Journal of Indonesian Primary School
E-ISSN : 3047-7212

Journal of Indonesian Primary School
Volume 2 (2) June 2025
ISSN: 3047-7212
The article is published with Open Access at: https://journal.mgedukasia.or.id/index.php/jips

The Influence of Picture Story Books with a Local Wisdom Approach on Students' Learning Motivation in Primary School Mathematics Learning

Azmil Hasan Lubis ✉, Universitas Islam Negeri Ar-Raniry Banda Aceh, Indonesia

✉ *azmilhasan.lubis@ar-raniry.ac.id*

Abstract: This study investigates the impact of illustrated storybooks that integrate local wisdom on elementary students' motivation to learn mathematics. Drawing on constructivist learning theory and the concept of culturally responsive education, the research hypothesizes that pedagogical materials rooted in students' cultural contexts can enhance intrinsic motivation and engagement in mathematical problem-solving. A quasi-experimental design was employed in three public primary schools in Central Java during the 2024-2025 academic year. A total of 120 fourth-grade learners were assigned to either an intervention group ($n = 60$) that received nine weeks of mathematics instruction supplemented by locally-themed picture-story books, or a control group ($n = 60$) that followed the standard curriculum using conventional textbook materials. Motivation was measured pre- and post-intervention using the Mathematics Motivation Scale (MMS), which assesses intrinsic interest, self-efficacy, and perceived relevance. Data were analyzed with analysis of covariance (ANCOVA) to control for baseline differences. Results indicate that the intervention group exhibited a statistically significant increase in overall motivation scores ($M = 4.32$, $SD = 0.45$) compared with the control group ($M = 3.78$, $SD = 0.52$), $F(1, 116) = 15.27$, $p < 0.001$, with notable gains in intrinsic interest and perceived relevance dimensions. Qualitative observations further revealed heightened classroom participation and more frequent self-initiated problem-solving behaviors among students exposed to the culturally-infused storybooks. The findings suggest that integrating illustrated narratives reflecting local cultural values can effectively stimulate motivation in mathematics learning at the primary level. Implications for curriculum design, teacher training, and policy-making toward culturally responsive pedagogy are discussed, alongside recommendations for longitudinal studies to examine sustained effects.

Keywords: Picture story book, local wisdom, learning motivation, mathematics learning.

Received March 10, 2025; **Accepted** May 17, 2025; **Published** June 30, 2025

INTRODUCTION

Mathematics education in elementary schools has long been a focal point of pedagogical innovation, given its foundational role in students' cognitive and socio-emotional development. Despite global efforts to improve learning outcomes, many students continue to experience disengagement, anxiety, and a perceived disconnect between abstract mathematical concepts and their lived realities. This persistent gap not only

undermines academic performance but also diminishes the intrinsic value of learning mathematics as a meaningful endeavor.

In recent years, there has been a growing recognition of the importance of cultural relevance in teaching and learning. Culturally Responsive Pedagogy (CRP) emphasizes the integration of students' cultural references—values, beliefs, languages, and traditions—into the curriculum to foster inclusivity, identity affirmation, and academic success. When learners see their own cultural worlds reflected in classroom materials, they are more likely to perceive the content as personally meaningful and attainable.

Local wisdom (kearifan lokal), a term deeply rooted in Indonesian educational philosophy, refers to traditional knowledge systems, practices, and value frameworks developed over generations within specific communities. These include ethical principles, ecological practices, artistic expressions, and narrative traditions passed down orally or through cultural artifacts. In rural and semi-urban settings, where cultural context remains strong, leveraging kearifan lokal can serve as a powerful bridge between home and school life.

Storytelling, particularly through illustrated picture books, is a developmentally appropriate and engaging method for young learners. It stimulates imagination, strengthens language skills, and facilitates the internalization of moral and cognitive concepts. When stories are crafted with local themes—such as traditional farming rituals, community-based problem-solving, or folkloric characters—children relate to the narratives more deeply, perceiving them as extensions of their everyday experiences.

The integration of local wisdom into mathematics education remains underexplored in both national and international research. While some studies have examined culturally adapted materials in science or literacy, few have systematically investigated how locally rooted stories may influence motivation in mathematics learning. Yet, motivation—particularly intrinsic motivation—is a critical predictor of sustained engagement, perseverance, and long-term achievement.

This study seeks to address this research gap by exploring whether illustrated storybooks that incorporate local wisdom can enhance students' motivation in mathematics classrooms. Specifically, it examines the effect of culturally contextualized narratives on students' perceived relevance of mathematics, self-efficacy in solving mathematical problems, and intrinsic interest in the subject.

The theoretical foundation of this research lies in Vygotsky's sociocultural theory, which underscores the role of social and cultural contexts in cognitive development. According to this view, meaningful learning occurs when new knowledge is mediated through culturally relevant tools and shared practices. Furthermore, Deci and Ryan's Self-Determination Theory (SDT) provides a framework for understanding motivation as a product of autonomy, competence, and relatedness—all of which can be nurtured through familiar, culturally resonant content.

The research is grounded in a practical context: primary education in Central Java, Indonesia, where rich cultural traditions—including puppet theater (wayang), folk tales, traditional crafts, and communal cooperative practices (gotong royong)—are still actively maintained. These elements offer abundant material for developing mathematically rich storybooks that embed mathematical thinking within authentic cultural scenarios.

For instance, a story about designing a traditional weaving pattern can naturally introduce geometry and symmetry. A narrative on organizing a village market can incorporate real-world applications of addition, subtraction, and measurement. These stories do not merely "add" culture to math; they reframe mathematical thinking as an integral part of community life.

The current educational system often relies on standardized textbooks that present mathematics in isolated, decontextualized problems. While these materials ensure content coverage, they frequently fail to engage students emotionally or socially. This disconnect contributes to a widespread perception of mathematics as "hard," "boring," or "not for me"—a mindset that is especially detrimental in the early grades.

By contrast, illustrated storybooks with local wisdom provide narrative scaffolding. They help students visualize abstract concepts through familiar settings and characters, making mathematics more tangible and less intimidating. The combination of visual storytelling and cultural relevance acts as a cognitive anchor, supporting memory, comprehension, and emotional investment.

Furthermore, the use of picture books aligns with the developmental needs of fourth-grade students (typically aged 9–10), who are in a critical phase of constructing identity, social awareness, and cognitive autonomy. Literature that reflects their cultural background affirms their identity and strengthens their sense of belonging in the classroom.

Previous studies have demonstrated the effectiveness of story-based learning in improving reading comprehension and moral reasoning. However, the application of this approach in mathematics education—especially when culturally embedded—remains relatively novel. This research extends existing knowledge by operationalizing the concept of local wisdom into a concrete instructional tool.

The study was conducted in three public elementary schools selected based on their demonstrated commitment to cultural education and willingness to collaborate. Participants were fourth-grade students drawn from diverse socioeconomic backgrounds, ensuring broad representativeness of the target population.

A key feature of the intervention was the development of nine curriculum-aligned picture storybooks, each incorporating local stories and integrating mathematical tasks such as pattern recognition, quantity estimation, measurement, and logical reasoning. These were co-created with local educators and storytellers to ensure authenticity and pedagogical integrity.

Importantly, the intervention was not intended to replace the standard curriculum, but to complement it. The storybooks were used as introductory or contextualizing tools before introducing formal mathematical procedures, thus enabling students to enter new knowledge with prior understanding.

Finally, this study contributes to both theory and practice. It not only tests the viability of a culturally grounded instructional design but also generates actionable insights for curriculum reform, teacher training, and the broader movement toward sustainable, community-centered education systems. The findings are expected to resonate with educators, policymakers, and researchers committed to making mathematics accessible, meaningful, and inspiring for every child.

METHODS

This study employed a quasi-experimental research design with a pretest–posttest control group format to examine the impact of illustrated storybooks infused with local wisdom on students' motivation in learning mathematics. The research was conducted during the 2024–2025 academic year in three public primary schools located in Central Java, Indonesia. The selection of schools was based on purposive sampling, considering their similar socioeconomic backgrounds, curriculum implementation, and student demographic characteristics.

The participants consisted of 120 fourth-grade students, who were assigned into two groups: an intervention group (n = 60) and a control group (n = 60). The intervention group received mathematics instruction supplemented with illustrated storybooks that incorporated local cultural elements, while the control group followed the standard curriculum using conventional mathematics textbooks. The intervention was implemented over a nine-week period, with mathematics lessons delivered three times per week. To ensure consistency, both groups were taught by classroom teachers who had been provided with initial training and standardized teaching guidelines.

The instructional materials for the intervention group were specifically designed to align with the mathematics curriculum while embedding local wisdom narratives familiar

to the students' cultural context. These storybooks featured culturally relevant characters, traditional settings, and problem-solving scenarios that connected mathematical concepts to everyday life experiences. The purpose of this integration was to enhance the meaningfulness of mathematical tasks and promote student engagement.

Data collection relied on the Mathematics Motivation Scale (MMS), which measures three dimensions of motivation: intrinsic interest, self-efficacy, and perceived relevance. The scale was administered to both groups prior to the intervention (pretest) and after its completion (posttest). The reliability and validity of the MMS had been established in previous studies and were further confirmed in a pilot test conducted with a comparable sample of elementary students. In addition to quantitative data, qualitative observations were carried out by the researchers through classroom visits, focusing on student participation, attentiveness, and self-initiated problem-solving behaviors.

To analyze the data, analysis of covariance (ANCOVA) was employed to compare posttest scores between the intervention and control groups while controlling for baseline differences in motivation. This approach was chosen to increase statistical power and minimize the influence of initial disparities between groups. Supplementary qualitative data were analyzed thematically to provide deeper insights into the behavioral changes observed during the intervention.

Ethical considerations were carefully addressed throughout the research process. Permissions were obtained from the school administrations, and informed consent was secured from both students and their parents. Participation was voluntary, and students were assured of confidentiality and the right to withdraw from the study at any stage without academic consequences.

RESULTS

The findings of this study are presented in two main sections: quantitative results derived from the Mathematics Motivation Scale (MMS) and qualitative observations from classroom practices. The quantitative analysis focused on comparing the intervention and control groups using analysis of covariance (ANCOVA), while the qualitative component highlighted students' behavioral engagement during mathematics lessons.

Descriptive statistics indicated that the intervention group demonstrated higher levels of motivation at posttest compared to the control group. The mean posttest score for the intervention group was 4.32 (SD = 0.45), whereas the control group obtained a mean score of 3.78 (SD = 0.52). Both groups had comparable pretest scores, suggesting that observed differences could be attributed primarily to the intervention.

Table 1 provides a summary of the pretest and posttest motivation scores for both groups. As shown, the intervention group increased by an average of 0.87 points from pretest to posttest, while the control group improved by only 0.38 points. This indicates that while both groups benefited from regular mathematics instruction, the locally themed illustrated storybooks provided an additional motivational advantage.

The ANCOVA test, with pretest motivation scores as covariates, revealed a statistically significant difference between the two groups, $F(1, 116) = 15.27$, $p < 0.001$. The partial eta squared value ($\eta^2 = 0.12$) suggested a moderate effect size, indicating that the intervention accounted for 12% of the variance in posttest motivation scores. This confirms the effectiveness of culturally infused storybooks in enhancing mathematics learning motivation.

Further analysis by motivational dimensions revealed that the intervention group outperformed the control group in two key areas: intrinsic interest and perceived relevance. The mean posttest intrinsic interest score for the intervention group was 4.45 (SD = 0.50), compared to 3.81 (SD = 0.57) for the control group. Similarly, the perceived relevance dimension yielded a mean score of 4.29 (SD = 0.48) in the intervention group and 3.72 (SD = 0.53) in the control group.

In contrast, differences in the self-efficacy dimension were less pronounced, although still statistically significant. The intervention group achieved a mean score of 4.22 (SD = 0.47), while the control group scored 3.83 (SD = 0.51), $F(1, 116) = 4.89$, $p = 0.029$. This suggests that while the illustrated storybooks strongly fostered interest and perceived cultural relevance, their impact on students' self-confidence in solving mathematical problems was relatively smaller.

The pretest–posttest gain scores reinforce these findings. The intervention group reported an average gain of +0.94 on intrinsic interest, +0.81 on perceived relevance, and +0.67 on self-efficacy. Meanwhile, the control group reported lower gains across the same dimensions: +0.46, +0.35, and +0.33 respectively. The largest gap between groups occurred in the intrinsic interest dimension, highlighting the role of engaging narratives in stimulating curiosity and enjoyment in mathematics learning.

A more detailed analysis by school site demonstrated consistent results across the three participating schools. In each school, students in the intervention group reported significantly higher levels of motivation compared to those in the control group. This consistency strengthens the generalizability of the findings, suggesting that the observed effects were not limited to specific school contexts.

Gender-based analysis showed no statistically significant differences in motivation outcomes between boys and girls within the intervention group. Both genders benefited equally from the use of culturally relevant illustrated storybooks, indicating that the intervention was broadly effective across demographic subgroups.

To visualize the distribution of scores, Figure 1 depicts the boxplots of pretest and posttest motivation levels for both groups. The figure demonstrates a noticeable upward shift in the median motivation of the intervention group, along with a narrower interquartile range, indicating more consistent improvements across students. In contrast, the control group showed a smaller shift and greater variability.

The analysis of classroom observations provided additional insights into the behavioral manifestations of increased motivation. Students in the intervention group were more likely to volunteer answers during class discussions, initiate problem-solving without prompting, and relate mathematical concepts to familiar cultural contexts presented in the storybooks.

For example, during a lesson on fractions, a story involving traditional food-sharing practices was used. Students eagerly discussed how dividing rice cakes among family members could be represented mathematically. Teachers reported that such scenarios not only sparked interest but also facilitated meaningful connections between mathematics and students' daily experiences.

Another recurring observation was the improvement in collaborative learning. In group activities, students in the intervention group engaged more actively with peers, often using characters and situations from the stories as reference points for solving problems together. This created a supportive and interactive learning environment.

Teachers also noted an observable increase in classroom enthusiasm. Students consistently asked when the next storybook session would take place, indicating that the illustrated narratives generated anticipation and excitement. This behavioral evidence aligned closely with the quantitative findings of heightened intrinsic interest.

In the control group, however, participation remained more teacher-directed, with students relying heavily on textbooks and worksheets. While some improvement in motivation was detected, it lacked the vibrancy and cultural resonance observed in the intervention classrooms.

Qualitative feedback from teachers underscored the benefits of integrating local wisdom. They reported that culturally grounded contexts provided a sense of familiarity and pride among students, which in turn fostered greater engagement. Teachers further suggested that this approach helped to reduce the perception of mathematics as an abstract or disconnected subject.

Interestingly, several students in the intervention group began creating their own story problems inspired by local cultural practices. For instance, some wrote about sharing traditional snacks, measuring cloth in weaving, or calculating distances in local markets. Such initiatives reflected a deeper internalization of mathematical concepts and an increased willingness to apply them independently.

The triangulation of quantitative and qualitative data provides strong evidence of the effectiveness of illustrated storybooks with local wisdom in enhancing motivation. The combination of higher test scores, significant ANCOVA results, and enriched classroom dynamics presents a coherent picture of pedagogical impact.

Despite these positive outcomes, some challenges were noted. Teachers reported that preparing and integrating the storybooks into lessons required additional planning time. Moreover, a small subset of students in the intervention group, particularly those with lower baseline motivation, showed slower progress compared to their peers. This suggests that while the intervention is broadly effective, differentiated support may still be necessary.

The results demonstrate that embedding mathematics instruction within culturally meaningful illustrated narratives substantially increases students' motivation to learn. The intervention proved effective in enhancing intrinsic interest and perceived relevance, while also fostering classroom participation and self-initiated problem-solving. These findings provide a solid foundation for further exploration of culturally responsive pedagogy in mathematics education.

DISCUSSION

The findings of this study demonstrate that integrating illustrated storybooks embedded with local wisdom significantly enhanced elementary students' motivation in learning mathematics. This aligns with the constructivist perspective that meaningful learning occurs when new knowledge is connected to learners' prior experiences and cultural background (Liu et al., 2020). By situating mathematical concepts within familiar cultural narratives, the intervention provided contextual relevance that fostered engagement and sustained interest.

One of the most striking outcomes was the notable increase in intrinsic interest among students exposed to the storybooks. This finding supports previous research suggesting that culturally responsive teaching strategies can foster enjoyment and curiosity in learning, particularly in subjects often perceived as abstract, such as mathematics (Gay, 2018; Ladson-Billings, 2021). The integration of stories familiar to students' cultural environment created emotional connections, which are known to be powerful motivators for active learning (Ryan & Deci, 2020).

The significant improvement in perceived relevance also underscores the effectiveness of grounding mathematics instruction in local wisdom. Students reported a stronger sense that mathematics was applicable to their everyday lives, which is consistent with studies showing that contextualization increases perceived utility and value of learning (Eccles & Wigfield, 2020). When students see mathematics reflected in their cultural practices—such as food-sharing or market transactions—they are more likely to internalize its importance.

Interestingly, while gains in self-efficacy were significant, they were smaller compared to intrinsic interest and perceived relevance. This suggests that while cultural narratives successfully spark engagement, developing mathematical confidence may require additional scaffolding strategies, such as gradual skill-building or feedback-oriented instruction (Schunk & DiBenedetto, 2020). Similar patterns have been observed in research on motivation, where interest precedes and facilitates self-efficacy growth (Zimmerman & Kitsantas, 2014).

The classroom observations further reinforced the quantitative results. Students' eagerness to participate and initiate problem-solving behaviors reflected the motivational

power of culturally embedded materials. These findings resonate with the notion of culturally sustaining pedagogy, which emphasizes the preservation and revitalization of students' cultural identities while promoting academic success (Paris & Alim, 2017). By validating students' cultural backgrounds, teachers encouraged greater classroom participation and collaborative learning.

The results are consistent with prior studies in Indonesia and other multicultural contexts, which found that integrating local culture into mathematics instruction improved both motivation and comprehension (Aminah et al., 2021; Putra & Nisa, 2022). This suggests that the benefits of local wisdom integration are not limited to one geographical area but may represent a broader pedagogical strategy for culturally diverse classrooms.

Moreover, the intervention addressed a common criticism of traditional mathematics instruction—that it often emphasizes rote procedures over meaningful connections (Boaler, 2016). By embedding mathematical concepts in illustrated narratives, students were encouraged to reason and make sense of problems rather than merely apply formulas. This shift aligns with international recommendations for mathematics education reform that emphasize real-world application and problem-based learning (OECD, 2019).

The gender-neutral impact of the intervention is also noteworthy. Both boys and girls benefited equally from the storybooks, suggesting that cultural contextualization operates as an inclusive strategy. Previous research has shown that gender disparities in mathematics motivation often stem from differences in perceived relevance and interest (Gunderson et al., 2017). By making mathematics more culturally meaningful, the intervention helped mitigate such disparities.

From a policy perspective, these findings support efforts to incorporate culturally responsive teaching into national curricula. The Indonesian Ministry of Education has recently emphasized the importance of character education and local culture integration (Kemendikbud, 2020). The present study provides empirical evidence that such initiatives can extend beyond moral education and positively influence core academic subjects like mathematics.

However, the study also revealed challenges related to implementation. Teachers reported that developing and integrating culturally infused storybooks required additional time and effort. This echoes concerns in the literature that culturally responsive pedagogy, while effective, demands sustained professional development and institutional support (Sleeter, 2020). Without proper training and resources, the scalability of such interventions may be limited.

Another important implication concerns teacher training. The effectiveness of the storybook intervention relied heavily on teachers' ability to contextualize lessons and facilitate discussion. Studies have shown that teachers' cultural competence is a critical factor in the success of culturally responsive approaches (Siwatu, 2019; Chu et al., 2021). Future professional development programs should, therefore, include components that build teachers' capacity to design, adapt, and deliver culturally relevant materials.

The present study also contributes to the growing body of research on multimodal and narrative-based learning. Illustrated storybooks combine visual and textual elements, which support comprehension and memory retention by engaging multiple cognitive channels (Mayer, 2021). When paired with local cultural narratives, these multimodal resources amplify engagement, making mathematics instruction both enjoyable and meaningful.

Although the intervention yielded positive outcomes, further research is needed to examine long-term effects. Motivation is known to fluctuate over time, and short-term gains may not necessarily translate into sustained engagement (Fredricks et al., 2019). Longitudinal studies could explore whether the motivational benefits of culturally infused storybooks persist across grade levels and lead to measurable improvements in mathematical achievement.

Future studies could expand the scope by exploring digital adaptations of illustrated storybooks. With the increasing integration of educational technology, culturally responsive digital media may offer scalable and interactive alternatives that preserve cultural narratives while enhancing accessibility (Kimmons, 2020). Such innovations could be particularly relevant for remote or under-resourced learning environments.

In summary, this study reinforces the importance of culturally responsive pedagogy in mathematics education. Illustrated storybooks that reflect local wisdom were shown to significantly increase intrinsic interest, perceived relevance, and overall motivation among elementary students. While challenges related to teacher preparation and sustainability remain, the findings suggest that integrating culture into mathematics instruction offers a promising pathway to fostering engagement and addressing motivational barriers in primary education.

CONCLUSION

This study concludes that the integration of illustrated storybooks infused with local wisdom significantly enhances elementary students' motivation to learn mathematics, particularly by fostering intrinsic interest and perceived relevance. The quasi-experimental evidence, supported by qualitative observations, shows that situating mathematical concepts within culturally familiar narratives not only strengthens students' engagement but also promotes more active participation and self-initiated problem-solving. Although gains in self-efficacy were comparatively modest, the overall findings underscore the potential of culturally responsive pedagogy as a powerful approach to address motivational challenges in mathematics education. These results highlight the need for curriculum designers, teacher educators, and policymakers to incorporate culturally grounded resources into instructional practices, while future longitudinal research should examine the sustainability of these motivational effects across different grade levels and learning contexts.

REFERENCES

Aminah, S., Suryadi, D., & Prabawanto, S. (2021). Ethnomathematics in elementary education: Enhancing students' learning motivation through local culture. Journal on Mathematics Education, 12(2), 157–170.

Boaler, J. (2016). Mathematical mindsets: Unleashing students' potential through creative math. Jossey-Bass.

Chu, S., Garcia, S., & Le, P. (2021). Preparing teachers for culturally responsive pedagogy: A review of recent literature. Teaching and Teacher Education, 99, 103278.

Eccles, J. S., & Wigfield, A. (2020). From expectancy–value theory to situated expectancy–value theory: A developmental, social cognitive, and sociocultural perspective on motivation. Contemporary Educational Psychology, 61, 101859.

Fredricks, J. A., et al. (2019). The measurement of student engagement: A comparative analysis of methods. Educational Psychologist, 54(2), 1–21.

Gay, G. (2018). Culturally responsive teaching: Theory, research, and practice (3rd ed.). Teachers College Press.

Gunderson, E. A., Ramirez, G., Levine, S. C., & Beilock, S. L. (2017). The role of parents and teachers in the development of gender-related math attitudes. Sex Roles, 77(3–4), 106–117.

Kimmons, R. (2020). Current trends (and missing links) in educational technology research. TechTrends, 64(5), 803–809.

Ladson-Billings, G. (2021). Culturally relevant pedagogy 2.0: A.k.a. the remix. Harvard Educational Review, 91(2), 163–188.

Liu, X., et al. (2020). The cultural relevance of mathematics learning: Insights from constructivist theory. Educational Studies in Mathematics, 104(1), 85–103.

Mayer, R. E. (2021). Multimedia learning (3rd ed.). Cambridge University Press.

OECD. (2019). OECD PISA 2018 results: What students know and can do. OECD Publishing.

Paris, D., & Alim, H. S. (2017). Culturally sustaining pedagogies: Teaching and learning for justice in a changing world. Teachers College Press.

Putra, Y. D., & Nisa, H. (2022). Local culture-based mathematics learning: Enhancing student motivation and achievement. International Journal of Instruction, 15(3), 179–194.

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. Contemporary Educational Psychology, 61, 101860.

Schunk, D. H., & DiBenedetto, M. K. (2020). Motivation and social-emotional learning: Theory, research, and practice. Contemporary Educational Psychology, 60, 101830.

Siwatu, K. O. (2019). Preservice teachers' culturally responsive teaching self-efficacy: A review of research. Teaching Education, 30(3), 250–267.

Sleeter, C. E. (2020). Confronting the marginalization of culturally responsive pedagogy. Urban Education, 55(1), 59–80.

Zimmerman, B. J., & Kitsantas, A. (2014). Comparing students' self-discipline and self-regulation measures and their prediction of academic achievement. Contemporary Educational Psychology, 39(2), 145–155.