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Managing Teacher Competence in Android-Based Differentiated Instruction: A Qualitative Study in Indonesian Vocational Education

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ABSTRACT

This study examines the management of teacher competence in implementing Android-based differentiated instruction within a vocational education context. Grounded in the increasing demand for technology-integrated and student-centered learning, this research aims to analyze (1) the managerial processes underlying teacher competence development, (2) the characteristics of Android-based differentiated instruction, and (3) the multidimensional competencies required by teachers. A qualitative descriptive design was employed, with data collected through in-depth interviews, participant observation, and document analysis involving school leaders, teachers, and students at SMK Negeri 2 Palopo, Indonesia. Data were analyzed using the interactive model of Miles and Huberman, including data reduction, data display, and conclusion drawing. The findings reveal that teacher competence management operates through a systematic cycle of planning, organizing, implementation, and evaluation, supported by institutional structures and continuous professional development. Android-based differentiated instruction is characterized by personalization, interactivity, flexibility, real-time monitoring, and collaborative learning environments. Furthermore, teacher competence is identified as a multidimensional construct encompassing technological, pedagogical, evaluative, managerial, and motivational dimensions. This study contributes to the discourse on digital pedagogy by highlighting that effective technology integration is contingent upon strategic competence management within educational institutions. The findings offer practical implications for policy and practice in enhancing teacher capacity and advancing adaptive, inclusive, and technology-driven learning systems.

Keywords: teacher competence, differentiated instruction, Android-based learning, educational management, digital pedagogy

INTRODUCTION

Education remains a central pillar in the construction of high-quality human capital, particularly within the rapidly evolving landscape shaped by globalization and the Fourth Industrial Revolution. Contemporary educational systems are no longer evaluated solely based on their capacity to transmit knowledge; rather, they are increasingly assessed through their ability to cultivate adaptive, technologically literate, and critically engaged learners. Within this context, teachers occupy a pivotal position as transformative agents who mediate between curriculum demands, technological advancement, and the diverse learning needs of students. Consequently, strengthening teacher competence emerges not merely as a technical necessity but as a strategic imperative in ensuring the relevance and sustainability of educational practices in the digital era (Syerlita & Siagian, 2024) .

One pedagogical approach that has gained significant scholarly attention in addressing learner diversity is differentiated instruction. This approach is grounded in the recognition that students exhibit variability in readiness levels, interests, learning profiles, and cognitive processing capacities. Differentiated instruction, therefore, requires teachers to design flexible learning environments, adapt instructional strategies, and employ varied assessment methods to ensure that each student achieves optimal learning outcomes. Such an approach demands not only pedagogical sensitivity but also advanced managerial competence in orchestrating instructional processes that are responsive, inclusive, and effective (Faiz et al., 2022; Kamal, 2021) .

Parallel to these pedagogical shifts, the integration of digital technology—particularly mobile-based platforms such as Android—has opened new avenues for instructional innovation. Android-based learning environments provide dynamic tools for content delivery, interactive engagement, formative assessment, and communication. These platforms enable the operationalization of differentiated instruction by allowing teachers to customize learning materials, adjust difficulty levels, and facilitate personalized learning pathways. Prior studies highlight that Android-based media can enhance student engagement and improve instructional effectiveness when properly designed and implemented (Kuswanto, 2020; Valentino et al., 2022).

Despite the theoretical promise of Android-supported differentiated instruction, empirical evidence suggests a persistent gap between technological potential and classroom implementation. Challenges such as limited teacher readiness, inadequate professional development, infrastructural constraints, and misalignment between technological tools and curricular objectives continue to hinder optimal utilization (Hasanah et al., 2023) . These conditions indicate that teacher competence should be conceptualized not merely as an individual attribute, but as a systematically managed construct encompassing planning, development, implementation, and evaluation.

The case of SMK Negeri 2 Palopo presents a particularly relevant context for investigating these dynamics. As a vocational institution designated as a Center of Excellence and an early adopter of the Merdeka Curriculum, the school has undergone significant pedagogical transformation, including the gradual implementation of differentiated instruction supported by institutional programs such as professional workshops and curriculum reinforcement initiatives (Initial Observation, 2023) . These

initiatives reflect an institutional effort to align pedagogical practices with contemporary educational demands while maintaining coherence with national educational philosophy.

Nevertheless, the transition toward differentiated, technology-enhanced learning is not without complexity. Variations in teacher competence, disparities in technological literacy, and the evolving nature of student learning preferences necessitate a comprehensive managerial approach to teacher development. Within this framework, understanding how teacher competence is systematically planned, developed, and evaluated becomes crucial in ensuring the effectiveness of Android-based differentiated instruction.

This study, therefore, seeks to provide an in-depth analysis of teacher competence management within the context of Android-based differentiated learning at SMK Negeri 2 Palopo. Specifically, it aims to (1) examine the managerial processes underlying teacher competence development, (2) identify the defining characteristics of Android-supported differentiated instruction, and (3) analyze the current state of teacher competence in implementing such approaches. By addressing these dimensions, this research contributes to bridging the gap between theoretical constructs and practical implementation, offering both conceptual insights and empirical evidence for advancing technology-integrated differentiated pedagogy.

Ultimately, this research is positioned within a broader scholarly effort to reconceptualize teacher competence in the digital age—not merely as an individual capability, but as a managed, contextually embedded, and strategically developed system that underpins the quality and effectiveness of contemporary education .

METHOD

This study employed a qualitative research design with a descriptive approach to explore and interpret the management of teacher competence in implementing Android-based differentiated instruction at SMK Negeri 2 Palopo. A qualitative framework was selected to capture the complexity of educational practices and to provide an in-depth understanding of participants' experiences, perceptions, and interactions within their natural context. Such an approach emphasizes natural settings, meaning construction, and inductive reasoning rather than hypothesis testing (Boari, 2023; Guntur, 2022) .

The research adopted a field-based qualitative design, emphasizing naturalistic inquiry and inductive analysis. Qualitative research enables the exploration of social phenomena through participants' perspectives and focuses on interpreting meanings embedded in human interactions (Fadli, 2021). This study specifically examined how teacher competence is managed and enacted within the context of Android-based differentiated instruction. The methodological orientation was further enriched through pedagogical and psychological approaches to better understand instructional practices and behavioral dynamics in learning environments (Nata, 2013) .

The study was conducted at SMK Negeri 2 Palopo, a vocational secondary school implementing the Merdeka Curriculum. Participants were selected purposively based on their roles and relevance to the research objectives. They included the school principal, vice principal for curriculum affairs, teachers implementing Android-based

differentiated learning, and students as key informants. This selection aligns with qualitative research principles that prioritize information-rich participants to gain deeper insights into the studied phenomenon (Sidiq & Choiri, 2019) .

Data were collected through in-depth interviews, participant observation, and document analysis. Interviews were conducted to obtain detailed perspectives from stakeholders regarding teacher competence and instructional practices. Observations enabled the researcher to examine classroom dynamics and the implementation of Android-based learning tools in real-time. Document analysis was used to complement primary data through the examination of lesson plans, instructional modules, and institutional records. These techniques are widely recognized in qualitative research as effective means to capture complex social realities (Fitrah, 2018). The primary instrument in this study was the researcher, supported by semi-structured interview guides, observation checklists, and document analysis protocols. In qualitative research, the researcher functions as the key instrument who interprets and constructs meaning from the data, allowing flexibility and responsiveness during the data collection process (Noor & Wathoni, 2020) .

Data analysis followed the interactive model proposed by Miles and Huberman, which consists of data reduction, data display, and conclusion drawing/verification. Data reduction involved selecting and focusing relevant information, while data display was conducted through structured narrative descriptions. Conclusions were drawn inductively and continuously verified throughout the research process to ensure validity and consistency (Yusrizal et al., 2017; Sugiyono, 2011) . To ensure the rigor of the study, several validation strategies were employed. Credibility was established through prolonged engagement, persistent observation, and triangulation of data sources and methods. Triangulation was used to verify data by comparing information from interviews, observations, and documents (Alfansyur & Mariyani, 2020). Dependability and confirmability were enhanced through peer debriefing and audit processes, while transferability was ensured by providing detailed contextual descriptions. These strategies are essential to strengthen the validity and reliability of qualitative research findings (Moleong, 2005).

RESULT AND DISCUSSION

Result

Management of Teacher Competence in Android-Based Differentiated Instruction

The findings indicate that the management of teacher competence in Android-based differentiated instruction at SMK Negeri 2 Palopo is implemented through four main stages: planning, organizing, implementation, and evaluation. This cycle reflects a structured managerial process in integrating technology with differentiated learning practices .

In the planning stage, teachers conduct a comprehensive analysis of students' readiness, interests, and learning profiles. Diagnostic assessments are used to classify students into different levels of ability. Based on this analysis, teachers develop

instructional plans, including digital modules and lesson plans that integrate Android-based applications such as Google Classroom, Canva, and Edmodo. Planning also involves collaboration among teachers to ensure alignment between learning objectives and student needs.

The organizing stage involves active support from school leadership. The principal and vice principal organize professional development programs, including workshops and mentoring related to Android-based learning. A professional development team is also established to monitor implementation and provide feedback to teachers. This stage ensures coordination, collaboration, and resource availability to support instructional innovation.

In the implementation stage, teachers apply differentiated instruction using various Android-based platforms. Learning activities include interactive content delivery, project-based learning, online discussions, and digital assessments. Students engage in activities such as creating videos and completing collaborative projects, which support both cognitive and technical skill development. Multiple applications are used to accommodate diverse learning styles.

In the evaluation stage, teachers employ both formative and performance-based assessments. Data are collected through quizzes, projects, and student feedback using digital tools. Evaluation results are discussed in reflective forums involving teachers and school management to support continuous improvement.

Characteristics of Android-Based Differentiated Instruction

The findings reveal several characteristics of Android-based differentiated instruction at SMK Negeri 2 Palopo. *First*, personalization of learning is implemented by adjusting content and tasks based on students' abilities and needs. *Second*, interactive applications are used to enhance student engagement through multimedia content and digital interaction. *Third*, learning flexibility is evident as students can access materials anytime and anywhere. *Fourth*, learning materials are structured systematically to support progressive understanding. *Fifth*, real-time monitoring enables teachers to track student progress and provide immediate feedback. *Sixth*, collaboration is facilitated through online platforms that support communication and group work. Finally, diverse learning resources and opportunities for independent learning are provided to support student autonomy .

Teacher Competence in Android-Based Differentiated Instruction

The findings show that teacher competence consists of several dimensions. Technological competence is reflected in the ability to use Android-based applications effectively. Pedagogical competence is demonstrated through differentiated instructional strategies. Assessment competence is evident in the use of digital tools for evaluation and feedback. Managerial competence involves managing digital classrooms and learning activities. Motivational competence is reflected in teachers' ability to engage students through interactive and gamified learning approaches

DISCUSSION

The findings of this study highlight that the management of teacher competence is not merely an individual effort but a systemic and institutional process. The structured cycle of planning, organizing, implementation, and evaluation reflects core principles of educational management, where effective instructional practices depend on coordinated organizational support. This supports the view that teacher competence development requires strategic leadership, continuous professional development, and collaborative learning environments. The planning stage demonstrates a shift toward data-informed and student-centered learning design. The use of diagnostic assessment and student profiling aligns with the principles of differentiated instruction, which emphasize responsiveness to learner diversity. The integration of Android-based technology further strengthens this process by enabling flexible and adaptive instructional design.

The organizing stage confirms the importance of institutional support in sustaining innovation. The presence of structured training programs and mentoring systems indicates that technological integration is more effective when supported by leadership and collaborative structures. This finding reinforces theories that emphasize the role of school management in driving educational change. The implementation findings show that technology integration is most effective when combined with active learning strategies such as project-based learning and collaborative activities. Android-based platforms function not only as instructional tools but also as mediating environments that enhance interaction, engagement, and personalization. This aligns with contemporary digital pedagogy, which emphasizes learner-centered and technology-enhanced learning. The evaluation process reflects a shift toward data-driven and reflective practices. The use of digital assessment tools allows real-time monitoring and continuous feedback, supporting adaptive teaching practices. This indicates that evaluation in digital learning environments extends beyond measuring outcomes to improving instructional processes.

Furthermore, the characteristics of Android-based differentiated instruction demonstrate alignment with 21st-century learning paradigms, particularly in terms of personalization, flexibility, and learner autonomy. These features support the development of digital literacy, collaboration, and independent learning skills, which are essential in modern education. Finally, the multidimensional nature of teacher competence identified in this study highlights the evolving role of teachers in the digital era. Teachers are required not only to master pedagogical knowledge but also to integrate technology, manage digital environments, and foster student motivation. This suggests that teacher competence should be understood as an integrative construct that combines technical, pedagogical, and managerial capabilities within a technology-rich learning context.

CONCLUSION

This study demonstrates that the management of teacher competence in Android-based differentiated instruction at SMK Negeri 2 Palopo operates through a structured and integrated cycle of planning, organizing, implementation, and evaluation, where

planning is grounded in students' readiness, interests, and learning profiles, organizing is supported by institutional leadership through professional development and collaborative structures, implementation reflects the effective integration of Android technologies with differentiated pedagogical strategies to create flexible and interactive learning environments, and evaluation is conducted through data-driven and reflective mechanisms to ensure continuous improvement . The findings further indicate that Android-based differentiated instruction is characterized by personalization, interactivity, flexibility, structured learning pathways, real-time monitoring, collaboration, and support for self-directed learning, signaling a shift toward a learner-centered and technology-mediated paradigm aligned with 21st-century education. In this context, teacher competence emerges as a multidimensional construct encompassing technological, pedagogical, evaluative, managerial, and motivational dimensions, highlighting that effective digital learning is not merely dependent on technology but on the strategic management of teacher capacity within institutional systems. Therefore, this study contributes both theoretically and practically by emphasizing that sustainable educational transformation requires the alignment of competence management, technological integration, and pedagogical innovation within a coherent and context-responsive framework.

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