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Exploring Elementary School Children's Numeracy Activities Integrated with Pancasila Values in Mobile Games

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Abstract. Mobile-based games have become an integral part of elementary school children's daily lives in Indonesia, offering informal digital environments where learning and social interaction occur simultaneously. While mobile games are often viewed primarily as entertainment, they also embed numerical practices and social dynamics that may support both numeracy development and character education. However, limited research has examined how these experiences relate simultaneously to numeracy and Pancasila values as Indonesia's cultural foundation. This study explores how elementary school children engage in numeracy activities through mobile gaming and how these practices intertwine with Pancasila values. Using a descriptive phenomenological approach, the study involved students in grades III-V from four regions in Indonesia: Pacitan, Klaten, Yogyakarta, and Banten. The findings reveal that numeracy in mobile games extends beyond basic counting to include resource management, collaboration, and shared decision-making. At the same time, Pancasila values such as cooperation (*gotong royong*), justice, empathy, and responsibility emerged organically through gameplay interactions. The study concludes that mobile games function as culturally grounded digital learning spaces that support contextual numeracy and character development, offering meaningful implications for values-based learning in elementary education.

Keywords: Digital citizenship; Mobile gaming; Numeracy; Pancasila values; Phenomenological study

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1. Introduction

Mobile gaming has become an inseparable part of many elementary school children's daily routines in the digital era. Countries such as the United States, China, South Korea, and several European nations report high levels of mobile game production and consumption, particularly among children and adolescents. With the increasing accessibility of smartphones and stable internet connections, children now spend a considerable portion of their free time playing popular mobile games such as *Free Fire*, *Mobile Legends*, and *Roblox*. These games attract young players not only through their visual appeal and interactive mechanics, but also through the social experiences they offer. Multiplayer modes, in-game communication, and virtual teamwork allow children to interact, collaborate, and negotiate roles, gradually shaping social identities within digital spaces. As a result, mobile gaming has shifted from a simple leisure activity to a routine practice embedded in children's everyday lives (Li et al., 2022).

Despite this widespread engagement, mobile gaming continues to generate concern among parents and educators (Hasan et al., 2024; Xu et al., 2023). Gaming is often associated with reduced study time, diminished concentration, and excessive screen exposure, sometimes framed as a risk to academic achievement or healthy development (Chow et al., 2020). Nevertheless, an expanding body of research suggests that games can also support the development of cognitive and social competencies when examined more carefully. Strategic and competitive games, even those not designed for educational purposes, frequently involve problem-solving, decision-making, teamwork, and adaptive thinking (Zayeni et al., 2020). Moreover, many of these games require players to engage with numerical information, such as calculating scores, managing limited resources, estimating time, assessing probabilities, and planning strategies (Ahmadov et al., 2025; Tang et al., 2025). These practices reflect forms of numeracy, understood as the use of mathematical reasoning in meaningful, real-world situations that are relevant to children's experiences.

In addition to cognitive engagement, the social interactions embedded in multiplayer games also create opportunities for the emergence of character-related values. Within the Indonesian context, these interactions may resonate with the values of Pancasila (*the official philosophical foundation of Indonesia, which forms the core principles that guide the nation's political, social, and cultural life*) (Nursalim et al., 2024; Putri & Putra, 2021). Cooperative gameplay reflects the principle of *gotong royong*, while fair role distribution and mutual support align with ideas of social justice. Respect for rules, opponents, and shared agreements also reflects humane and civilized conduct. Although these connections appear intuitively meaningful, existing studies have rarely examined mobile gaming as a space where numeracy practices and Pancasila values intersect within children lived experiences (Zainudin et al., 2024).

This situation highlights several unresolved issues. First, the significant amount of time children spend playing mobile games has not yet been fully recognized as a potential learning context (Zhong & Zheng, 2023). Second, persistent negative perceptions of gaming tend to overshadow its possible educational value, limiting

scholarly and pedagogical exploration (Hidayat, 2022). Third, although gameplay clearly embeds numerical reasoning and social interaction, educators seldom analyze these elements from an educational perspective (Denham et al., 2025). Finally, there remains a lack of conceptual guidance on how popular, non-educational games might be interpreted or adapted into meaningful, value-oriented learning spaces (Antonioni et al., 2013).

Recent international studies have explored the role of digital and mobile games in supporting numeracy development and social learning; however, these studies tend to examine cognitive outcomes in isolation from culturally grounded value systems. For example, Ahmadov (2025) and Fiorucci (2023) demonstrate how game-based environments foster numerical reasoning, strategic thinking, and problem-solving (Ahmadov et al., 2025; Fiorucci et al., 2023). Yet, they do not explain how gameplay enacts local moral or civic values. Similarly, research on character and citizenship education in digital contexts has emphasized ethical behavior, collaboration, and digital citizenship (Qu, 2023; Valcke & Nilsen, 2023), yet largely overlooks numeracy practices embedded in everyday mobile gaming.

Moreover, existing studies rarely attend to children's lived experiences of integrating mathematical reasoning and national value frameworks within popular commercial games rather than purpose-built educational games. This gap highlights the lack of empirical research that simultaneously examines numeracy and culturally specific values, such as Pancasila, within children's authentic mobile gaming practices, underscoring the urgency and relevance of the present study.

To address these gaps, this study explores how elementary school children experience mobile gaming in their everyday lives. Using a phenomenological approach, the research focuses on how numeracy practices and Pancasila values emerge naturally during gameplay. Rather than treating games as instructional tools imposed from outside, the study attends to children's own perspectives and interactions within gaming environments. Specifically, the objectives of this study are to:

1. Examine how elementary school children engage in numeracy practices while playing mobile games.
2. Explore how Pancasila values emerge through children's social interactions in mobile gaming contexts.
3. Understand how different game types and regional contexts shape children's experiences of numeracy and value integration.

In light of these considerations, this study addresses the following research problem: how do elementary school children experience numeracy practices and enact Pancasila values through their everyday engagement with mobile gaming? Based on these objectives, the study addresses the following questions:

1. How do elementary school children engage with numeracy practices while playing mobile-based games?
2. What Pancasila values emerge through children's interactions during mobile gaming activities?

3. How do game genres and regional contexts influence the integration of numeracy practices and Pancasila values in children's gaming experiences?

This study contributes to the existing body of knowledge by providing an empirically grounded understanding of how numeracy practices and Pancasila values are enacted simultaneously in children's everyday mobile gaming experiences. Unlike previous studies that examine digital numeracy or character education separately, this research offers a contextual framework that integrates digital numeracy learning with nationally grounded moral values through a phenomenological lens.

2. Literature Review

2.1 Numeracy in Elementary Education

The understanding of numeracy in elementary education has undergone a paradigm shift, moving from viewing it merely as a technical counting skill to emphasizing its application in real-life situations. Twenty-first-century numeracy encompasses quantitative reasoning, data interpretation, evidence-based decision-making, and the use of mathematical representations in authentic contexts (Tunstall, 2020). This approach underscores that numeracy learning is most effective when integrated into meaningful activities relevant to children's everyday lives.

A study by Bitter (2016) found that children develop a deeper numerical understanding through informal contexts, such as play, shopping, and digital games, rather than through traditional classroom drills (Bitter et al., 2016). In digital contexts, strategies and simulations in games require players to manage limited resources, predict outcomes, and optimize decisions that involve mathematical concepts such as proportion, estimation, and probability.

Furthermore, Hjärpe (2019) emphasized that numbers in real life function not only as quantities but also as tools for classification (e.g., character levels), regulation (e.g., scoring systems), and coordination (e.g., distribution) (Hjärpe, 2019). These findings align with Nepal & Shrestha (2023), who assert that mathematical understanding develops through active participation in meaningful cultural practices (Nepal & Shrestha, 2023). Thus, numeracy functions not simply as a competence but as life literacy that teachers must cultivate through meaningful and engaging contexts for students.

2.2 Pancasila Values in Character Education

Pancasila, as the foundation of the state and the Indonesian way of life, has long served as a central pillar in the national education curriculum. The National Education System Act No. 20 of 2003 explicitly states that national education aims to shape the character and civilization of a dignified nation, with *Pancasila* as its philosophical foundation. However, the main challenge in its implementation lies in instilling these values naturally, not through rote memorization, but through meaningful real-life experiences for children (Kemdikbudristek, 2022).

How *Pancasila* values operate in modern contexts, noble values such as religiosity, humanity, deliberation, cooperation, harmony, and tolerance can manifest through digital environments. In gaming contexts, these values surface in how players act and interact within the game, not in the storyline. For example, the *Honor Score* system in *Free Fire* rewards prosocial behavior, while the role-sharing mechanism in *Mobile Legends* requires collective agreement.

Moral understanding develops through social conflict and the negotiation of norms within real contexts (Carpendale et al., 2021). Thus, modern citizenship treats *Pancasila* as a living ethical framework that individuals bring into practice in different domains, including the digital sphere. The *Pancasila Student Profile Reinforcement Program* guides schools to integrate cooperation, independence, and critical reasoning into students' daily interactions, including those occurring in digital environments (Kemdikbudristek, 2022).

2.3 Mobile Games as Digital Learning Environments

Mobile games have become an integral part of elementary school children's lives in the digital era. Global research indicates that modern games are designed based on strong pedagogical principles: they provide scaffolding, feedback, progressive challenges, and opportunities for experimentation, all of which support constructivist learning (Fiorucci et al., 2023; Hart et al., 2021). More importantly, multiplayer games create communities of practice in which social norms, collaborative ethics, and shared responsibilities are dynamically negotiated (Haryadi, 2023).

A study by Lee (2018) found that online games that reward team assistance foster empathy and cooperative behavior (Lee et al., 2018). Similarly, children who play cooperative games demonstrate significant improvements in their sense of justice (Valcke & Nilsen, 2023). These findings support the argument that games do not merely reflect values but actively shape them through their mechanisms and structures (Van Noordwijk et al., 2020).

However, most research has focused on serious games specifically designed for educational purposes. At the same time, few have explored popular commercial games, the ones most frequently played by children, as potential learning resources (Boti et al., 2023). In fact, games such as *Free Fire*, *Mobile Legends*, and *Roblox* contain rich numerical elements (resource management, time estimation, statistical analysis) and social dynamics that enable the internalization of prosocial values (Wilhelmsson et al., 2021). In this context, the role of educators becomes crucial, not to prohibit, but to guide children in reflecting on their gaming experiences through the development of numeracy and *Pancasila* values.

Based on the synthesis of the literature, this study uses a conceptual framework that positions mobile gaming as a contextual learning environment in which gameplay simultaneously enacts numeracy practices and *Pancasila* values. In this framework, mobile games serve as informal digital spaces that expose children to numerical concepts such as scores, virtual currency, ratios, and time management, thereby supporting contextual numeracy through decision-making and problem-

solving. At the same time, the social and interactive features of mobile games facilitate the enactment of Pancasila values, including cooperation, deliberation, fairness, responsibility, and collective support.

This study treats numeracy and Pancasila values not as separate outcomes but as interrelated dimensions that emerge through children's lived experiences during gameplay. Teachers and learning contexts act as mediating factors by facilitating reflection and pedagogical connections between in-game experiences and formal learning objectives. This conceptual framework provides the theoretical direction of the study by illustrating how digital gameplay, numeracy practices, and value formation intersect within children's everyday digital lives, guiding both data collection and interpretation

3. Methodology

This study employed a qualitative descriptive phenomenological approach to exploring the meaning of elementary school children's subjective experiences when interacting with popular mobile games such as *Free Fire*, *Mobile Legends*, *Roblox*, and *Block Blast*, in relation to numeracy activities and the internalization of Pancasila values. This study adopts a phenomenological approach to capture the essence of participants' lived experiences before any theoretical lens narrows the interpretation (Creswell & Poth, 2016; Moustakas, 1994). This methodology allows the researcher to deeply explore how children interpret numerical elements and social values that naturally emerge during gameplay, both consciously and unconsciously.

This study adopted a descriptive phenomenological design that followed systematic stages integrating the models of: (a) bracketing (epoché), (b) data collection through in-depth interviews and participatory observation, (c) horizontalization, (d) clustering of meaning units and identification of invariant constituents, (e) textural description, (f) structural description, and (g) synthesis of the essence (Creswell & Poth, 2016; Moustakas, 1994). This process explores not only what participants experience but also how those experiences take shape and what essential meanings they contain.

The research subjects were 48 students in grades III-V from four public elementary schools across four provinces on the island of Java, Indonesia. Participants were selected using a purposive sampling technique based on the following criteria: (1) actively playing mobile games at least three times per week, (2) having regular access to smart devices and the internet, and (3) voluntarily agreeing to participate. The four research sites were: (1) Elementary School in Pacitan (East Java); (2) Elementary School in Klaten (Central Java); (3) Elementary School in Yogyakarta (Special Region of Yogyakarta); and (4) Elementary School in Kramatwatu (Banten). The diverse selection of sites, spanning geographical and socio-cultural contexts, aimed to enrich the range of experiences and strengthen the transferability of the findings.

3.1 Data Collection

The researcher employs three complementary techniques to collect data and reinforce the validity of the findings.

3.1.1 In-depth Interview

This study employed in-depth semi-structured interviews using an open-ended instrument comprising 10 core questions. The researchers chose this approach because it allowed them to systematically yet flexibly explore children's gaming experiences while ensuring alignment with the research objectives. Compared with structured questionnaires, semi-structured interviews allowed participants to describe gaming activities, numeracy practices, and expressions of *Pancasila* values in their own words. At the same time, the predetermined question framework-maintained consistency across participants and research sites.

Unlike completely unstructured interviews, this format ensured that all key dimensions, such as game type, numeracy activities, and value-based interactions, could be thoroughly addressed. The use of open-ended questions was well-suited to capturing implicit numerical reasoning and social behaviors that might not emerge through fixed-answer instruments. Instrument validation using Aiken's V further ensured content relevance, clarity, and logical sequence, supporting the credibility of the collected data.

Table 1: The validation results of the interview instrument were analyzed using Aiken's V

Assessment Aspect	\bar{x}	$\Sigma s (\Sigma (r-1))$	Aiken's V	Description
Alignment of items with research objectives	4,8	19	0,95	Valid
Clarity of language and question phrasing	4,4	17	0,85	Valid
Logical sequencing of questions	4,4	17	0,85	Valid
Relevance to numeracy indicators	4,8	19	0,95	Valid
Relevance to <i>Pancasila</i> value indicators	4,6	18	0,90	Valid

3.1.2 Participatory Observation

In addition to the interview instrument, the researcher also employed an observation instrument to examine children's gaming practices directly. The observation focused on three main aspects: (1) the presence of numerical elements within the games, (2) the *Pancasila* values reflected in both interactions and game rules, and (3) the impact of integrating numerical elements with *Pancasila* values during individual and group play. To ensure adequate content validity, five experts in elementary education, numeracy, and *Pancasila*-based character education were involved. The validation process involved expert evaluations of the appropriateness of the interview items and observation indicators, with consideration of their clarity, measurability, and relevance to the research objectives.

Table 2: The validation results of the observation instrument were analyzed using Aiken's V

Assessment Aspect	\bar{x}	$\Sigma s (\bar{r}-1)$	Aiken's V	Description
Alignment of items with the research objectives	4,8	19	0,95	Valid
Clarity of language and phrasing of questions	4,4	17	0,85	Valid
Logical sequencing of questions	4,4	17	0,85	Valid
Relevance to numeracy indicators	4,8	19	0,95	Valid
Relevance to <i>Pancasila</i> value indicators	4,6	18	0,90	Valid

The researcher involved five experts who validated the instruments through Aiken's V. The interview instrument achieved $V = 0.95$ for alignment with research objectives and numeracy indicators, $V = 0.90$ for *Pancasila* values, and $V = 0.85$ for language clarity and sequencing, all within the valid to very valid range. The observation instrument showed similarly strong results, with $V = 1.00$ for alignment with research objectives, $V = 0.95$ for numerical indicators, $V = 0.90$ for *Pancasila* values, and $V = 0.85$ for measurability and rubric completeness. These results indicate both instruments are suitable for use, with minor refinements recommended for clarity and rubric detail.

3.1.3 Documentation

The researcher documents supporting data by capturing gameplay moments, compiling player profiles, and collecting contextual materials that enrich interpretation.

3.2 Data Analysis

Data analysis followed a rigorous phenomenological procedure consisting of the following stages: (1) Bracketing (Epoché): The researcher suspended personal assumptions about gaming, numeracy, and *Pancasila* to ensure the purity of participants' experiences as the primary source of meaning. (2) Horizontalization: All relevant statements from the transcripts were given equal weight and identified as meaning units. (3) Clustering and Identification of Invariant Constituents: The meaning units were grouped into major themes and refined into invariant constituents that consistently emerged across participants. (4) Textural Description: This stage outlines how the participants experience numeracy and *Pancasila* values. (5) Structural Description: This stage explored how these experiences occurred, including the contexts, conditions, and dynamics of interaction. (6) Essence Description: The final stage synthesized the core meaning of the phenomenon under study, forming a holistic thematic conclusion.

3.3 Data Validation Procedures

To ensure the credibility, dependability, and confirmability of the findings, this study applied the following strategies: (1) Technique Triangulation: The use of interviews, observations, and documentation to verify findings across multiple sources. (2) Member Checking: The researcher reconfirmed transcript results and

data interpretations with participants to ensure that the findings accurately represented their intended meanings and lived experiences. (3) Prolonged engagement and Persistent Observation: The researcher engaged intensively and for an adequate period during data collection to gain a deep understanding of the context and to consistently observe emerging key aspects. (4) Audit Trail: All processes, from transcription and coding to interpretation, were systematically documented and traceable. The consistent application of these procedures ensured both the dependability and confirmability of the research process. (5) Reflection: The researcher continuously reflected on personal position, beliefs, and interpretations throughout the study to remain aware of potential biases that could influence data analysis and interpretation (Creswell & Poth, 2016).

4. Results and Findings

The presentation of findings begins with an exploration of participants' experiences, followed by data reduction through systematic analytical stages. This section presents raw data in narrative form to show how elementary school children interact with numerical elements and *Pancasila* values while playing mobile games. This presentation aims to illustrate the phenomenon under investigation, encompassing gameplay dynamics, strategies employed, forms of team collaboration, and expressions of social value.

4.1 Researcher Reflexivity and Bracketing Procedures

Before data collection, the researcher engaged in bracketing (*epoché*) to suspend personal assumptions, prior experiences, and preferences related to digital games and learning. This procedure aimed to ensure that data interpretation was grounded in participants' lived experiences rather than the researcher's preconceptions. To support reflexivity, the researcher maintained reflective notes documenting initial assumptions, potential biases, and ongoing self-awareness throughout the research process. These reflections informed the development of neutral and open-ended interview questions and guided the researcher's engagement during interviews and observations to facilitate authentic participant expression.

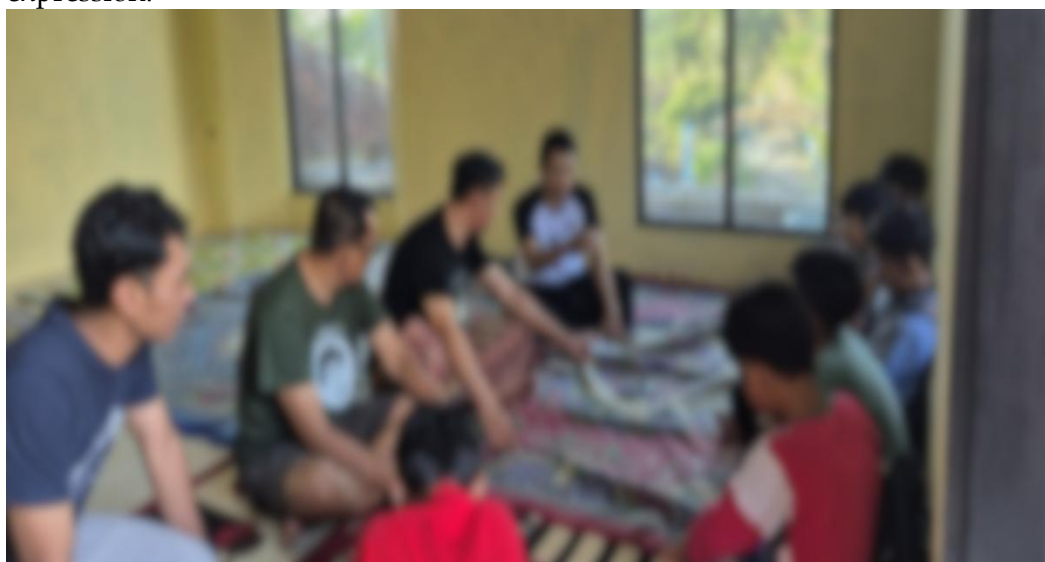


Figure 1: Research Data Collection in the Pacitan Region

4.2 Gameplay Experiences Across Regions

4.2.1 Game Preferences and Gameplay Contexts

Across the four regions, students engaged with a range of digital games that reflected both competitive and creative gameplay contexts. In Yogyakarta, students frequently mentioned *Roblox*, particularly simulation and tower-based modes that required persistence and attention to technical details such as speed, height, and progression levels. In Pacitan, students commonly played *Free Fire*, *Mobile Legends*, *Roblox*, *FIFA*, and *Block Blast*, with gameplay often involving team-based competition and character customization.

Students in Klaten preferred *Roblox* simulation modes such as gardening and security scenarios, which involved managing resources, monitoring quantities, and making situational judgments. In Banten, *Mobile Legends* was the dominant game, with students forming five-member teams and selecting heroes based on specific roles that influenced team strategy.



Figure 2: Interview and Observation Process in Yogyakarta School

4.2.2 Duration and Intensity of Gameplay

Gameplay duration varied across regions and game types. Students in Yogyakarta and Pacitan typically spent approximately two to three hours per day playing digital games, particularly when engaging with simulation or competitive modes that required extended attention. In Klaten, students generally reported shorter gameplay durations of one to two hours, favoring more flexible and relaxing game modes.

In Banten, although individual *Mobile Legends* matches were relatively short, repeated gameplay sessions led to high overall intensity. These patterns indicate that gameplay duration was shaped not only by available time but also by game mechanics and social interaction patterns.

4.2.3 Numeracy Practices and Emerging Values in Gameplay

Across all regions, students interacted with numerical elements embedded in gameplay, including scores, ammunition counts, virtual currency, timers, item

prices, and performance statistics. These numerical cues served as references for strategic decision-making, such as saving gold for upgrades, monitoring remaining resources, and estimating speed and timing in simulation games.

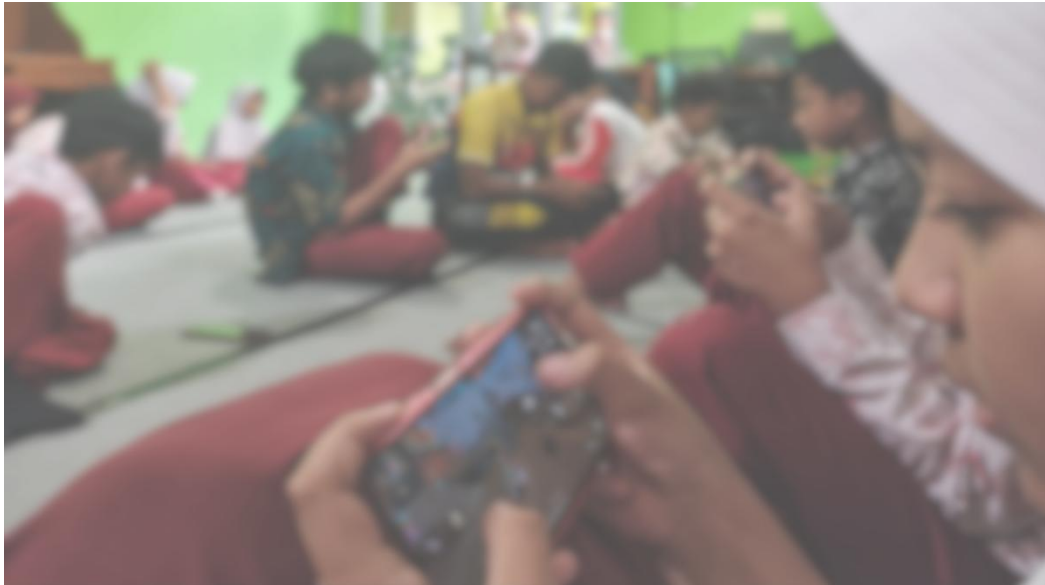


Figure 3: Observation of Numeracy and *Pancasila* Elements in Gameplay

Alongside numeracy practices, gameplay interactions also reflected the emergence of *Pancasila* values. Team-based games fostered cooperation, responsibility, and mutual support, particularly through coordinated strategies and role-sharing. Resource sharing and collective decision-making illustrated values of fairness and deliberation, while collaborative activities in creative games supported solidarity and unity. These findings indicate that students experienced numeracy practices and social values together in their everyday gameplay.

4.3 Patterns of Numeracy and *Pancasila* Values in Gameplay Interactions

Observations indicated that students' engagement in digital games extended beyond entertainment and involved recurring patterns of numeracy practices and social interaction. In *Free Fire* and *Mobile Legends*, students frequently encountered numerical elements such as kill/death ratios, accumulated gold, and level progression. These numerical indicators functioned as reference points for evaluating performance and guiding strategic decisions during gameplay.

In *Roblox*, students engaged with numeracy in more creative contexts, particularly through game design activities that required basic coding logic, variable settings, and numerical calculations. Meanwhile, *Block Blast* presented numeracy in a more explicit form, as students performed addition and subtraction operations and visualized fraction concepts using digital blocks. Across these games, numeracy practices ranged from strategic calculations to direct mathematical modeling embedded in gameplay mechanics.

Alongside numeracy, gameplay experiences also involved rich social interactions. Students actively discussed strategies, organized teams, and distributed roles

based on individual strengths. Text and voice chat features in *Free Fire* and *Mobile Legends* supported deliberation and coordination among team members. In *Roblox*, collaborative activities such as building virtual environments and developing gameplay scenarios require collective planning and shared responsibility.

Similarly, interactions in *Block Blast* often involved group discussions and mutual assistance when solving block-based challenges. These social interactions reflected recurring patterns of cooperation, deliberation, and fairness that aligned with Pancasila values observed during gameplay. The findings indicate that integrating numeracy practices and Pancasila values during gameplay manifests in recurring patterns of decision-making, social interaction, and meaning making across different game contexts.

4.3.1 Numeracy-Based Decision-Making in Gameplay

During gameplay, students used numerical cues embedded in the game mechanics to guide their strategic decisions. Numerical elements such as scores, timers, levels, virtual currency, and resource indicators functioned as tools for evaluating risks and opportunities rather than as passive displays. For example, in *Mobile Legends*, students considered the amount of available gold before purchasing items to enhance character abilities. At the same time, in *Free Fire*, ammunition counts influenced decisions to attack or adopt defensive strategies. In games such as *Roblox* and *Block Blast*, numerical reasoning was also evident in configuring variables, designing game elements, and performing basic arithmetic operations. These experiences demonstrate that numeracy emerged as a practical reasoning process embedded in gameplay activities.

4.3.2 Social Interaction and Enactment of Pancasila Values

Alongside numeracy practices, gameplay interactions facilitated the enactment of Pancasila values through collaborative and social dynamics. Students negotiated roles, shared resources, and coordinated strategies, reflecting deliberation, cooperation, solidarity, and fairness. In *Roblox*, collaborative game creation required students to divide tasks, respect differing ideas, and work toward shared goals, fostering unity and mutual responsibility. Similarly, in *Block Blast*, students frequently assisted peers, exchanged strategies, and discussed solutions to numerical challenges, illustrating cooperative problem-solving and social care. These interactions show that everyday gameplay practices enacted Pancasila values rather than explicit instruction.

4.3.3 Linking Gameplay Experiences with Meaning-Making

Across game types, students interpreted numerical and social experiences as interconnected elements of gameplay rather than as isolated skills. Numerical features such as scores, ratios, and virtual currency were understood in relation to gameplay outcomes, while social interactions reinforced shared responsibility and collective success. This pattern of meaning-making indicates that numeracy practices and Pancasila values were jointly experienced during gameplay, forming consistent experiential patterns across different digital game environments.

4.4 Regional Findings

Across the four regions studied, variations were observed in students' game preferences and gameplay experiences, while recurring patterns of numeracy practices and Pancasila value enactment remained evident.

In Pacitan and Banten, students predominantly engaged with competitive games such as *Free Fire* and *Mobile Legends*. Gameplay in these contexts involved frequent interaction with numerical elements, including individual and team scores, kill/death ratios, virtual currencies (gold or diamonds), and time-based mechanisms. These numerical features functioned not only as performance indicators but also as tools for strategic decision-making. For example, the amount of accumulated gold influenced decisions about purchasing items, while students used kill/death ratios to assess the effectiveness of their strategies during gameplay.

In contrast, students in Yogyakarta and Klaten showed a strong preference for *Roblox*, with engagement extending beyond gameplay to creative production. Students interacted with virtual currency (Robux) to acquire items, modify avatars, and expand gameplay options. In addition, many students participated in game creation using *Roblox Studio*, which involved basic coding logic, numerical variables, and value assignments. These activities required students to apply numeracy skills to set character attributes, manage scores, and simulate simple economic transactions. Alongside these numerical practices, collaborative game design activities fostered cooperation, role-sharing, and mutual respect, reflecting the enactment of Pancasila values such as solidarity and unity during shared creative processes.

The researchers also observed educational gameplay experiences using *Block Blast* in school settings. In this game, students engaged with numerical concepts through visual and manipulative representations, such as assembling blocks to perform addition and subtraction or using segmented blocks to explore fractions. These interactions supported an intuitive understanding of numerical relationships. At the same time, social interactions during gameplay included helping peers, exchanging strategies, and collectively discussing solutions, demonstrating cooperation and deliberation aligned with Pancasila values. Overall, while regional and contextual differences shaped the forms of gameplay experiences, consistent patterns emerged across all regions. Both commercial and educational games provided experiential contexts in which gameplay jointly manifested numeracy practices and Pancasila values.

4.5 Patterns of Numeracy and Pancasila Values Across Gameplay Contexts

Overall, the findings indicate that both popular commercial games frequently played by students, such as *Free Fire*, *Mobile Legends*, and *Roblox*, and educational games like *Block Blast*, provide contexts in which numeracy practices and Pancasila values co-emerge during gameplay. Across various game types, students encounter numerical elements such as scores, levels, virtual currency, timers, and resource indicators, which require them to engage in mathematical thinking and strategic decision-making.

In these same game interactions, social dynamics facilitate the application of Pancasila values, particularly deliberation, cooperation, solidarity, and social justice. While there are regional differences in game preferences, such as students in Pacitan and Banten preferring competitive games (Free Fire and Mobile Legends), and students in Yogyakarta and Klaten preferring creative games (Roblox), researchers consistently observe patterns of numeracy engagement and the application of these values across all regions. These findings suggest that, regardless of game genre or regional context, mobile games provide recurring patterns of experience in which numeracy practices and Pancasila values co-embodiment.

5. Discussion

The integration of Pancasila values into mobile game-based learning carries broader conceptual and pedagogical implications at the global level, even though this research takes place in the Indonesian context. Pancasila represents a moral framework rooted in national culture that emphasizes cooperation, justice, responsibility, and shared well-being, aligning with universal principles in character and moral education. From an international perspective, this study illustrates how digital game-based learning can serve as a culturally responsive platform for meaningfully embedding local value systems into everyday digital practices.

Rather than promoting culturally neutral or generic moral constructs, the findings suggest that effective digital character education can benefit from linking ethics learning to locally relevant value frameworks. This approach contributes to global discussions on digital citizenship and moral education by demonstrating how educators can integrate national or cultural values into informal digital learning environments without compromising their broader educational relevance. Therefore, this study offers applicable conceptual insights for educators and researchers worldwide seeking to design values-based and context-sensitive learning approaches in digitally mediated environments.

The findings of this study indicate that mobile gaming experiences among elementary school children are not merely recreational activities but meaningful arenas in which students naturally internalize numeracy skills and Pancasila values as part of the learning process (Ishak & Rahman, 2021; Zainudin et al., 2024). These findings align with and extend global discourse on mathematical numeracy skills in informal contexts and the transmission of Pancasila values to elementary school students, while also offering an original contribution to technology-based character education in Indonesia (Arzfi et al., 2025; Sager et al., 2023; Williams-Pierce & Thevenow-Harrison, 2021).

When researchers consider the findings in relation to participant characteristics such as age and gender, the phenomenological analysis did not reveal clear or consistent patterns in how children engaged with numerical elements or internalized Pancasila values during gameplay. Across grade levels, students demonstrated comparable approaches to strategic decision-making, collaboration, and resource management. Similarly, both male and female

participants actively participated in team-based interactions and deliberative processes. These patterns suggest that the integration of numeracy skills and character values in mobile gaming is shaped primarily by game mechanics and social interaction dynamics rather than by demographic variables, within the scope of this qualitative, phenomenological inquiry. In this regard, mobile games appear to function as a relatively inclusive learning context in which children's experiences of numeracy and values develop in comparable ways across ages and genders.

First, regarding numeracy skills, this research confirms that children do not simply "use numbers," but engage with numeracy as a cognitive and social framework for understanding, managing, and interacting with virtual worlds (Calvert et al., 2020; Gulz et al., 2020; Hikmatyar et al., 2025). Findings such as students counting gold to purchase items, monitoring timers to coordinate attacks, or managing resources in a gardening simulation in Roblox align with assertion that numeracy skills emerge most strongly through meaningful practices outside the classroom (Williams-Pierce & Thevenow-Harrison, 2021).

This research also contributes to existing research on resource management in strategy games as a training ground for proportional reasoning, in which players allocate limited resources to achieve goals (Ahmadov et al., 2025). Furthermore, research suggests that in competitive games like Free Fire or Mobile Legends, numeracy skills also serve as a tool for social regulation, for example, when players distribute gold fairly or adjust strategies based on team statistics. These findings support the idea that mathematical skills develop through in-game problem-solving, conceptual understanding, and encouragement for logical, critical, creative, innovative, and analytical thinking (Gök & İnan, 2021; Hui & Mahmud, 2023; Russo et al., 2021).

Second, the presence of Pancasila values in game interactions challenges the assumption that character development relies exclusively on explicit narrative instruction. Instead, this study reveals that values such as cooperation, mutual support (principle 3), fairness, and deliberation emerge implicitly through game mechanics and social dynamics. For example, the Honor Score system in Free Fire structurally incentivizes fair and civilized behavior (principle 2) by rewarding players who help teammates. Similarly, role allocation in Mobile Legends requires mutual agreement, reflecting the democratic principle of deliberative wisdom and representation (principle 4).

Furthermore, when students voluntarily share resources, such as giving items to peers in need, this reflects the value of social justice for all Indonesians (principle 5). These findings reinforce the work of Ran (2025), who demonstrated that game design can shape prosocial behavior while also extending it to a culturally specific value framework (Ran et al., 2025). In the Indonesian context, this confirms that Pancasila functions not merely as a doctrine but as an ethical system that can be realized in digital spaces (Islamy, 2023; Ngesthi et al., 2023; Oktaviana et al., 2023).

Third, the teacher's role as a facilitator has proven crucial for connecting gaming experiences with formal learning and fostering moral values (Sholehuddin et al., 2023). This study shows that the first principle (Belief in God Almighty) does not emerge from the game's mechanics alone but can be meaningfully experienced through guided reflection by the teacher. This finding confirms that technology is not value-neutral; rather, its pedagogical significance depends on the extent to which educators actively facilitate interpretation. Faith does not operate solely within the game; it grows through guided reflection and meaningful interactions with the teacher, such as praying before playing and expressing gratitude afterward. Therefore, teachers are not only supervisors but also transformative agents who help children understand play as part of a holistic learning journey encompassing intellect (Ponomariovieniė & Jakavonytė-Staškuvieniė, 2025).

Fourth, regional variations, such as the preference for competitive play in Pacitan and Banten and creative play in Yogyakarta and Klaten, indicate that cultural differences shape how children experience numeracy and character values. Nevertheless, the pattern of integration between the two remains consistent, suggesting that the pedagogical potential of mobile games is universal, despite varying expressions. Communities express global values such as fairness and empathy through culturally specific practices (Babo & Syamsuddin, 2023; Nur et al., 2020).

Importantly, this study also highlights a challenge: excessive gaming time in some cases underscores the need for clear boundaries and strong guidance. Rather than banning gaming, these findings support a values-based approach to digital literacy education (Qu, 2023). By capitalizing on children's natural interest in gaming, educators can shift the focus from "screen time" to "quality of experience." In conclusion, this study not only strengthens the literature on the potential of games as learning environments but also proposes a unique integrative model: contextual numeracy, Pancasila values, and pedagogical reflection can work together to foster meaningful digital learning rooted in national identity. This model is relevant not only to Indonesia but also to other countries seeking to integrate local values into the global technology ecosystem.

Despite its contributions, this study has several limitations that warrant acknowledgment. First, the study used a qualitative phenomenological approach with a relatively small number of participants across selected regions. While this approach allowed for in-depth exploration of children's lived experiences, the study does not intend the findings to be statistically generalized to all elementary school populations. Second, the study relied primarily on interviews and participatory observations, which may have been influenced by participants' ability to articulate their experiences and by the researcher's presence during gameplay sessions.

Third, although the researchers documented demographic characteristics such as age and gender, the study did not aim to conduct comparative analyses across these variables, as the focus was on shared experiential patterns rather than group differences. Finally, teacher-guided reflection partly facilitated the integration of

numeracy and Pancasila values, and variations across educational contexts may influence how learners internalize these values. These limitations provide essential context for interpreting the findings and highlight directions for future research.

Although this study is grounded in the Indonesian context, its relevance extends to other educational settings where children's engagement with mobile games is increasingly common. The findings highlight universal learning processes, such as decision-making, collaboration, and resource management, embedded in digital games across cultures. By illustrating how informal digital environments can meaningfully realize locally rooted value frameworks, this study offers a conceptual framework for educators and researchers seeking to integrate numeracy learning and character education in culturally responsive ways beyond the Indonesian context.

6. Conclusion

This research demonstrates that educators can strategically use digital games to integrate numeracy learning and Pancasila-based character education. The numerical elements in the games provide a concrete context for mathematical understanding. In contrast, the social interactions within the games create a space for instilling the values of cooperation, fairness, deliberation, and responsibility. Through a constructivist approach and planned reflective activities, teachers can direct gaming experience into a meaningful learning process. Thus, digital games serve not only as entertainment but also as contextual tools to increase learning motivation while building students' character based on Pancasila values.

7. Conflict of Interest, Acknowledgements, etc.

The authors declare that there is no conflict of interest regarding the publication of this article. The researchers conducted the study independently, and no financial, institutional, or personal relationships influenced the objectivity or integrity of the findings. This study involved elementary school children and adhered strictly to ethical research standards. Before data collection, the researchers obtained informed consent from school authorities, classroom teachers, parents or guardians, and all participating students. Participation was voluntary, and the researchers' told students that they could withdraw at any time without consequence. All data were anonymized to protect participants' identities, and the research procedures complied with ethical guidelines for educational research involving minors.

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