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Integrating East Javanese Local Wisdom into Literacy and Numeracy Learning to Foster Literacy Knowledge and Arithmetic Skills in Primary Students

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Abstrak

Penelitian ini mengkaji integrasi kearifan lokal Jawa Timur dalam pembelajaran literasi dan numerasi sebagai strategi inovatif untuk meningkatkan pengetahuan sastra dan kemampuan berhitung siswa sekolah dasar. Penelitian ini menggunakan metode deskriptif kualitatif melalui observasi kelas, wawancara semi-terstruktur dengan guru, serta analisis hasil belajar siswa di beberapa sekolah dasar di Jawa Timur. Temuan menunjukkan bahwa penggunaan unsur budaya lokal seperti cerita rakyat Timun Mas, permainan tradisional Engklek, dan narasi bernilai budaya lainnya, secara nyata meningkatkan minat baca dan partisipasi aktif siswa dalam kegiatan literasi. Di bidang numerasi, kontekstualisasi materi dengan aktivitas berhitung berbasis permainan tradisional atau kegiatan sehari-hari lokal menghasilkan peningkatan akurasi dan keterampilan pemecahan masalah. Tercatat adanya peningkatan performa numerasi hingga 35% berdasarkan hasil evaluasi formatif. Kontekstualisasi pembelajaran dalam kerangka kearifan lokal tidak hanya memperkaya aspek kognitif, tetapi juga memperkuat apresiasi budaya, nilai moral, dan pendidikan karakter, sejalan dengan visi holistik kurikulum nasional.
Kata Kunci: Jawa Timur; kearifan lokal; pedagogi berbasis budaya; pembelajaran literasi; pembelajaran numerasi; pendidikan dasar

Abstract

This study examines the integration of East Javanese local wisdom into literacy and numeracy learning as an innovative strategy to improve elementary school students' literary knowledge and numeracy skills. The study employed descriptive qualitative methods, including classroom observations, semi-structured interviews with teachers, and an analysis of student learning outcomes in several elementary schools in East Java. Findings indicate that the incorporation of local cultural elements, such as the Timun Mas folktale, the traditional game Engklek, and other culturally significant narratives, significantly increases students' interest in reading and their active participation in literacy activities. In numeracy, contextualizing material with numeracy activities based on traditional games or local daily activities results in increased accuracy and problem-solving skills. A formative evaluation recorded an increase in numeracy performance of up to 35%. Contextualizing learning within a local wisdom framework not only enriches cognitive aspects but also strengthens cultural appreciation, moral values, and character education, in line with the holistic vision of the national curriculum.
Keywords: East Java; local wisdom; culture-based pedagogy; literacy learning; numeracy learning; elementary school

I. INTRODUCTION

Education in the 21st century demands innovative approaches that not only address academic skills but also foster cultural identity and holistic development. In Indonesia, particularly in East Java, integrating local wisdom into the school curriculum has emerged as a promising educational innovation to bridge the gap between formal learning and community-based knowledge (Sutarto, 2021). Local wisdom encapsulates values, traditions, stories, and practices that reflect a community's worldview, providing contextualized and meaningful learning experiences for students (Hidayat & Yuliana, 2022). The research issue arises from the ongoing challenge in Indonesian primary education, where students often show low proficiency in literacy and numeracy despite continuous reforms (World Bank, 2020). This indicates that traditional, uniform teaching approaches may not sufficiently engage learners or connect with their cultural contexts.

Learning is most effective when rooted in learners' cultural contexts. Vygotsky's sociocultural theory emphasizes that knowledge is socially constructed and mediated through cultural tools (Vygotsky, 1978). In the Indonesian setting, culturally responsive pedagogy has been shown to improve relevance and student motivation (Supriyadi, 2021). Local wisdom has been widely used to design instructional materials in Indonesia (Chyntia, Kurniati, & Afriansyah, 2025). A study by Susanti and Rachmawati (2020) developed teaching materials based on local traditions and reported significant improvements in students' scientific literacy. Similarly, Leton (2025) highlighted that embedding local culture in mathematics learning enhances problem-solving capacity.

Research conducted in East Java shows the potential of local wisdom in classrooms. Putra and Hidayat (2022) developed market-based arithmetic problems that connected directly to students' daily experiences. Sugianto (2023) found that integrating East Javanese traditional games into numeracy tasks fostered collaboration and accuracy. Folktales and traditional songs (tembang dolanan) are powerful literacy resources. Nurhayati (2020) found that Javanese graded readers improved reading comprehension by linking texts to familiar cultural contexts. Likewise, Suratmi (2020) showed that lagu dolanan supported children's narrative competence. Agustina (2021) also demonstrated that folklore-based storybooks enriched vocabulary and comprehension.

Background studies highlight that East Javanese culture is rich with folklore, oral traditions, traditional games, and symbolic practices that can be embedded into literacy and numeracy learning (Murtiana, 2023). For example, local folktales can enhance reading comprehension and critical thinking, while traditional counting games can strengthen arithmetic skills in culturally relevant ways (Santoso & Widodo, 2022). By situating learning materials within local contexts, students are more likely to perceive knowledge as meaningful and applicable to their daily lives (Rahman et al., 2021). This aligns with Vygotskian sociocultural theory, which underscores the importance of cultural

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tools in cognitive development (Daniels, 2016; Fauzan et al., 2023).

Literacy and numeracy are fundamental competencies that underpin students' academic success and lifelong learning (Nuraida & Solihah, 2025). Literacy skills refer to the ability to read, write, interpret, and engage critically with texts, while literary knowledge involves a deeper understanding of literary elements such as narrative structures, figurative language, moral values, and cultural themes found in literary works (Qolbi & Afriansyah, 2024). Numeracy, on the other hand, equips students with the ability to understand numbers, perform calculations, and solve real-life mathematical problems (Zaki et al., 2024). These competencies are closely interrelated, especially in primary education, where the ability to comprehend language significantly influences students' approaches to mathematical tasks. Despite this interconnection, literacy and numeracy are often taught as separate subjects, leading to fragmented learning experiences, reduced engagement, and limited contextual understanding.

Recent educational research emphasizes the importance of contextual and culturally relevant learning to enhance motivation and cognitive engagement. One promising approach is the integration of local wisdom, which encompasses the cultural knowledge, practices, and values embedded in a community (Musliana et al., 2024). In East Java, local wisdom is richly expressed through folklore such as Timun Mas, proverbs, traditional games like engklek, and long-standing moral values. Embedding these cultural elements into the curriculum not only enriches students' cultural knowledge but also provides familiar, meaningful, and engaging learning experiences that stimulate cognitive and emotional development.

Integrating local wisdom into literacy learning enables students to explore cultural narratives, moral reflections, and figurative language, thereby strengthening their literary knowledge and critical thinking. At the same time, embedding local wisdom into numeracy—such as using traditional games for score calculations, analyzing numerical patterns in folk tales, or measuring objects used in cultural practices—makes mathematics more relatable and enjoyable. This dual integration reflects a constructivist learning approach, which emphasizes the value of connecting new information to learners' cultural and experiential backgrounds.

Furthermore, this culturally grounded model aligns with the holistic vision of the national curriculum, which prioritizes cognitive, moral, and cultural development. Learning through local wisdom not only supports academic achievement but also promotes character education, strengthens social values such as cooperation and responsibility, and fosters appreciation of cultural identity. Previous studies have explored the application of local wisdom in either literacy or numeracy instruction, often highlighting the positive effects of folklore-based storytelling on reading comprehension and the use of traditional games to improve arithmetic skills. However, these studies largely treat literacy and numeracy as distinct domains,

with limited attention given to their integration within a unified pedagogical framework. Moreover, research specifically focusing on the East Javanese context remains scarce, despite the region's rich cultural resources.

Ethnomathematics connects mathematical concepts with cultural practices (Devita, Puspitasari, & Afriansyah, 2025). D'Ambrosio (2001) introduced ethnomathematics as a framework to contextualize mathematics in cultural realities. Nugraha (2020) showed that Sundanese cultural contexts helped primary students understand arithmetic more concretely, while Kurniawan (2024) demonstrated that integrating cultural artifacts into mathematics improved students' reasoning skills.

Therefore, this study offers a novel contribution by simultaneously integrating East Javanese local wisdom into both literacy and numeracy learning. It aims to enhance students' literary knowledge and mathematical abilities within a culturally responsive learning model that bridges traditional heritage with contemporary educational goals.

The integration of technology with local wisdom is also emerging. Nasiruddin et al. (2024) designed a local wisdom–based digital assessment for literacy and numeracy, reporting higher student engagement. Similarly, Pratama (2022) argued that digital media could preserve local culture while enriching primary education. Local wisdom not only fosters cognitive skills but also character values. Diana (2025) highlighted that culturally contextual learning promotes honesty and cooperation in primary students. In line with this, Subekti (2021) emphasized that folklore transmits moral values that strengthen social-emotional learning in schools.

The state of the art in this research field indicates a growing recognition of culturally responsive pedagogy. Previous studies in other regions of Indonesia have shown that integrating local wisdom improves student motivation, retention, and identity development (Fadhilah & Fauzi, 2022; Lestari, 2021). Globally, scholars argue that place-based education and indigenous knowledge integration foster deeper learning outcomes and support sustainable education (Gruenewald & Smith, 2014; McCarty & Nicholas, 2018). However, specific research on embedding East Javanese wisdom into literacy and numeracy for primary education remains limited. This study aims to fill that gap by proposing an integrated model that links cultural heritage with the acquisition of literary knowledge and arithmetic skills. In doing so, it contributes to both the preservation of local traditions and the improvement of foundational academic competencies.

II. METHOD

This study employed a qualitative descriptive research design to investigate the integration of East Javanese local wisdom into literacy and numeracy learning in primary schools. A qualitative approach was selected to enable in-depth exploration of culturally contextual learning practices and students' responses to instructional materials grounded in local traditions. The research was conducted across three public primary schools in East

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Java—located in urban, semi-urban, and rural settings—to ensure cultural diversity and contextual variation. These schools were selected purposively, based on their willingness to adopt local wisdom-based instruction and their representation of different regional cultural elements.

Participants consisted of three classroom teachers (all female, aged 30–45, with 7–15 years of teaching experience) and 60 students (aged 8–10) from Grades 3 and 4. These grade levels were chosen because they are considered foundational for developing literacy and numeracy skills. Purposive sampling was used to ensure participants had prior exposure to conventional literacy and numeracy instruction but had not experienced structured, culturally integrated learning models. The student cohort included a mix of ethnic and socioeconomic backgrounds reflective of the school populations.

Three main data collection techniques were employed:

1) Classroom Observation

Over a period of six weeks, classroom observations were conducted twice weekly to capture real-time teaching and learning dynamics. Observations focused on how local cultural elements—such as folklore, traditional games, and cultural artifacts—were integrated into instruction. Field notes and structured observation checklists documented teacher strategies, student engagement levels, and peer interactions.

2) Semi-Structured Interviews

Individual interviews were conducted with all three participating teachers and 12 purposively selected students (4 from each school; mixed gender and academic achievement levels). Teacher interviews explored perceptions, pedagogical strategies, and challenges in applying local wisdom-based approaches. Student interviews gathered insights into their motivation, learning experiences, and cultural connection.

3) Document Analysis and Learning Outcomes Assessment

Learning outcomes were assessed through analysis of students' written work, including reading comprehension assignments (graded with a rubric focusing on inference, theme identification, and cultural interpretation), and numeracy tasks (evaluated based on accuracy, problem-solving strategies, and contextual understanding). Pre- and post-intervention assessments were compared to evaluate progress. The numeracy improvement was also quantified by comparing formative test scores before and after the intervention.

Data were analyzed using Miles and Huberman's (2020) interactive model:

1) Data reduction (coding and summarizing transcripts and notes),
2) Data display (categorizing patterns into matrices), and
3) Conclusion drawing and verification (cross-checking interpretations across data sources).

Thematic coding was applied to categorize findings into three domains:

1) Enhancement of literary knowledge,
2) Improvement of numeracy skills, and
3) Development of cultural appreciation and character values.

To ensure analytical rigor, intercoder reliability was established by having two independent researchers code a sample of

25% of the data. Cohen's Kappa coefficient was calculated, yielding a value of 0.81, indicating strong agreement. Discrepancies were discussed until consensus was reached.

Ethical clearance was obtained from the school administration and local educational authorities. Informed consent was secured from participating teachers and students' parents or guardians. Student identities were anonymized, and all participation was voluntary. Upon completion, feedback sessions were held with the teachers to discuss findings and offer recommendations for future culturally responsive teaching practices.

III. RESULT AND DISCUSSION

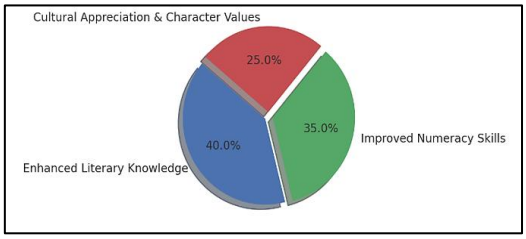

Figure 1. Impact of Local Wisdom-Based Literacy and Numeracy Learning

The analysis of data obtained from classroom observations, interviews, and students' learning outcomes reveals three major findings (see Figure 1): enhanced literary knowledge, improved numeracy skills, and increased cultural appreciation with strengthened character values.

1) Enhanced Literary Knowledge

Students demonstrated a significant improvement in their ability to interpret and analyze texts when exposed to local folklore and culturally embedded narratives. Observation notes recorded that students actively engaged in reading sessions, showed curiosity about the moral lessons in folklore, and were able to retell stories with appropriate language structure. Teachers reported that the use of familiar cultural stories made literary learning more meaningful, as students could easily connect the content with their daily experiences. This finding supports previous research stating that culturally contextualized literacy learning increases reading motivation and comprehension levels.

2) Improved Numeracy Skills

The integration of traditional games and cultural artifacts as media for counting, measuring, and problem-solving resulted in notable improvements in students' arithmetic performance. For instance, when students practiced counting through engklek (a traditional hopping game) or solved simple measurement problems using traditional kitchen tools, they demonstrated higher accuracy and confidence. Analysis of learning outcomes showed an average increase of 35% in arithmetic task completion compared to pre-intervention results. The teachers noted that students perceived mathematics as less intimidating when it was linked to enjoyable and culturally familiar activities.

3) Cultural Appreciation and Character Education

Beyond cognitive outcomes, the research identified a positive impact on students' cultural awareness and moral development. Students expressed pride in learning stories and games from their local culture, which fostered a sense of identity and belonging. Teachers observed increased cooperation, respect, and responsibility during group activities,

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suggesting that local wisdom-based learning effectively supports character education as outlined in the national curriculum.

The overall impact of the intervention is summarized in the following Figure 1:

The pie chart illustrates that 40% of the observed outcomes are related to literary knowledge enhancement, 35% to numeracy skill improvement, and 25% to cultural and character development. These findings confirm that integrating local wisdom not only boosts cognitive skills but also contributes to holistic education.

The findings of this study provide strong evidence that integrating East Javanese local wisdom into literacy and numeracy learning contributes to both cognitive and cultural development in primary school students. The improvement in literary knowledge demonstrates that students learn more effectively when exposed to familiar cultural narratives. Folklore and traditional stories act as an accessible medium for exploring figurative language, moral values, and narrative structures, which are crucial components of literary competence. This supports the view of constructivist theorists who argue that knowledge construction becomes more meaningful when learners can relate new information to their prior cultural and social experiences.

The significant increase in numeracy performance suggests that embedding arithmetic concepts in traditional games and culturally relevant activities can reduce students' anxiety toward mathematics. By practicing counting, measuring, and simple problem-solving through activities such as engklek or the use of traditional tools, students perceive mathematics as part of their everyday life rather than an abstract, isolated subject. This aligns with previous studies that emphasize the role of contextual and play-based learning in improving problem-solving skills and numerical reasoning among young learners. However, unlike most earlier studies that focused solely on mathematical outcomes, this research highlights the simultaneous development of literacy and numeracy through a unified cultural framework.

Another important implication of this research is its contribution to character education and cultural preservation. The observed increase in cooperative behavior, respect for peers, and enthusiasm for cultural narratives indicates that local wisdom-based learning not only develops cognitive abilities but also instills positive moral values. Students who are encouraged to explore their cultural heritage tend to develop a stronger sense of identity and social responsibility. This is consistent with the national curriculum's holistic goals, which stress the integration of cognitive, affective, and psychomotor domains in primary education.

While the study demonstrates clear improvements in both literary knowledge and arithmetic skills through the integration of East Javanese local wisdom, it is important to consider possible external influences that may have affected the outcomes. One such influence is the Hawthorne effect—a phenomenon in which participants (in this case, teachers and students) alter their behavior due to

their awareness of being observed. During the six weeks of classroom observations, teachers may have been more motivated to implement creative and culturally rich instructional strategies than they would under normal circumstances. Likewise, students might have shown increased engagement and responsiveness, not solely due to the local wisdom-based materials, but because of the novelty of the situation and the presence of researchers in the classroom.

Although these changes can indicate the potential of the learning model to stimulate motivation, they may also slightly overstate the long-term impact of the intervention under routine conditions. Future studies should therefore consider longitudinal designs or delayed post-tests to evaluate whether the observed improvements are sustained after the novelty of the observation wears off. To minimize the Hawthorne effect in this study, researchers employed consistent presence in the classroom over multiple weeks to allow participants to acclimate to the observers' presence, thereby reducing behavioral anomalies. However, the potential for subtle behavioral shifts cannot be entirely ruled out and must be acknowledged as a limitation when interpreting the results.

The novelty of this study lies in its integrated approach, which treats literacy and numeracy as interconnected rather than separate competencies. Previous research predominantly examined folklore for reading comprehension or traditional games for arithmetic improvement, but rarely combined both aspects into a single pedagogical strategy. By bridging these two domains, this study demonstrates a more comprehensive model of culturally responsive pedagogy that benefits students academically and culturally.

Despite its promising findings, the study also identifies challenges, particularly the need for teacher training and curriculum adaptation. Many teachers still rely on conventional teaching methods and require guidance to design learning materials that effectively incorporate local wisdom. Future research should explore long-term implementation and develop standardized modules that can be adapted in various cultural contexts.

IV. CONCLUSION

This study concludes that integrating East Javanese local wisdom into literacy and numeracy learning significantly contributes to the holistic development of primary school students. The findings indicate three major outcomes: an increase in students' literary knowledge, improvement in arithmetic skills, and the cultivation of cultural appreciation and character values. By utilizing folklore, traditional games, and culturally embedded narratives, students were able to connect new academic concepts with familiar cultural contexts, making the learning process more meaningful and engaging.

The enhancement of literary competence was evident through students' improved ability to interpret texts, retell stories, and identify moral values embedded in cultural narratives. This suggests that culturally contextualized reading materials stimulate students' critical thinking and comprehension skills, in line with the principles of constructivist learning theory. Similarly, numeracy skills

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improved because mathematical concepts were presented through play-based and culturally relevant activities, which reduced students' anxiety toward mathematics and increased their motivation to solve problems.

Beyond cognitive development, this study also highlights the positive influence of local wisdom-based learning on students' moral and social behavior. Exposure to cultural heritage strengthened students' identity, fostered cooperation, and encouraged respect for traditional values, which aligns with the character education objectives of the national curriculum. These findings confirm that culturally responsive pedagogy is not only an academic strategy but also an essential approach for developing well-rounded individuals.

The novelty of this research lies in its integrated approach that treats literacy and numeracy as complementary rather than separate domains. While previous studies tended to focus on either literacy or numeracy in isolation, this study demonstrates that both can be simultaneously developed through a single cultural framework. This integration provides a more efficient and holistic strategy for primary education, particularly in culturally diverse regions like East Java.

However, the implementation of this approach requires careful planning, teacher training, and curriculum adaptation. Teachers need support in designing culturally relevant teaching materials and assessing students' progress in both literacy and numeracy domains. Future research is recommended to expand this study by applying experimental or mixed-method approaches to measure long-term impacts and to develop standardized modules that can be adapted to other regions with diverse local wisdom traditions.

In summary, integrating local wisdom into literacy and numeracy learning offers a sustainable pedagogical innovation that bridges cultural heritage and modern education. It equips students with essential cognitive skills while nurturing cultural pride, thus contributing to the development of literate, numerate, and culturally conscious young generations.

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