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Managing Infographic-Mediated Indonesian Language Instruction to Improve Elementary Students' Procedural Writing Skills

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Abstract
Elementary students frequently encounter challenges in developing writing proficiency due to inadequate instructional strategies and limited engagement with conventional text-based approaches. This study examined the management of Indonesian language instruction incorporating infographic media to enhance elementary students' procedural writing skills through systematic PDCA (Plan-Do-Check-Act) cycle implementation. A qualitative multiple case study was conducted at two elementary schools (SDN Sindanglaya and SDN Panagan) in Cianjur Regency, Indonesia. Data were collected through classroom observations (24 sessions), semi-structured interviews with teachers (n=4), principals (n=2), and students (n=48), and document analysis of instructional artifacts. Data analysis followed Miles et al.'s systematic procedures encompassing data reduction, display, and conclusion drawing with cross-case comparison. Findings revealed that structured infographic-based instructional management significantly improved students' writing quality (34% average improvement) with particularly substantial gains in structural organization (47%). Student engagement during infographic activities (78%) substantially exceeded traditional instruction (52%). Teachers demonstrated pedagogical adaptability despite technological constraints, while systematic evaluation and continuous improvement processes enhanced instructional effectiveness. PDCA-based management of infographic-mediated instruction represents an effective, evidence-based approach for enhancing elementary writing instruction when implemented through comprehensive frameworks encompassing rigorous planning, adaptive pedagogy, systematic evaluation, and continuous refinement that balance innovation with pragmatic implementation realities.

INTRODUCTION

Writing proficiency constitutes a fundamental literacy competency essential for academic achievement and cognitive development in elementary education. As a productive language skill, writing serves not merely as a communicative medium but as an instrumental mechanism for cultivating critical thinking, organizing complex information systematically, and expressing ideas coherently (Graham et al., 2020; Kim & Graham, 2021; Tarigan, 2008). Contemporary research emphasizes that writing development involves coordinating multiple cognitive and linguistic processes simultaneously, drawing upon language skills, transcription abilities, and higher-order cognitions (Hayes & Flower, 1980; McCutchen, 2006). In educational contexts characterized by rapid digital transformation and information abundance, robust writing competencies have become increasingly imperative for students' academic progression and lifelong learning trajectories (Graham et al., 2012). Despite this recognized importance, empirical evidence demonstrates that substantial proportions of elementary school students encounter persistent difficulties in developing adequate writing proficiency, manifesting in challenges related to ideation, linguistic expression, textual organization, and motivational engagement with writing tasks (Graham, 2019; Rehan et al., 2022).

The pedagogical challenges surrounding writing instruction at the elementary level are multifaceted and interconnected. Research indicates that conventional instructional approaches frequently fail to stimulate students' intrinsic motivation and sustained interest in writing activities, primarily due to methodological monotony and insufficient contextual relevance (Graham & Rijlaarsdam, 2016; Sulistyo-Basuki, 2011). International studies reveal that elementary students experience significant difficulties in vocabulary acquisition, systematic organization of conceptual frameworks, and confidence deficits that inhibit their willingness to engage in written expression (Berninger et al., 2016; Moreno et al., 2022). These learner-centered obstacles are compounded by institutional and instructional limitations, including inadequate deployment of innovative pedagogical media and insufficient teacher competencies in managing effective writing instruction (BSNP, 2018; Graham et al., 2017). Consequently, learning outcomes in writing frequently fall below established educational standards globally, necessitating urgent intervention through evidence-based pedagogical innovations (Graham et al., 2012).

Within the scholarly discourse on literacy education, visual learning media have emerged as promising pedagogical tools with demonstrable potential for enhancing writing instruction. Specifically, infographics—which integrate textual and visual elements within aesthetically structured formats—have garnered considerable attention for their capacity to facilitate cognitive processing and conceptual understanding (Dunlap & Lowenthal, 2016; Lankow et al., 2012). Grounded in Mayer's (2009, 2014) cognitive theory of multimedia learning and Paivio's (1986, 1991) dual coding theory, infographics operate through simultaneous activation of verbal and visual cognitive channels, thereby optimizing information encoding and long-term retention (Clark & Paivio, 1991; Mayer & Moreno, 1998). The systematic presentation of information through infographic media has been empirically associated with improved comprehension, enhanced motivation, and increased engagement in writing activities (Alshehri & Ebaid, 2016; Heinich et al., 2005). Recent international studies have substantiated the effectiveness of infographic-based instruction in elementary contexts, demonstrating significant improvements in students' text comprehension, writing performance, and learning motivation (Damyanov & Tsankov, 2018; Islamoglu et al., 2015; Tetri et al., 2025).

Despite these promising developments, a critical knowledge gap persists in understanding how infographic media can be systematically integrated within comprehensive instructional management frameworks to optimize writing instruction. Existing literature has predominantly focused on the isolated effects of infographic media on learning outcomes, with limited attention to the broader pedagogical processes encompassing planning, implementation, evaluation, and continuous improvement (Noh et al., 2015; Smith & Robertson, 2016). This gap is particularly salient given that effective media utilization requires strategic instructional management aligned with established quality improvement frameworks such as the PDCA (Plan-Do-Check-Act) cycle (Coates, 2010; Deming, 1986). The PDCA model, characterized by its systematic and iterative approach to instructional enhancement, provides a robust theoretical foundation for examining how infographic-based instruction can be planned, executed, assessed, and refined to achieve sustained improvements in student writing performance (Langford, 2015). However, empirical investigations examining the intersection of infographic media utilization and comprehensive instructional management remain notably scarce, particularly within Indonesian elementary education contexts where integration of innovative digital pedagogies with traditional quality management frameworks could address persistent literacy challenges.

This research addresses the identified knowledge gap by examining the management of Indonesian language instruction utilizing infographic visual media as an integrated pedagogical framework for enhancing elementary students' writing skills. The study adopts the PDCA cycle as its conceptual framework, investigating how systematic instructional management—encompassing meticulous planning, interactive implementation, comprehensive evaluation, and continuous refinement—can optimize the deployment of infographic media in writing instruction (Ala-Vähälä, 2016; Hakim et al., 2020). By conducting in-depth case studies at two elementary schools (SDN

Sindanglaya and SDN Panagan), this research provides empirical insights into the practical application and effectiveness of infographic-based instructional management in authentic educational settings, addressing calls for more contextualized research on visual literacy tools in primary education (Hattwig et al., 2013; Lundy & Stephens, 2015).

The significance of this investigation extends across multiple dimensions. Theoretically, this study contributes to literacy education scholarship by elucidating the mechanisms through which visual media integration within structured management frameworks enhances writing instruction effectiveness, extending Paivio's (1991, 2007) dual coding theory and Mayer's (2014) multimedia learning principles into elementary writing pedagogy. Methodologically, the research demonstrates the applicability of quality management principles to pedagogical contexts, thereby bridging educational management and instructional design disciplines while responding to international calls for evidence-based approaches to curriculum improvement (Elken et al., 2018; Williams, 2016). Practically, the findings offer actionable guidance for educators, school administrators, and curriculum developers seeking to implement innovative, evidence-based approaches to writing instruction that align with 21st-century educational demands and contemporary curriculum frameworks (Graham, 2018; Graham et al., 2015). Ultimately, this research endeavors to inform the development of adaptive, student-centered instructional strategies that foster comprehensive literacy competencies essential for academic success and civic participation in increasingly complex informational landscapes.

METHODS

This study employed a qualitative descriptive approach utilizing multiple case study design to investigate the management of Indonesian language instruction incorporating infographic media for enhancing elementary students' writing competencies. The case study methodology was selected for its capacity to facilitate in-depth exploration of contemporary phenomena within authentic educational contexts, particularly when examining complex processes and their outcomes in real-world settings (Baxter & Jack, 2008; Merriam, 1998; Yin, 2018). This approach enabled comprehensive examination of instructional management practices across multiple sites, thereby strengthening the analytical depth and transferability of findings through cross-case comparison and pattern identification (Stake, 2006).

The research was conducted at two purposively selected elementary schools in Cianjur Regency, West Java, Indonesia: SDN Sindanglaya and SDN Panagan. These institutions were selected based on specific criteria including their active implementation of infographic-based Indonesian language instruction, willingness to participate in the research, and representativeness of typical elementary school contexts in the region. The research participants comprised classroom teachers responsible for Indonesian language instruction (n=4), school principals (n=2), and fourth- and fifth-grade students (n=48) who were directly involved in infographic-mediated writing instruction. This purposive sampling strategy aligned with the qualitative research paradigm's emphasis on information-rich cases that illuminate the phenomenon under investigation (Patton, 2015). The selection of multiple informant types facilitated comprehensive understanding of instructional management from diverse stakeholder perspectives, including those responsible for planning and implementation (teachers), institutional leadership (principals), and direct beneficiaries (students).

Data collection employed methodological triangulation through three primary techniques implemented over a four-month period during the 2024 academic year. First, structured classroom observations documented pedagogical practices, teacher-student interactions, and students' engagement with infographic media during writing instruction, utilizing observation protocols adapted from established frameworks for literacy instruction observation (Pressley et al., 2001). Second, semi-structured interviews were conducted with teachers and principals to elicit detailed accounts of planning processes, implementation strategies, evaluation procedures, and continuous improvement efforts related to infographic-based instruction. Interview guides were developed based on the PDCA (Plan-Do-Check-Act) cycle framework and included open-ended questions designed to capture

participants' experiences, perceptions, and reflections (Seidman, 2019). Third, comprehensive document analysis examined instructional artifacts including lesson plans, infographic materials, student writing samples, assessment rubrics, and evaluation records. These documents provided tangible evidence of instructional planning quality, implementation fidelity, and student learning outcomes. To ensure data trustworthiness, multiple validity strategies were employed including prolonged engagement in the field, persistent observation, and triangulation of data sources, methods, and investigators (Creswell & Miller, 2000; Lincoln & Guba, 1985).

Data analysis followed the systematic procedures outlined by Miles et al. (2014), encompassing three concurrent and iterative phases. The data reduction phase involved systematic coding and categorization of raw data from observations, interview transcripts, and documents to identify patterns, themes, and salient concepts relevant to the research questions. Initial coding employed both deductive codes derived from the PDCA framework and inductive codes emerging from the data itself, consistent with hybrid coding approaches in qualitative analysis (Fereday & Muir-Cochrane, 2006). The data display phase organized reduced data into matrices, networks, and narrative summaries that facilitated pattern recognition and comparison across cases and data sources. Visual displays enabled identification of relationships among planning quality, implementation fidelity, evaluation rigor, and student writing outcomes. The conclusion drawing and verification phase involved interpreting displayed data patterns, formulating propositions about infographic-based instructional management effectiveness, and verifying conclusions through iterative comparison with original data sources and existing theoretical frameworks. Throughout the analytical process, analytic memos documented emerging insights, methodological decisions, and interpretive reasoning, thereby establishing a comprehensive audit trail that enhanced confirmability (Saldaña, 2016). The cross-case analysis approach enabled identification of common patterns and unique contextual variations between the two research sites, strengthening the credibility and transferability of findings. To further ensure analytical rigor, peer debriefing sessions were conducted with fellow researchers who provided critical feedback on emerging interpretations and challenged potential researcher biases (Merriam & Tisdell, 2016).

RESULTS AND DISCUSSION

Results

The findings from this multiple case study investigation revealed comprehensive insights into the management of Indonesian language instruction incorporating infographic media across four interconnected dimensions of the PDCA cycle: planning, implementation, evaluation, and continuous improvement. Data triangulation through classroom observations, semi-structured interviews, and document analysis enabled identification of patterns, challenges, and effectiveness indicators that characterize infographic-based writing instruction at the elementary level.

Planning Phase: Strategic Design of Infographic-Mediated Instruction

Analysis of lesson plans, curriculum documents, and teacher interview transcripts revealed that both SDN Sindanglaya and SDN Panagan demonstrated structured and systematic planning approaches aligned with PDCA principles. Teachers articulated clear learning objectives specifically targeting procedural text writing competencies, with explicit integration of infographic media as cognitive scaffolding tools. The planning documentation demonstrated careful consideration of students' developmental characteristics, with infographic selection criteria emphasizing visual clarity, age-appropriate complexity, and contextual relevance to students' lived experiences. Observational data indicated that teachers at both schools conducted preliminary needs assessments to identify students' existing writing challenges, particularly difficulties in organizing sequential information and maintaining coherent textual structure—findings consistent with research documenting elementary students' struggles with ideation and organization (Berninger et al., 2016; Graham, 2019). Teachers developed differentiated infographic materials accommodating diverse learning styles, with approximately 65% of instructional materials incorporating stepped visual representations that

explicitly modeled procedural text structure. Interview responses revealed that teachers consciously designed infographics to activate dual coding processes, explaining their intention to "help students see the structure before they write it" and to "give visual anchors for organizing their thoughts"—perspectives aligning with theoretical frameworks emphasizing visual-verbal integration (Clark & Paivio, 1991; Mayer, 2014).

Document analysis further revealed systematic curriculum alignment, with 87% of lesson plans explicitly connecting infographic activities to Indonesian language competency standards for procedural writing. However, an unexpected finding emerged regarding planning timeline variations: SDN Sindanglaya teachers invested approximately 25% more preparation time in infographic development compared to SDN Panagan counterparts, attributable to differences in technological infrastructure and digital literacy competencies. This finding underscores the resource-intensive nature of quality infographic preparation and highlights potential equity concerns in implementation across diverse school contexts.

Implementation Phase: Interactive Engagement and Adaptive Pedagogy

Classroom observations documented 24 instructional sessions across both research sites, revealing highly interactive implementation patterns characterized by student-centered pedagogical approaches. Video-recorded observations and field notes indicated that infographic-mediated lessons generated notably higher student engagement compared to traditional text-only instruction, with engagement indicators (verbal participation, sustained attention, task completion) averaging 78% during infographic activities versus 52% during conventional writing exercises. This substantial engagement differential aligns with research demonstrating visual media's capacity to enhance motivation and attention in elementary learners (Bond & Bedenlier, 2019; Regondola & Astorga, 2025). Teachers consistently employed a three-phase instructional sequence: (1) collaborative infographic analysis involving whole-class discussion of visual elements and structural patterns, (2) guided practice wherein students translated infographic information into written procedural steps, and (3) independent application where students created original procedural texts using infographic templates as scaffolds.

Observational data revealed significant teacher adaptability in response to implementation challenges. When confronted with technological limitations—including insufficient digital devices (student-to-device ratio of approximately 4:1 at both schools) and inconsistent internet connectivity—teachers demonstrated pedagogical flexibility by supplementing digital infographics with printed versions and incorporating kinesthetic learning activities. For instance, teachers at SDN Panagan developed "living infographics" where student groups physically arranged themselves to represent procedural sequences, demonstrating creative problem-solving that enhanced multimodal learning experiences. Student interview responses (n=48) indicated overwhelmingly positive perceptions, with 89% reporting that infographics "made writing easier to understand" and 76% expressing increased confidence in their procedural writing abilities. Representative student comments included: "The pictures help me remember the order" and "I can see what comes first, second, and last more clearly than just hearing the teacher explain it"—testimonies supporting research on visual scaffolding effectiveness (Dunlap & Lowenthal, 2016; Smith & Robertson, 2016).

An unexpected finding concerned differential implementation success across student ability levels. While struggling writers demonstrated the most substantial gains in structural organization (advancing from predominantly incoherent sequences to recognizable procedural frameworks), high-achieving students initially exhibited resistance to what they perceived as "overly simple" visual supports. Teachers addressed this through differentiated infographic complexity, providing advanced learners with more sophisticated multi-layered infographics requiring higher-order analytical thinking—an adaptive response consistent with differentiation principles in literacy instruction (Graham et al., 2017).

Evaluation Phase: Assessment of Learning Outcomes and Instructional Effectiveness

Systematic evaluation encompassed multiple assessment modalities including rubric-based scoring of student writing samples, formative assessment observations, and stakeholder feedback mechanisms. Analysis of pre-instruction and post-instruction writing samples (n=48 student portfolios) revealed marked improvements across multiple dimensions of procedural text quality. Using standardized rubrics assessing structure, language mechanics, content coherence, and creativity, student writing quality scores increased by an average of 34% following sustained infographic-based instruction (mean duration: 8 weeks). Specifically, structural organization scores demonstrated the most substantial gains (47% improvement), followed by content relevance (38% improvement), language mechanics (29% improvement), and creativity (26% improvement). These quantitative indicators corroborate qualitative observational data and align with experimental research demonstrating infographic media's significant impact on writing proficiency (Alrwele, 2017; Damyanov & Tsankov, 2018).

Rubric analysis revealed that students transitioned from producing predominantly disorganized text fragments to generating well-structured procedural texts with clearly demarcated sequential steps, appropriate transitional language, and coherent logical flow. Representative examples from student portfolios illustrated dramatic transformations: pre-instruction samples characterized by run-on sentences lacking clear sequence markers evolved into organized multi-paragraph texts with explicit procedural stages, numbered steps, and appropriate temporal connectives. Teachers' assessment documentation indicated that 72% of students who initially struggled with procedural text organization achieved grade-level competency standards following infographic-mediated instruction—a substantial improvement rate supporting the pedagogical effectiveness of systematic visual scaffolding (Islamoglu et al., 2015).

Constructive feedback mechanisms operated bidirectionally, with teachers providing individualized written and oral feedback on student work while simultaneously soliciting student input on instructional effectiveness. Student feedback surveys revealed particular appreciation for infographics' clarity (92% positive responses), visual appeal (87% positive responses), and utility as reference tools during independent writing (84% positive responses). Teacher interviews indicated that systematic evaluation processes informed ongoing instructional adjustments, exemplifying the Check phase of PDCA's continuous improvement orientation. An unexpected evaluation finding concerned assessment validity challenges: teachers reported difficulty distinguishing between students' genuine procedural writing competence and their capacity to replicate infographic-modeled structures without deep comprehension—a critical concern warranting refined assessment strategies that evaluate transfer of learning to novel contexts.

Continuous Improvement Phase: Strategic Refinement and Sustainability

Analysis of school planning documents, meeting minutes, and teacher reflection journals revealed active engagement in continuous improvement processes characteristic of effective PDCA implementation. Teachers at both schools participated in regular reflective practice sessions (bi-weekly collaborative meetings) where they critically analyzed instructional outcomes, identified implementation barriers, and collaboratively developed enhancement strategies. Three primary improvement initiatives emerged across both sites: (1) expanding infographic diversity to address varied procedural text types beyond the initial focus on technical instructions, (2) developing student competencies in infographic creation rather than solely consumption, thereby promoting higher-order thinking and multimodal composition skills, and (3) establishing sustainable professional learning communities focused on digital literacy and visual pedagogy.

Documentation revealed systematic efforts to address identified constraints, including resource limitations and technological competency gaps. Schools pursued multiple sustainability strategies: SDN Sindanglaya established partnerships with local technology organizations to enhance digital infrastructure, while SDN Panagan developed a teacher mentorship program pairing digitally proficient educators with colleagues requiring additional technological support. Both schools integrated infographic pedagogy into their professional development frameworks, with 100% of Indonesian

language teachers participating in capacity-building workshops on visual media design, multimedia learning principles, and assessment of multimodal compositions. These institutionalization efforts reflect recognition that sustained implementation requires systemic support encompassing professional development, resource allocation, and policy alignment (Langford, 2015).

Principals' interviews revealed administrative commitment to continuous improvement through monitoring and evaluation systems. Both schools implemented structured classroom observation protocols specifically targeting infographic-based instruction quality, with principals conducting monthly instructional walkthroughs and providing feedback aligned with quality indicators. This administrative engagement exemplifies educational leadership practices that support instructional innovation and continuous quality enhancement (Coates, 2010; Elken et al., 2018). An unexpected finding concerned sustainability challenges related to teacher workload: while teachers unanimously endorsed infographic pedagogy's effectiveness, 68% reported that infographic development required substantial preparation time that competed with other instructional responsibilities—a pragmatic concern necessitating balance between innovation benefits and implementation feasibility.

Discussion

This investigation fundamentally addresses the research question of how infographic media can be systematically integrated within comprehensive instructional management frameworks to optimize elementary writing instruction. The findings unequivocally demonstrate that structured PDCA-based management of infographic-mediated Indonesian language instruction significantly enhances students' procedural writing competencies while fostering increased motivation and engagement. This comprehensive integration of planning rigor, adaptive implementation, systematic evaluation, and continuous improvement creates a synergistic instructional ecosystem wherein visual media function not merely as supplementary tools but as integral cognitive mediators facilitating writing development.

The substantial improvements in students' writing quality—particularly the 47% gain in structural organization—directly validate theoretical propositions regarding dual coding and multimedia learning effectiveness. The simultaneous activation of verbal and visual cognitive channels optimizes information encoding and long-term retention (Clark & Paivio, 1991; Mayer, 2009, 2014; Paivio, 1986, 1991), with infographics providing visual representations that scaffold students' mental models of procedural text structure. The finding that struggling writers demonstrated the most substantial gains aligns with research indicating that explicit visual scaffolding particularly benefits students lacking robust internal organizational schemas (Graham et al., 2012). The observed 78% engagement rate during infographic activities versus 52% during traditional instruction corroborates extensive research establishing visual media's motivational power (Bond & Bedenlier, 2019; Regondola & Astorga, 2025), suggesting that infographics' aesthetic appeal and perceptual salience capture and sustain elementary students' attention more effectively than text-only formats.

Critically examining these findings within existing literature reveals both confirmatory and novel contributions. The effectiveness of infographic media in enhancing writing performance aligns with experimental studies demonstrating significant impacts across diverse educational contexts (Alrwele, 2017; Damyanov & Tsankov, 2018; Islamoglu et al., 2015). However, this investigation extends beyond demonstrating isolated media effects to illuminate the critical role of systematic instructional management in maximizing infographic pedagogy's potential. While previous research predominantly examined infographics as standalone interventions, this study's PDCA framework reveals that planning quality, implementation fidelity, evaluation rigor, and continuous improvement mechanisms collectively determine effectiveness—a systems-level insight addressing recognized gaps in understanding comprehensive integration processes (Noh et al., 2015; Smith & Robertson, 2016). The unexpected finding regarding differential effects across ability levels enriches existing literature by suggesting that infographic pedagogy requires differentiation and adaptive complexity rather than one-size-fits-all approaches, challenging simplistic assumptions about universal visual scaffolding benefits.

The teachers' pedagogical adaptability in response to technological constraints—exemplified by "living infographics" and strategic blending of digital and analog approaches—demonstrates that successful implementation depends less on sophisticated technology than on pedagogical creativity and responsiveness to contextual realities. This finding resonates with research emphasizing that technology integration success hinges on thoughtful pedagogical design rather than mere technological availability (Graham, 2018; Williams, 2016). However, the substantial preparation time required for quality infographic development presents a pragmatic challenge potentially limiting scalability, particularly in resource-constrained schools—a critical consideration absent from much existing literature that may inadvertently present idealized implementation scenarios.

The PDCA framework's applicability to literacy instruction, clearly demonstrated through this investigation, extends quality management principles into pedagogical domains. The systematic planning-implementation-evaluation-refinement cycle creates iterative improvement mechanisms that prevent stagnation and promote continuous enhancement (Deming, 1986; Langford, 2015), with teachers actively using evaluation data to inform instructional adjustments rather than treating assessment as merely summative judgment. This represents a substantive shift toward evidence-based, reflective practice characteristic of professional learning communities (Coates, 2010). The principals' active engagement in monitoring and supporting infographic pedagogy exemplifies educational leadership that enables innovation through systemic support rather than superficial endorsement.

Theoretically, this research enriches understanding of how cognitive theories translate into actionable pedagogical practices. The successful application of dual coding and multimedia learning principles within authentic elementary classrooms validates these frameworks' practical utility while revealing implementation nuances absent from laboratory studies. The finding that visual scaffolding particularly benefits struggling writers suggests that cognitive load theory implications warrant further exploration in literacy contexts, potentially informing targeted intervention design. The study's demonstration of PDCA applicability to literacy instruction bridges educational management and instructional design disciplines, modeling systematic quality improvement approaches transferable to diverse pedagogical innovations.

Practically, findings offer concrete guidance for practitioners, administrators, and policymakers. Teachers gain evidence-based strategies for infographic integration including differentiation principles, assessment approaches, and pedagogical sequences that maximize effectiveness. The identification of resource requirements and preparation demands provides realistic implementation frameworks enabling informed planning rather than unrealistic expectations. School administrators learn that supporting innovation requires systemic infrastructure encompassing professional development, resource allocation, monitoring systems, and workload considerations—not merely policy directives. Curriculum developers gain insights for integrating visual literacy and multimodal composition into language arts frameworks, recognizing that contemporary literacy encompasses visual meaning-making alongside traditional textual competencies.

The unexpected findings regarding assessment validity challenges and ability-level differentiation needs highlight areas requiring additional attention. Practitioners must develop assessment methodologies distinguishing genuine competence from superficial template replication, ensuring that infographic scaffolding promotes transferable skills rather than context-bound imitation. The resistance among high-achieving students suggests that visual scaffolding differentiation warrants careful consideration to prevent inadvertently constraining advanced learners' development. These nuances underscore that effective infographic pedagogy requires sophisticated professional judgment rather than mechanical application of predetermined protocols.

Several limitations warrant acknowledgment. The relatively small sample size and purposive sampling approach, while appropriate for qualitative case study methodology, limit statistical generalizability to broader populations. The two-school focus within a single district raises questions about transferability to schools with substantially different demographic, cultural, or resource

contexts. The eight-week implementation timeframe, though sufficient for observing immediate effects, precludes examination of long-term sustainability and retention. The reliance on researcher-developed assessment rubrics rather than standardized writing measures introduces potential measurement subjectivity despite inter-rater reliability procedures. Future research should employ larger-scale studies with experimental designs enabling causal inference, longitudinal investigations examining sustained effects and knowledge transfer, cross-cultural comparative studies exploring contextual variation in effectiveness, and refined assessment methodologies that validly measure deep comprehension versus surface-level reproduction.

Despite these limitations, this investigation makes substantive contributions by demonstrating that systematic PDCA-based management of infographic-mediated instruction significantly enhances elementary students' procedural writing competencies while revealing practical implementation considerations essential for successful adoption. The integration of rigorous planning, adaptive teaching, systematic evaluation, and continuous improvement creates sustainable instructional frameworks wherein visual media realize their considerable pedagogical potential.

CONCLUSION

This investigation demonstrates that systematic PDCA-based management of infographic-mediated Indonesian language instruction significantly enhances elementary students' procedural writing competencies, with students achieving a 34% average improvement in overall writing quality and a particularly substantial 47% gain in structural organization. The findings validate theoretical propositions regarding dual coding and multimedia learning principles while revealing that implementation effectiveness depends critically on comprehensive instructional management encompassing rigorous planning, adaptive pedagogy, systematic evaluation, and continuous improvement rather than isolated media adoption. The study contributes to literacy education scholarship by bridging educational management and instructional design disciplines, demonstrating how quality improvement frameworks can systematically optimize innovative pedagogical approaches in authentic elementary contexts.

The research carries significant implications for educational practice and policy. Teachers require substantial professional development in visual pedagogy and differentiation strategies to maximize infographic effectiveness across diverse learner profiles. School administrators must provide systemic support including technological infrastructure, manageable workload structures, and monitoring systems that enable rather than constrain innovation. Curriculum developers should integrate visual literacy and multimodal composition competencies into language arts frameworks, recognizing contemporary literacy's expanded scope beyond traditional text-only instruction.

Several limitations warrant acknowledgment, including the relatively small sample size, short implementation timeframe, and geographic specificity that may limit transferability to substantially different contexts. The reliance on researcher-developed assessment instruments introduces potential measurement subjectivity despite reliability procedures. Future research should employ larger-scale experimental designs enabling causal inference, longitudinal investigations examining sustained effects and knowledge transfer, cross-cultural comparative studies exploring contextual variation, and refined assessment methodologies distinguishing genuine competence from template replication. Despite these limitations, this study substantiates infographic-based instructional management as a viable, evidence-based approach for enhancing elementary writing instruction when implemented through systematic, adaptive frameworks that balance innovation with pragmatic implementation realities.

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