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Digital Comics as an Innovative Strategy to Foster Reading Interest among Fifth-Grade Students: Evidence from Indonesian Elementary Education

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ABSTRACT
Numerous studies have documented low reading interest among Indonesian elementary students, yet empirical exploration of innovative digital media interventions remains limited, particularly in rural contexts. This study aims to analyze the effectiveness of digital comic media in enhancing fifth-grade students' reading interest. Classroom action research with cyclical design was conducted at SD Negeri 122 Sayur Maincat, Mandailing Natal Regency, involving 29 participants. Data were collected through learning activity observations and reading interest questionnaires, analyzed quantitatively-descriptively. Results revealed significant improvement in reading interest from baseline 27.5% (low category) to 86.2% (very high category) at Cycle II completion. Teachers' instructional management capacity increased from 75% to 82.5%, while student engagement rose from 77% to 85%. This study confirms that integrating digital comics as innovative pedagogical strategy effectively transforms students' literacy engagement in resource-constrained settings. The findings suggest teachers can adopt visual-digital media to address low reading motivation, contributing to quality literacy achievement aligned with SDG 4.

ABSTRAK
Beragam riset terdahulu menunjukkan rendahnya minat baca siswa sekolah dasar di Indonesia, namun intervensi menggunakan media digital inovatif masih terbatas eksplorasi empirisnya, khususnya di konteks pedesaan. Penelitian ini bertujuan menganalisis efektivitas media komik digital dalam meningkatkan minat baca siswa kelas V sekolah dasar. Penelitian tindakan kelas dengan desain siklus dilaksanakan di SD Negeri 122 Sayur Maincat, Kabupaten Mandailing Natal, melibatkan 29 peserta didik. Data dikumpulkan melalui observasi aktivitas pembelajaran dan angket minat baca, dianalisis secara kuantitatif-deskriptif. Hasil menunjukkan peningkatan signifikan minat baca dari *baseline* 27,5% (kategori rendah) menjadi 86,2% (kategori sangat tinggi) pada akhir Siklus II. Kemampuan guru mengelola pembelajaran meningkat dari 75% menjadi 82,5%, sementara aktivitas siswa meningkat dari 77% menjadi 85%. Penelitian ini mengonfirmasi bahwa integrasi komik digital sebagai strategi pedagogi inovatif efektif mentransformasi engagement literasi siswa di konteks sumber daya terbatas. Implikasinya, guru dapat mengadopsi media visual-digital untuk mengatasi rendahnya minat baca, berkontribusi pada pencapaian literasi berkualitas sesuai SDG 4.

PRELIMINARY

Reading proficiency constitutes a fundamental pillar of educational success and cognitive development in elementary education globally. As emphasized in Sustainable Development Goal 4 (SDG 4), ensuring inclusive and equitable quality education requires cultivating essential literacy competencies from early childhood (UNESCO, 2021). Reading transcends mere decoding of textual symbols; it encompasses critical comprehension, knowledge acquisition, and analytical thinking capabilities that shape lifelong learning trajectories (Nikou & Economides, 2020; Hao & Lee, 2021). However, contemporary Indonesian elementary education confronts a paradoxical reality wherein digital advancement coincides with declining reading interest among young learners. Indonesia's performance in the 2022 Programme for International Student Assessment (PISA) remains concerning, ranking 70th among 80 participating nations in reading literacy (OECD, 2021). The Indonesian Central Bureau of Statistics revealed that

merely 60% of children engage in voluntary reading outside academic obligations, while the Literacy Development Index (IPLM) positioned North Sumatra province at 17th rank nationally with a score of 56.10 in 2023. This literacy crisis threatens Indonesia's progress toward SDG 4.1, which mandates ensuring all learners acquire effective literacy skills.

Extensive scholarship has examined pedagogical interventions to address diminishing reading motivation in digital-era education. Research demonstrates that reading interest emerges from complex interactions between internal factors, including intrinsic motivation, perseverance, and cognitive readiness, and external elements such as instructional methodologies, school resources, and familial support (Barzilai & Eshet-Alkalai, 2020; Clarck & Picton, 2021). Traditional text-based approaches increasingly fail to captivate contemporary students socialized in visually-rich digital environments, creating pedagogical misalignment between instructional delivery and learners' cognitive preferences. Technological integration in literacy education has emerged as a promising trajectory aligned with SDG 4.c, which emphasizes leveraging Information and Communication Technology (ICT) to enhance learning quality (Rasheed, et al., 2020; Lin & Lin, 2022; Huang, et al., 2021). Digital comics specifically exemplify this multimodal approach, synthesizing narrative structures, visual illustrations, and interactive digital affordances to create engaging learning experiences accessible via tablets, computers, and smartphones (Moreno & Mayer, 2020; Hwang & Fu, 2020; Robinson, 2021).

Empirical evidence supports digital comics' efficacy in literacy development. Delgado, et al. (2020) documented significant reading comprehension improvements among fifth-grade students in urban Indonesian contexts following digital comic interventions, while international research demonstrates that visual-textual integration in digital formats enhances material understanding by approximately 30% compared to conventional print media (Shin & Kim, 2023; Jeong & Gweon, 2021). Yet these promising interventions encounter implementation challenges, particularly in resource-constrained rural settings. Infrastructure limitations, including inadequate technological devices and internet connectivity, constrain digital media adoption in peripheral Indonesian regions (Maher & Phelps, 2020; Hobbs & Jensen, 2021; Huang, et al., 2020). Furthermore, teachers' limited digital design competencies impede effective digital comic implementation. These contextual barriers create implementation gaps between digital pedagogy's theoretical potential and practical classroom realization, especially in underserved educational contexts where reading literacy interventions are most urgently needed.

Critical examination reveals three substantial research gaps warranting empirical investigation. First, while existing literature predominantly documents digital comic effectiveness in urban, resource-adequate settings, empirical evidence from rural, infrastructure-limited contexts remains scarce, limiting understanding of digital interventions' adaptability across diverse socioeconomic educational landscapes. Second, previous studies emphasize reading comprehension outcomes rather than foundational reading interest, the motivational precursor essential for sustained literacy engagement. Third, methodologically, limited classroom action research explicitly documents iterative implementation processes, teacher capacity development trajectories, and student engagement patterns across intervention cycles, which are crucial for scalable, context-sensitive intervention design in real-world educational settings.

SD Negeri 122 Sayur Maincat in Mandailing Natal Regency exemplifies these challenges. Preliminary interviews with fifth-grade teachers revealed persistently low reading interest, with students demonstrating reluctance toward reading activities and preferring recreational alternatives, severely impeding instructional effectiveness. The school's rural location presents typical infrastructure constraints, making it an ideal site for examining digital intervention feasibility in resource-limited contexts. Fifth-grade students (ages 10-11 years) represent an optimal developmental window for reading habit formation, possessing sufficient decoding skills for complex texts while remaining malleable for motivational intervention (Zhao & Frank, 2021; Ong & Puteh, 2022; McTigue & Flowers, 2020).

This study addresses identified gaps through three novel contributions. First, it provides empirical evidence of digital comic media effectiveness specifically within rural, resource-constrained Indonesian elementary contexts, extending knowledge beyond predominantly urban-focused existing literature. Second, it foregrounds reading interest, rather than mere comprehension as the primary outcome variable, recognizing motivation as foundational for sustainable literacy development aligned with SDG 4's quality education emphasis. Third, methodologically, it employs classroom action research with cyclical implementation, generating granular process documentation of intervention adaptation, teacher

professional development, and progressive student engagement patterns transferable to similar underserved educational contexts.

Accordingly, this study aims to analyze the effectiveness of digital comic media implementation in enhancing fifth-grade students' reading interest at SD Negeri 122 Sayur Maincat, Mandailing Natal Regency. Specifically, the research examines: (1) progressive changes in reading interest across intervention cycles; (2) teacher instructional management capacity development; and (3) student learning engagement patterns during digital comic-mediated instruction. Through rigorous classroom action research, this study contributes empirical evidence supporting technology-enhanced literacy pedagogy in resource-limited settings, advancing Indonesia's progress toward SDG 4 quality education objectives.

METHOD

Research Design

This study employed Classroom Action Research (CAR) with a cyclical design to investigate the effectiveness of digital comic media in enhancing students' reading interest. CAR was selected as the methodological approach due to its inherent suitability for addressing practical pedagogical challenges through systematic, reflective intervention cycles within authentic classroom contexts (Assingkily, 2021). Following Lewin's action research framework, the investigation comprised iterative cycles, each encompassing four sequential phases: planning, action/implementation, observation, and reflection. This cyclical procedure was repeated until predetermined success indicators were achieved, enabling progressive refinement of intervention strategies based on empirical evidence from each cycle.

Research Setting and Participants

The research was conducted at SD Negeri 122 Sayur Maincat, Huta Bargot District, Mandailing Natal Regency, North Sumatra Province, during the 2024/2025 academic year. Site selection was purposively determined based on preliminary investigations revealing critically low reading interest among fifth-grade students, coupled with the school's rural location presenting typical infrastructure constraints characteristic of underserved Indonesian elementary contexts. The study involved 29 fifth-grade students (ages 10-11 years) and one classroom teacher as research participants. Fifth-grade was deliberately targeted as this developmental stage represents an optimal window for reading habit formation, wherein students possess sufficient decoding competencies for complex texts while remaining responsive to motivational interventions.

Data Collection Instruments

A mixed-methods approach integrating quantitative and qualitative data was implemented to ensure comprehensive evaluation of intervention effectiveness. Three primary instruments were employed: (1) structured observation protocols documenting teacher instructional management capacity and student learning engagement during digital comic-mediated lessons; (2) validated reading interest questionnaires administered to students at baseline and following each intervention cycle; and (3) photographic and video documentation capturing classroom dynamics and digital comic implementation processes. The reading interest questionnaire comprised 20 Likert-scale items assessing four dimensions: reading frequency, reading enjoyment, reading material diversity, and autonomous reading motivation. Observation protocols evaluated specific teaching behaviors and student activities aligned with digital comic pedagogical objectives.

Intervention Procedures

The digital comic intervention was systematically implemented across two complete cycles, each consisting of two instructional sessions. In the planning phase, researchers collaboratively designed lesson plans integrating digital comics aligned with Indonesian elementary curriculum standards, developed assessment rubrics, and prepared necessary technological infrastructure. During the action phase, the classroom teacher delivered instruction utilizing digital comics displayed via projector, facilitating interactive reading activities wherein students engaged with narrative-visual content. The observation phase involved systematic documentation of teacher performance and student behaviors using structured protocols. The reflection phase synthesized observational data and student feedback to identify implementation strengths, weaknesses, and necessary adaptations for subsequent cycles. Each cycle's

reflective insights informed strategic modifications in the following cycle, exemplifying the iterative refinement characteristic of action research methodology.

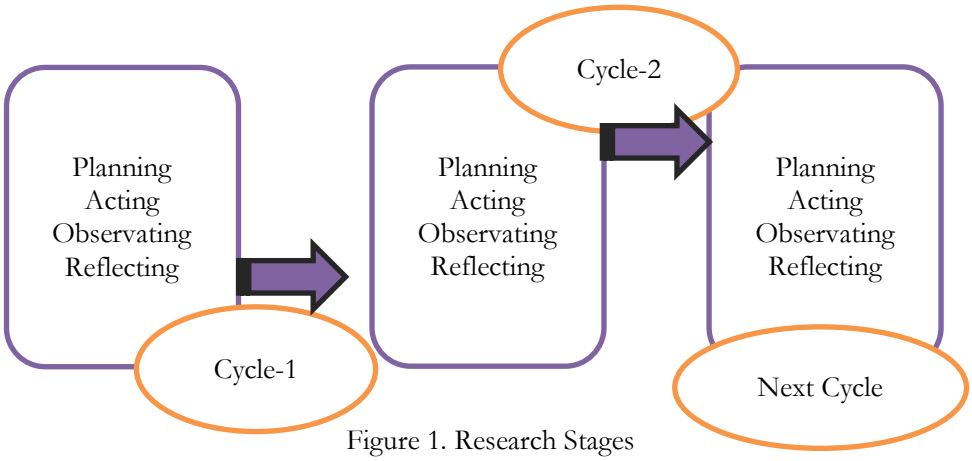

Figure 1. Research Stages

Figure 1 illustrates the cyclical action research framework operationalized in this investigation, depicting the iterative progression through successive intervention cycles. Each cycle systematically traverses four interconnected phases: planning (designing intervention strategies and instructional materials), acting (implementing digital comic-mediated instruction), observing (documenting teacher performance and student responses through structured protocols), and reflecting (critically analyzing outcomes to identify refinements for subsequent cycles). The spiral progression from Cycle 1 through Cycle 2 toward potential next cycles exemplifies the recursive nature of action research, wherein reflective insights from each cycle inform adaptive modifications in subsequent iterations. This cyclical methodology enables progressive intervention optimization, responding dynamically to emerging classroom realities and participant feedback. The research terminated after Cycle 2 upon achieving predetermined success criteria (≥70% reading interest for ≥75% of students), demonstrating that two complete cycles sufficed to generate substantial, sustained improvements in reading interest without necessitating additional iterations.

Data Analysis

Quantitative data were analyzed using descriptive statistics, calculating percentage scores for three primary variables: teacher instructional capacity, student engagement levels, and reading interest across intervention cycles. For teacher instructional management and student activity observations, performance was assessed using the formula: $P = (F/N) \times 100\%$, where P represents percentage score, F denotes frequency of observed positive behaviors, and N indicates total observable behaviors. The resulting percentages were categorized using standardized rubrics presented in Table 1 and Table 2.

Table 1. Categories of Teacher Activity Observation Results

No	Score (%)	Assessment Categories
1	80 – 100	Excellent
2	60 – 79	Good
3	30 – 59	Adequate
4	0 – 29	Poor

Teacher observation protocols evaluated eight instructional dimensions: learning objective articulation, digital comic presentation effectiveness, student engagement facilitation, questioning techniques, time management, instructional material mastery, classroom management, and lesson closure quality. Each dimension was scored on a 4-point scale (1=poor, 2=adequate, 3=good, 4=excellent), with cumulative scores converted to percentages for categorical classification.

Table 2. Categories of Student Activity Observation Results

No	Score (%)	Assessment Categories
1	80 – 100	Excellent
2	60 – 79	Good
3	30 – 59	Adequate
4	0 – 29	Poor

Student engagement observations focused on eight behavioral indicators: attentiveness during instruction, participation in digital comic reading activities, peer collaboration quality, question-asking frequency, task completion rates, enthusiasm demonstration, comprehension of comic narratives, and lesson summary creation. Identical scoring procedures and analytical formulas were applied as specified for teacher observations.

Reading interest was measured using a validated 20-item Likert-scale questionnaire administered at baseline (pre-cycle) and following each intervention cycle. Questionnaire items assessed four dimensions: reading frequency preferences, affective enjoyment of reading activities, diversity of reading material engagement, and autonomous reading motivation. Individual student scores were calculated as: P = (Total Score Obtained / Maximum Possible Score) × 100%, then categorized according to the framework presented in Table 3.

Table 3. Reading Interest Level Categories

Score Range (%)	Assessment Categories
86 – 100%	Very High
70 – 85%	High
40 – 69%	Low
0 – 39%	Very Low

Qualitative data derived from field notes, reflective journals, and photographic documentation were analyzed thematically using an inductive coding approach. Initial open coding identified recurring patterns in teacher instructional adaptations, student behavioral responses, and classroom dynamics. Subsequent axial coding synthesized these patterns into thematic categories illuminating contextual factors influencing intervention effectiveness. Qualitative insights were triangulated with quantitative findings to provide comprehensive interpretation of implementation processes and outcomes.

Success criteria were operationally defined as achieving ≥70% average reading interest percentage (high category) for at least 75% of participating students by the final intervention cycle, coupled with maintaining ≥80% teacher instructional quality (excellent category) and ≥80% student engagement (excellent category). These benchmarks ensured both substantive reading interest improvement and sustained pedagogical quality throughout the intervention.

Research Ethics

Ethical protocols were rigorously observed throughout the investigation. Informed consent was obtained from school administration, participating teachers, and students' parents/guardians prior to data collection. Participants were assured of confidentiality, voluntary participation, and the right to withdraw without consequence. All photographic and video documentation obtained institutional permissions and was utilized exclusively for research purposes. Student identities were anonymized in data reporting through assignment of alphanumeric codes.

FINDINGS AND DISCUSSION

Baseline Assessment of Reading Interest

Prior to intervention implementation, preliminary interviews with the school principal and fifth-grade classroom teacher at SD Negeri 122 Sayur Maincat revealed critically low reading interest among participating students. Teachers reported pervasive student reluctance toward reading activities, with learners demonstrating marked preference for recreational activities, including playing, peer socializing, and drawing, over engaging with textual materials. This reading aversion encompassed both curricular texts and supplementary reading materials, significantly impeding instructional effectiveness. Teachers attributed this phenomenon to both intrinsic student factors and extrinsic contextual constraints,

particularly inadequate infrastructural support and limited access to engaging reading resources characteristic of rural educational settings.

Baseline reading interest assessment, conducted via validated questionnaire administration prior to Cycle I implementation, substantiated these qualitative observations with quantitative evidence. As presented in Table 4, pre-intervention data revealed that 72.5% of students (n=21) exhibited low reading interest (40-69% score range), while only 27.5% (n=8) demonstrated high interest levels (70-85% range). Notably, no students achieved very high interest scores (≥86%), and none fell into the very low category (<40%). The aggregate baseline reading interest percentage stood at 27.5%, categorized as low, establishing a critical need for pedagogical intervention to address this motivational deficit threatening literacy development.

Table 4. Baseline Reading Interest Distribution (Pre-Cycle)

Score Range (%)	Frequency (n)	Percentage (%)	Interest Category
0 – 39	0	0	Very Low
40 – 69	21	72.5	Low
70 – 85	8	27.5	High
86 – 100	0	0	Very High
Total	**29**	**100**	
Meeting Criteria	**8**	**27.5**	
Below Criteria	**21**	**72.5**	

Progressive Intervention Outcomes Across Cycles

Digital comic media implementation generated substantial, progressive improvements in students' reading interest across both intervention cycles. Figure 2 illustrates the trajectory of reading interest enhancement from baseline through final assessment, demonstrating consistent upward progression following each instructional session.

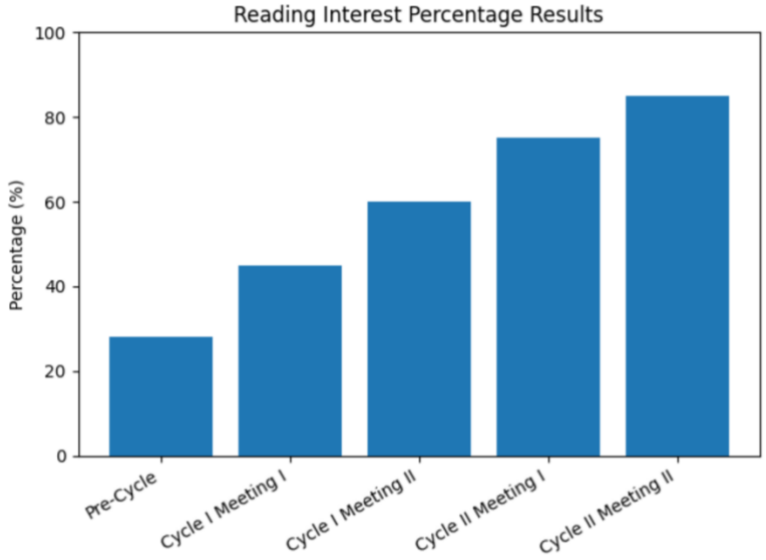

Figure 2. Progressive Reading Interest Improvement Across Intervention Cycles

Cycle I implementation yielded moderate initial gains. Following Session 1, average reading interest increased to 45%, representing a 17.5 percentage point improvement from baseline, though remaining within the low interest category. This modest initial gain likely reflected students' novelty response to the innovative digital comic format, coupled with emerging familiarity with visual-narrative learning modalities. By Cycle I Session 2, reading interest further increased to 58.6%, a 31.1 percentage point gain from baseline, transitioning into the high interest category threshold. This acceleration suggested developing student comfort with digital comic pedagogical approaches and increasing intrinsic engagement with narrative-visual content.

Cycle II intervention produced more substantial improvements, indicating cumulative intervention effects and pedagogical refinement based on Cycle I reflections. Cycle II Session 1 yielded 75.8% average reading interest, representing a 48.3 percentage point improvement from baseline and firmly establishing high interest categorization. By the final intervention session (Cycle II Session 2), reading interest reached 86.2%, a remarkable 58.7 percentage point increase from baseline, achieving very high interest classification. This final outcome exceeded the predetermined success criterion (≥70% for ≥75% of students), with 89.7% of participating students (n=26) demonstrating high or very high reading interest levels. These results validate digital comic media's effectiveness in transforming reading motivation within resource-constrained rural contexts.

Teacher Instructional Management Capacity Development

Systematic observation of teacher instructional management across intervention cycles revealed progressive pedagogical capacity enhancement aligned with reading interest improvements. Cycle I Session 1 observations documented 75% instructional management effectiveness (good category), identifying specific areas requiring development, particularly lesson closure synthesis and concluding summary articulation. By Cycle I Session 2, teacher performance improved to 77.5% (good category), demonstrating enhanced digital comic presentation techniques, though student reading guidance during comic narrative engagement required further refinement.

Cycle II observations documented substantial teacher capacity advancement. Session 1 assessment yielded 82.5% instructional effectiveness (excellent category), reflecting improved learning objective articulation, more sophisticated digital comic display techniques, and enhanced lesson synthesis capabilities. Cycle II Session 2 maintained excellent performance at 80%, demonstrating sustained pedagogical quality. This teacher capacity trajectory illustrates that digital comic implementation not only benefits students but concurrently develops educators' technological-pedagogical competencies, suggesting dual-level intervention value relevant for professional development in technology-enhanced education contexts.

Student Learning Engagement Patterns

Student engagement observations paralleled reading interest trends, revealing progressive behavioral transformation across intervention cycles. Cycle I Session 1 documented 77% student engagement (good category), with identified weaknesses in attentiveness during motivational segments and lesson summary creation activities. These initial limitations likely reflected students' unfamiliarity with digital comic learning modalities and adjustment challenges to novel pedagogical approaches.

Subsequent sessions demonstrated marked engagement improvements. Cycle I Session 2 achieved 82.5% engagement (excellent category), while Cycle II Session 1 reached 85% (excellent category), with four observational indicators achieving maximum scores. This peak engagement reflected students' developed facility with digital comic narratives and heightened intrinsic interest in visual-textual learning materials. Cycle II Session 2 maintained 80% engagement (excellent category), demonstrating sustained high-quality participation. These engagement patterns substantiate that digital comic media effectively captures and maintains elementary students' attention, facilitating active learning participation essential for meaningful literacy development.

Theoretical and Practical Implications

These findings illuminate several theoretically and practically significant insights. First, results validate multimodal learning theory (Oberländer, et al., 2020; Mayer, 2020; Howard, et al., 2021), demonstrating that integrating visual and textual modalities enhances engagement and motivation among elementary learners. The visual-narrative structure of digital comics appears particularly suited to contemporary students' cognitive preferences shaped by digital media exposure, creating pedagogical alignment between instructional delivery and learner characteristics.

Second, findings extend existing literature by documenting digital comic effectiveness specifically within resource-constrained rural contexts, addressing a critical gap in predominantly urban-focused research. The substantial reading interest improvements achieved despite infrastructural limitations, including intermittent internet connectivity and limited technological devices, demonstrate that thoughtfully designed digital interventions can function effectively in underserved settings when adapted

to contextual constraints. This finding holds particular significance for achieving SDG 4's equity imperatives, suggesting scalable pathways for enhancing literacy in marginalized educational contexts.

Third, the cyclical action research methodology generated valuable process-oriented evidence illustrating iterative intervention refinement. The progressive improvements across cycles, both in student outcomes and teacher capacity, demonstrate that sustained, reflective pedagogical adaptation optimizes intervention effectiveness. This finding suggests that technology-enhanced literacy interventions require iterative implementation rather than one-time deployment, with ongoing adjustment based on learner responses and contextual factors.

Fourth, results indicate that addressing reading interest, the motivational foundation for literacy engagement, may constitute a more strategic intervention target than directly targeting comprehension skills. By cultivating intrinsic reading motivation through engaging digital formats, this intervention potentially establishes sustainable reading habits extending beyond the research timeframe, contributing to long-term literacy development trajectories.

Limitations and Future Research Directions

While findings demonstrate substantial promise, several limitations warrant acknowledgment. The study's single-site design limits generalizability beyond similar rural Indonesian elementary contexts. Future research should examine digital comic interventions across diverse geographic and socioeconomic settings to establish broader applicability (Serafini, et al., 2020; Leu, et al., 2020). Additionally, the two-cycle timeframe, while sufficient for demonstrating short-term effectiveness, provides limited insight into sustained effects. Longitudinal studies tracking reading interest maintenance and literacy skill development months or years post-intervention would strengthen evidence of lasting impact.

Furthermore, this study did not systematically examine differential intervention effects across student subgroups (e.g., gender, prior achievement levels, socioeconomic backgrounds). Future investigations employing larger samples could explore whether digital comic effectiveness varies across learner characteristics, informing targeted intervention design (Pennequin, et al., 2019). Finally, comparative research contrasting digital comics with alternative technology-enhanced literacy approaches (e.g., educational games, interactive e-books) would illuminate relative effectiveness and optimal intervention selection for specific educational contexts and objectives.

CONCLUSION

This study demonstrates that digital comics constitute a pedagogically powerful and contextually adaptable strategy for enhancing elementary students' reading interest, particularly within rural and resource-constrained educational settings. The most distinctive finding lies not merely in the magnitude of improvement, from low to very high reading interest, but in the simultaneous transformation of three interrelated dimensions: student motivation, teacher instructional capacity, and classroom engagement dynamics. By foregrounding reading interest as a foundational literacy driver rather than a secondary outcome, this research advances current literacy discourse and provides empirical support for multimodal learning theory within underrepresented rural contexts. Academically, the findings contribute to SDG 4 by evidencing that equitable quality education can be meaningfully advanced through low-cost, visually rich digital interventions that align instructional design with learners' cognitive and motivational profiles.

Despite these contributions, several limitations warrant consideration and guide future research directions. The single-site classroom action research design restricts generalizability, suggesting the need for multi-site and cross-regional studies to test scalability across diverse socioeconomic and infrastructural contexts. Additionally, the short intervention duration limits insight into the long-term sustainability of reading interest and its transfer to measurable literacy achievement. Future research should adopt longitudinal and mixed-methods designs to examine sustained impacts, learner differentiation effects, and comparative effectiveness against other digital literacy interventions. Addressing these limitations will strengthen the empirical foundation for digital comic–based pedagogy and further clarify its strategic role in advancing inclusive, high-quality literacy education aligned with the global SDG 4 agenda.

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