful

exchanges. Furthermore, principals undertake a proactive follow-up process to ensure that the insights and findings from the academic supervision contribute effectively to teacher improvement. This follow-up also involves alignment with pertinent regulations to ensure compliance and consistency in educational practices. The feedback and follow-up stage is crucial to the academic supervision process, contributing significantly to teacher improvement. Reporting: The concluding stage necessitates principals to compile comprehensive reports detailing the academic supervision process. These reports serve as a crucial mechanism for accountability, encompassing critical information. They comprise observation instruments, the outcomes of teacher observations, learning materials crafted by educators, and accompanying documentation, which may include screenshots of activities. The act of reporting meticulously maintains transparency and instills a structured approach in executing academic supervision, facilitating a well-documented record of the entire process.

Conclusion

This study highlights the limited effectiveness of digital-based supervision in enhancing the competencies of early childhood educators. This inadequacy stems from educators' lack of digital literacy, insufficient institutional preparedness, and suboptimal digital communication channels between educators and school administrators. Based on these findings, principals and administrators in early childhood education settings are strongly recommended to prioritize digital literacy training for educators. Addressing the critical need for essential facilities and infrastructure is imperative to support effective digital learning initiatives. Moreover, principals and administrators should proactively establish continuous communication channels and foster collaboration among early childhood educators, parents, and young learners. Sustained engagement in these relationships can contribute to a more supportive learning environment. In the realm of digital learning and monitoring within early childhood education, adopting user-friendly, specialized applications accessible to all stakeholders is deemed essential. This strategic move allows early childhood education to harness the full potential of digital tools, ultimately enhancing educator competencies and providing a more enriching learning experience for young children.

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