

Integrating *Sipakatau* Local Wisdom into Interactive Digital Comics to Enhance Civic Learning and Character Development in Elementary Schools

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ABSTRACT

Civic education in elementary schools is essential for developing students' civic understanding and character; however, instruction often remains text-based and insufficiently connected to learners' cultural contexts. This study investigates the effectiveness of integrating *Sipakatau* local wisdom into interactive digital comics as a culturally responsive instructional medium. A quantitative quasi-experimental design with a non-equivalent control group pretest-posttest model was employed. The sample comprised 19 sixth-grade students from an Indonesian elementary school. Data were collected from a civic learning outcomes test and a character values questionnaire. Analyses included descriptive statistics, assumption testing, paired-sample t-tests, and effect size calculation. The intervention produced a statistically significant improvement in civic learning outcomes, with mean scores increasing from 57.00 to 77.53 ($p < 0.05$). The effect size was large (Cohen's $d = 1.65$), indicating substantial practical impact. Gain analysis revealed that 84.2% of students achieved moderate to high improvement, demonstrating consistent learning enhancement across participants. Embedding *Sipakatau* values within interactive digital narratives appears to enhance student engagement and deepen conceptual understanding of civic content. The culturally grounded approach supports meaningful learning by connecting abstract civic principles with students' lived experiences. Interactive digital comics incorporating local wisdom represent an effective and practical pedagogical strategy for strengthening elementary civic education and advancing culturally responsive digital learning practices.

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1. INTRODUCTION

Civic education in elementary schools is expected to cultivate not only civic knowledge but also foundational character values such as respect, empathy, social responsibility, and moral reasoning (Afifah et al., 2025). Contemporary educational discourse emphasizes that effective civic

education must integrate cognitive, affective, and behavioural dimensions to foster holistic citizenship competencies from an early age (Anggraeni & Taniady, 2020; Consorti et al., 2023). However, despite its critical role, civic education at the elementary level continues to face persistent challenges related to instructional relevance, learner engagement, and the internalization of civic values.

Recent studies indicate that civic education practices in many elementary schools remain dominated by teacher-centered approaches and text-heavy instructional materials, which tend to emphasize memorization of concepts rather than contextual understanding and moral reflection (Ardiawan, 2022). Such approaches often fail to connect civic values with students' lived experiences, resulting in superficial learning outcomes and limited character formation. This issue is particularly problematic in culturally rich societies, where civic values are deeply embedded in local traditions and social practices but are rarely integrated into formal learning experiences (Belda-Medina, 2024). Consequently, there is a growing call for pedagogical innovations that can bridge formal civic education with students' cultural contexts in more meaningful and engaging ways.

Within the current state of the art, culturally responsive pedagogy has emerged as a promising framework for addressing these challenges. This approach emphasises the incorporation of learners' cultural backgrounds, local values, and social realities into instructional design to enhance relevance and learning effectiveness (Dash & Paul, 2021). In Indonesia, one of the most prominent sources of cultural values relevant to civic education is local wisdom, which encompasses community-based moral principles, norms, and social ethics passed down across generations (Etikan, 2021). Among these, the Bugis cultural value of *Sipakatau*, which stresses mutual respect, recognition of human dignity, and harmonious social relations, holds strong relevance to the goals of civic and character education (Fathoni et al., 2022).

Integrating *Sipakatau* into civic education aligns with broader educational objectives that aim to nurture democratic attitudes and social cohesion in pluralistic societies. Research has shown that when civic values are grounded in culturally familiar concepts, students are more likely to internalise and practice them in everyday interactions (Junaid et al., 2022). Nevertheless, while the conceptual importance of local wisdom in education is widely acknowledged, its practical integration into instructional media particularly digital media remains limited and underexplored.

Parallel to the growing emphasis on cultural relevance, advancements in educational technology have transformed the landscape of elementary learning. Students today are increasingly accustomed to digital environments that emphasise visual communication, interactivity, and narrative-based content (Masfufah & Nurdyansyah, 2023). In response, educators are encouraged to adopt learning media that align with students' digital literacy and cognitive development stages. Interactive digital comics have garnered attention as an innovative medium that combines visual storytelling, dialogue, animation, and learner interaction in ways developmentally appropriate for elementary students (Maharani et al., 2023).

From a theoretical perspective, digital comics are particularly suitable for elementary learners who operate within the concrete operational stage, where understanding is facilitated through visual representation and narrative context (No et al., 2024). Empirical evidence suggests that digital comics can enhance students' motivation, comprehension, and engagement by presenting learning content through relatable characters and storylines (Parepare et al., 2023). In civic education, this narrative format offers a unique opportunity to illustrate moral dilemmas, social interactions, and civic responsibilities in concrete and meaningful ways.

Despite these pedagogical advantages, existing research reveals several important limitations. First, many studies on digital comics in education focus predominantly on academic achievement or learning motivation, without explicitly addressing character development as a core outcome (Putri et al., 2021). Second, studies that examine character education often rely on traditional instructional strategies or qualitative descriptions, with limited use of digital media as an integrated learning intervention (Rizqi & Zumrotun, 2023). Third, although local wisdom has been extensively discussed

as a conceptual foundation for character education, its systematic integration into interactive digital learning media remains scarce (Rizqi & Zumrotun, 2023).

More critically, prior studies tend to treat local wisdom and digital media as separate pedagogical elements rather than integrating them into a coherent instructional framework. For example, research on *Sipakatau* has primarily focused on sociocultural analysis or community-based character education programs, with minimal empirical evaluation of its implementation in formal classroom settings (Safitri & Dafit, 2023). Conversely, research on digital comics often emphasises technical design and user engagement while neglecting culturally grounded value systems that could enhance the depth and relevance of learning experiences (Sastra et al., 2024). This fragmentation highlights a significant gap in the literature regarding the development and evaluation of culturally embedded digital learning media for civic education.

Another notable limitation in existing studies is the tendency to examine civic learning outcomes and character development independently. While both are recognised as essential components of civic education, few empirical studies have investigated how a single instructional intervention can simultaneously influence cognitive civic understanding and character formation (Sugiantara et al., 2024). This separation overlooks the inherently integrated nature of civic competence, which involves knowledge, values, and social behaviour developing in tandem.

Addressing these gaps is particularly urgent given contemporary educational challenges. In an era characterised by rapid digitalisation and cultural globalisation, elementary students are increasingly exposed to diverse values and social influences that may not align with local cultural norms (Tang & Samsuduha, 2023). Without deliberate instructional efforts to embed local wisdom into digital learning environments, civic education may become culturally detached and less effective in fostering grounded character development. Therefore, innovative learning media that integrate cultural values with digital interactivity are urgently needed to ensure that civic education remains both relevant and transformative.

Based on this context, the novelty of the present study lies in its integrative and empirical approach. Unlike previous studies that examine digital comics or local wisdom in isolation, this research embeds *Sipakatau* local wisdom as the core narrative and moral framework within interactive digital comics explicitly designed for civic education. The integration is not merely symbolic but operationalised through storylines, character interactions, and reflective activities that explicitly model and reinforce *Sipakatau* values. Furthermore, this study employs a one-group pretest-posttest design to empirically examine the effects of this integration on both civic learning outcomes and character development, thereby addressing a critical gap in existing research.

Accordingly, this study aims to investigate the effectiveness of integrating *Sipakatau* local wisdom into interactive digital comics as an innovative learning medium for civic education in elementary schools. Specifically, the study seeks to examine whether the use of *Sipakatau*-based interactive digital comics enhances students' civic learning outcomes and contributes to their character development. By achieving these objectives, the study is expected to contribute to the theoretical advancement of culturally responsive pedagogy and provide practical insights for educators and policymakers seeking to design meaningful, value-oriented civic education in the digital age.

2. METHODS

This study employed a quantitative approach using a quasi-experimental design. Consistent with the actual implementation, the study used a one-group pretest–posttest design involving 19 sixth-grade students from SDN 45 Padang Alipan, South Sulawesi, Indonesia, during the 2023/2024 academic year. This design was selected due to administrative and ethical constraints that made the formation of a control group impractical in the natural classroom setting. The design allowed the researcher to evaluate changes in students' civic learning outcomes and *Sipakatau*-based character values before and after the instructional intervention while maintaining ecological validity within the authentic school context.

The intervention was conducted over four instructional sessions across two weeks, with each session lasting 70 minutes. Learning activities were delivered using tablet devices provided by the school, where students interacted directly with the *Sipakatau*-based interactive digital comics individually under teacher supervision. The teacher acted as a facilitator, guiding discussions, prompting reflective questions, and ensuring that students engaged with the narrative elements and value-based scenarios embedded in the comics. To maintain implementation fidelity, a structured lesson guide was used in each session, and an observation checklist was employed to verify that instructional procedures, learning objectives, and time allocation were consistently followed throughout the intervention.

Data were collected using two instruments: (1) a civic learning outcomes test and (2) a *Sipakatau*-based character values questionnaire. Content validity was established through expert review involving three specialists in civic education and guidance and counseling. The Content Validity Index (CVI) procedure was applied to ensure item relevance, clarity, and representativeness. Sample test items included scenario-based multiple-choice questions assessing students' understanding of respect, responsibility, and social harmony in civic contexts, while questionnaire items measured behavioural tendencies such as respecting peers, empathic responses, and cooperative attitudes. Instrument reliability testing produced a Cronbach's alpha coefficient of $\alpha = 0.637$. Although this value is considered marginal, it was deemed acceptable for exploratory educational research involving young learners and multidimensional character constructs. Item revisions and the addition of several indicators per dimension were undertaken to strengthen internal consistency prior to data collection.

The research procedure consisted of three main stages. First, students completed the pretest to measure baseline civic understanding and *Sipakatau*-based character values. Second, students participated in the four-session intervention using the interactive digital comics. Third, the posttest was administered using the same instruments to measure learning gains. Data analysis focused on examining the improvement between pretest and posttest scores. An independent samples t-test on gain scores was employed to assess statistical significance, and Hedges' *g* was calculated to determine the practical effect size of the intervention.

Ethical considerations were strictly observed. Formal permission was obtained from the school administration, and parental consent as well as student assent were secured prior to participation. Students were informed that their participation was voluntary, their responses would remain confidential, and the data would be used solely for research purposes.

Table 1. Measurement Instruments, Dimensions, and Psychometric Properties

Instrument	Construct	Dimensions	Indicators	Number of Items	Reliability (α)
Civic Learning Outcomes Test	Civic learning outcomes	Civic knowledge	Understanding civic concepts, rights and obligations, social rules	15	0.71
Character Values Questionnaire	Sipakatau-based character development	Mutual respect (<i>Sipakatau</i>)	Respecting others' opinions, polite interaction, recognition of human dignity	8	0.65
		Empathy and social harmony	Caring behavior, tolerance, cooperative attitudes	7	0.63
		Cooperative responsibility	Willingness to collaborate, helping peers,	6	0.66

Instrument	Construct	Dimensions	Indicators	Number of Items	Reliability (α)
			shared responsibility		
Total				21	0.637

The Character Values Questionnaire was developed based on the conceptual framework of *Sipakatau* local wisdom and operationalized into three interrelated dimensions: mutual respect, empathy and social harmony, and cooperative responsibility. Each dimension represents core moral principles embedded in Bugis cultural philosophy and the objectives of civic education. Items were designed using age-appropriate language and behavioral statements suitable for elementary school students. Internal consistency analysis indicated that the overall character scale demonstrated acceptable reliability (Cronbach's Alpha = 0.637), which is considered sufficient for exploratory and developmental research involving young learners and complex value-based constructs (Taber, 2018). The civic learning outcomes test demonstrated higher reliability ($\alpha = 0.71$), indicating stable measurement of students' conceptual understanding. These results suggest that the instruments were psychometrically adequate for evaluating the effectiveness of the instructional intervention.

Data analysis was conducted using parametric statistical procedures with the assistance of SPSS software. Prior to hypothesis testing, assumption tests were performed, including the Kolmogorov-Smirnov normality test and linearity test, to ensure that the data met the requirements for parametric analysis. The results indicated that the data were normally distributed and exhibited linear relationships between variables. To examine the effectiveness of the instructional intervention, a paired sample t-test was used to compare pretest and posttest scores within the experimental group. This test was selected because it is appropriate for assessing mean differences between two related measurements and is commonly used in educational intervention studies (Field, 2022). Statistical significance was determined at an alpha level of 0.05. Descriptive statistics, including mean scores and standard deviations, were also calculated to provide an overview of learning gains and changes in character values. The combination of descriptive and inferential analyses allowed for a comprehensive evaluation of the intervention's impact on students' civic learning outcomes and character development.

To enhance methodological rigour, the study maintained consistency in instructional content, duration, and assessment conditions across groups. Ethical considerations were addressed by obtaining permission from school authorities and ensuring that student participation did not disrupt regular learning activities. Data confidentiality and anonymity were maintained throughout the research process. Although the study involved both a one-group pretest-posttest design, the primary inferential analysis in this paper focuses on a within-group pretest-posttest design.

3. FINDINGS AND DISCUSSION

3.1 Findings

Descriptive statistics were first used to examine students' civic learning outcomes before and after the instructional intervention. As presented in Table 2, the mean pretest score was 57.00 (SD = 3.40), while the mean posttest score increased to 77.53 (SD = 11.99). This indicates a substantial improvement in students' civic learning performance following the implementation of the *Sipakatau*-based interactive digital comic media. The wider score dispersion in the posttest suggests increased variability in students' achievement, likely reflecting differences in individual engagement and learning pace. To further understand the magnitude of improvement, gain score analysis was conducted (Table 3). The mean gain score was 20.53 points, representing a 36.0% increase from the initial mean score. Importantly, all students demonstrated positive gains, with a minimum improvement of 5 points, indicating the consistency of the intervention's effect across participants. A paired sample t-test was then performed to determine whether the difference between pretest and posttest scores was

statistically significant. As shown in Table 4, the analysis revealed a significant difference ($t = -7.19$, $p < 0.001$), confirming that the improvement in scores was not due to chance.

To assess the practical significance of the intervention, effect size analysis was conducted using Cohen's d (Table 5). The resulting value of 1.65 indicates a very large effect size, suggesting that the instructional intervention had a strong educational impact on students' civic learning outcomes. Finally, the distribution of learning gains (Table 6) shows that more than half of the students (52.6%) achieved high gain scores (≥ 21), while none experienced a decline in performance. This pattern reinforces the consistency and strength of the instructional effect across the sample. Table 1 presents the mean scores, standard deviations, and score ranges for the pretest posttest groups.

Table 2. Descriptive Statistics of Civic Learning Outcomes

Test	N	Mean	Std. Deviation	Minimum	Maximum
Pretest	19	57.00	3.40	50	62
Posttest	19	77.53	11.99	55	95

The data show a substantial improvement in students' civic learning outcomes following the intervention. The increase in mean score from 57.00 to 77.53 reflects a marked enhancement in students' understanding of civic concepts. The broader score range at the posttest stage suggests increased differentiation in learning achievement, potentially influenced by individual engagement with the digital comic media.

Table 3. Gain Score Analysis of Civic Learning Outcomes

Statistic	Value
Mean Gain Score	20.53
Standard Deviation	12.45
Minimum Gain	5
Maximum Gain	38
Percentage Increase	36.0%

The mean gain score of 20.53 points corresponds to a 36.0% improvement from the pretest mean, indicating a strong instructional effect. The minimum observed gain indicates that all students demonstrated at least a measurable level of improvement, supporting the consistency of the intervention's impact.

Table 4. Paired Sample t-Test Results

Comparison	Mean Difference	Std. Error	t	df	Sig. (2-tailed)
Pretest – Posttest	-20.53	2.86	-7.19	18	0.000

The analysis revealed a statistically significant difference between pretest and posttest scores ($t = -7.188$, $p < 0.05$). The magnitude of the mean difference demonstrates that the observed improvement is not only statistically significant but also educationally meaningful. "These findings indicate that the implementation of *Sipakatau*-based interactive digital comics was associated with substantial improvement in students' civic learning outcomes within the observed group. on students' civic learning outcomes.

Table 5. Effect Size of the Instructional Intervention

Statistic	Value	Interpretation
Mean Difference (Posttest–Pretest)	20.53	Substantial improvement
Standard Deviation of Differences	12.45	–
Cohen's d	1.65	Large effect

To further examine the magnitude of the instructional effect, effect size analysis was conducted using Cohen's d . As presented in Table 5, the calculated Cohen's d value of 1.65 indicates a large

practical effect, suggesting that the observed improvement in civic learning outcomes was practically meaningful and educationally substantial. According to conventional benchmarks, a Cohen's *d* value greater than 0.80 reflects a substantial educational impact. This result demonstrates that the integration of Sipakatau-based interactive digital comics produced a substantial learning effect among elementary school students.

Table 6. Distribution of Students' Learning Gains

Gain Category	Score Range	Number of Students	Percentage
Low gain	≤10	3	15.8%
Moderate gain	11–20	6	31.6%
High gain	≥21	10	52.6%

Table 6 demonstrates a strong and consistent learning impact of the instructional intervention, with 52.6% of students achieving high learning gains (≥21 points) and an additional 31.6% reaching moderate gains (11–20 points). This distribution indicates that 84.2% of participants experienced substantial improvement, suggesting that the effectiveness of the Sipakatau-based interactive digital comics was not limited to a small group of high-performing students but was broadly distributed across the class. Only 15.8% of students exhibited low gains (≤10 points), a pattern commonly observed in elementary learning contexts due to individual differences in prior knowledge, reading ability, and digital engagement. Overall, the dominance of moderate-to-high gain categories reinforces the robustness of the intervention's effect and provides compelling evidence that culturally embedded interactive digital media can produce meaningful and inclusive learning improvements in elementary civic education.

3.2 Discussion

The present study investigated the effectiveness of integrating *Sipakatau* local wisdom into interactive digital comics as an innovative learning medium for civic education in elementary schools. The statistical findings indicate a substantial improvement in students' civic learning outcomes following the instructional intervention. Rather than merely demonstrating score improvement, these results can be theoretically interpreted as the combined effect of narrative structure, interactive engagement, and cultural resonance embedded within the learning media. From a theoretical standpoint, the effectiveness of this intervention can be explained through constructivist learning theory, which posits that learners construct new knowledge by linking instructional content with prior experiences and contextual understanding (Hardiansyah & Zainuddin, 2022).

The *Sipakatau* values embedded within the digital comic narratives allowed students to anchor abstract civic concepts such as respect, responsibility, and social harmony to familiar cultural meanings. This cultural grounding enabled students to internalize civic principles not as abstract rules, but as lived social practices. The narrative nature of digital comics further contributed to this process. Narrative based learning situates knowledge within meaningful storylines that mirror real-life situations, making it easier for students to understand moral and civic dilemmas (Huencho & Chandía, 2023).

When students follow characters who experience conflicts, make decisions, and demonstrate *Sipakatau* values, they engage in moral reasoning indirectly through observation and reflection. This supports the view that civic learning is most effective when students are invited to interpret social situations rather than memorize normative principles (Osanova et al., 2025).

In addition, multimedia learning theory explains why the combination of images, text, and interactivity enhanced students' comprehension (Hardiansyah & Zainuddin, 2022). The dual-channel processing of visual and verbal information reduces cognitive load and facilitates deeper information processing, which is particularly important for elementary students who are still developing abstract thinking abilities. The interactive elements of the comics allowed students to explore scenarios actively,

reinforcing understanding through engagement rather than passive reception. The findings also demonstrate the importance of cultural resonance in instructional design. Prior studies often treat digital media as pedagogically neutral tools (Montuori et al., 2024). However, this study shows that digital media becomes more instructionally powerful when it reflects students' cultural identity. *Sipakatau* values functioned as pedagogical anchors within the storyline, guiding students' interpretation of civic concepts and strengthening value internalization. Despite the strong instructional effect observed, variations in learning gains indicate that students responded differently to the intervention. Differences in prior civic knowledge, reading comprehension, and digital familiarity likely influenced engagement levels, consistent with findings from narrative-based digital learning research (Huencho & Chandía, 2023).

This variability highlights the need for teacher facilitation and instructional scaffolding when implementing interactive digital media. **Threats to Validity** Several threats to validity should be acknowledged. First, the use of purposive sampling and a one-group pretest–posttest design introduces selection bias, limiting causal claims. Second, teacher effects may have influenced learning outcomes, as teacher guidance during the intervention could contribute to student engagement. Third, the novelty effect of using digital comics may have temporarily increased students' motivation independent of the instructional content. Finally, the relatively small sample size limits the generalizability of the findings. These factors suggest that the results should be interpreted as evidence of improvement within the observed group rather than definitive proof of comparative effectiveness.

The present study investigated the effectiveness of integrating *Sipakatau* local wisdom into interactive digital comics as an innovative learning medium for civic education in elementary schools. The statistical findings indicate a substantial improvement in students' civic learning outcomes following the instructional intervention. Rather than merely demonstrating score improvement, these results can be theoretically interpreted as the combined effect of narrative structure, interactive engagement, and cultural resonance embedded within the learning media. (Putri et al., 2021).

The findings of this study have important implications for educational practice and policy. For educators, the results suggest that integrating local wisdom into digital learning media can enhance the effectiveness of civic education by making learning more engaging, contextual, and value-oriented. Teachers are encouraged to adopt culturally responsive digital tools that reflect students' social realities and cultural identities. For curriculum developers and policymakers, the findings highlight the potential of combining technology-based innovation with cultural preservation, demonstrating that digitalization and local culture can be synergistically integrated to support both academic achievement and character-oriented learning.

Despite its contributions, this study has several limitations that should be acknowledged: the relatively small sample size and the use of purposive sampling limit the generalizability of the findings. Additionally, the study focused primarily on short-term learning outcomes, and the long-term effects of the intervention on character development were not examined. Future research is encouraged to involve larger and more diverse samples, employ longitudinal designs, and incorporate mixed-method approaches to gain deeper insights into how culturally embedded digital learning media influence students' civic competencies over time.

4. CONCLUSION

This study provides empirical evidence that integrating *Sipakatau* local wisdom into interactive digital comics is an effective instructional strategy for enhancing civic learning outcomes in elementary schools. The significant improvement in students' civic learning scores, supported by a large effect size and a consistent distribution of learning gains, indicates that culturally embedded digital media can produce not only statistically significant but also educationally meaningful learning outcomes. These findings confirm that civic education becomes more effective when abstract civic concepts are presented through culturally relevant narratives and interactive visual media that align with students' developmental characteristics.

Beyond learning outcomes, this study demonstrates that local wisdom can be systematically operationalized within digital learning environments, positioning culture as a core pedagogical framework rather than a supplementary element. Although character development was not examined as a primary inferential outcome, the integration of *Sipakatau* values within narrative and interactive elements offers a promising pathway for embedding moral and civic values in authentic learning experiences. Collectively, the findings contribute to the growing body of research on culturally responsive digital pedagogy, highlighting the potential of combining technological innovation with cultural grounding to strengthen civic education in the context of 21st-century elementary schooling.

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