

IMPLEMENTING AN AIK-INTEGRATED SNAKES-AND-LADDERS GAME TO SUPPORT FOUNDATIONAL LITERACY AND NUMERACY AMONG CHILDREN IN ORPHANAGE

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Abstract: Children in orphanage often learn in mixed-age groups with markedly different levels of foundational literacy and numeracy, while access to interactive, low-technology learning media may be limited. This community-based study examined the implementation of Mentari Snakes and Ladders, a floor-sized educational game integrating differentiated reading, writing, and arithmetic tasks with *Al-Islam and Kemuhammadiyahan* (AIK) values. Twelve elementary-school-aged children at a Muhammadiyah orphanage institution in Surabaya participated in five 90-minute sessions in May 2026. Data were drawn from needs-assessment observations and interviews, initial diagnostic tasks, written products, challenge-card records, structured behavioral observations, reflection journals, and a final individual assessment. Quantitative evidence was summarized descriptively, while qualitative records were organized thematically around feasibility, participation, differentiated support, academic practice, and values-related behavior. The program was feasible in the available space and enabled children from Grades 1-6 to participate in a common activity through tiered challenge cards and graduated prompts. The number meeting the specified reading criterion increased from 2 to 7 of 12, simple-sentence writing from 1 to 6, and two-digit arithmetic from 3 to 8. Consistent observations of *shiddiq*, *amanah*, *ta'awun*, and *takaful* also increased. The findings indicate that the game offers a context-responsive mechanism for combining foundational learning, movement, peer assistance, and values-based reflection. Because the initial and final assessments were not identical and the study had no comparison group, the results constitute preliminary descriptive evidence rather than causal proof of effectiveness.

Keywords: Foundational Literacy, Numeracy, Game-Based Learning, Orphanage, Islamic Character Education

Introduction

Foundational literacy and numeracy are enabling capabilities rather than isolated school subjects. Reading permits children to recognize, interpret, and use

written information; writing allows them to communicate and organize ideas; and numeracy supports quantitative judgment in everyday situations. Indonesian studies of early reading, writing, and arithmetic show that children benefit from repeated practice, contextual materials, and instructional support that is responsive to their developmental level.¹ The practical problem is therefore not only whether children receive exercises, but whether the learning environment makes those exercises accessible, meaningful, and sustainable for learners with different starting points.

Children living in orphanage may encounter a distinctive combination of educational opportunities and vulnerabilities. Residential institutions can provide routine, peer companionship, and collective learning time, yet the children may differ in age, grade level, previous schooling, family support, and confidence in academic tasks. International guidance on alternative care emphasizes children's rights to education, participation, dignity, development, and protection regardless of care setting.² Indonesian child-situation analyses similarly call for locally responsive support that addresses unequal educational opportunities without defining children solely through deficit labels.³ In a mixed-grade residential learning group, a uniform worksheet or lecture can be too difficult for some participants and insufficiently challenging for others.

Community-service scholarship has increasingly treated literacy development as a process of partner capacity building rather than a one-off transfer of teaching materials. In *Khidmatuna: Jurnal Pengabdian Masyarakat*, Muttaqin and Atmari showed that literacy initiatives became more sustainable when needs diagnosis,

¹ Lilik Latifah and Fitri Puji Rahmawati, "Penerapan Program Membaca, Menulis, Dan Berhitung Untuk Meningkatkan Literasi Numerasi Siswa Kelas Rendah Di Sekolah Dasar," *Jurnal Basicedu* 6, no. 3 (2022): 5021–29, <https://doi.org/10.31004/basicedu.v6i3.3003>; Nita Ayu Lestari, Muhammad Mawardi, and Sugeng Sunaryo, "Literasi Dasar Untuk Meningkatkan Minat Baca Siswa Kelas Empat Di Sekolah Dasar," *Jurnal Educatio Fakultas Keguruan Dan Ilmu Pendidikan Universitas Majalengka* 9, no. 4 (2023): 1905–9; Hotmauli Agnes Turnip and Leli Wijayaningsih, "Pengembangan Dadu Quick Response Code Untuk Alternatif Pengenalan Membaca, Menulis, Dan Berhitung Anak Usia 5-6 Tahun," *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini* 6, no. 5 (2022): 4392–4404, <https://doi.org/10.31004/obsesi.v6i5.2595>.

² United Nations General Assembly, "Guidelines for the Alternative Care of Children (Resolusi Majelis Umum Perserikatan Bangsa-Bangsa 64/142)" (United Nations, 2010).

³ UNICEF Indonesia, "The Situation Analysis of Children and Young People in Indonesian Cities" (United Nations International Children's Emergency Fund, 2021).

mentoring, collaborative production, and institutional follow-up were connected.⁴ Alamsyah et al., likewise linked participatory diagnosis, structured training, evaluation, and follow-up planning in a Muhammadiyah educational community.⁵ Although those programs involved different populations and literacy domains, they illustrate a relevant principle for the present study: community-engaged learning media should respond to an identified institutional need, generate observable learning opportunities, and leave the partner with a usable model.

Game-based learning provides one route for structuring such opportunities. A learning game can combine goals, rules, feedback, challenge, repetition, and social interaction, but the presence of play does not automatically produce learning. The academic task must be necessary to progress, the challenge must remain achievable, and feedback must help participants understand what to do next.⁶ Reviews and meta-analyses generally report positive cognitive, motivational, or affective outcomes from well-designed games, while also stressing substantial variation across designs and implementation conditions.⁷ This qualification is particularly important in community programs, where excitement about a novel medium can easily be mistaken for durable learning.

⁴ Ahmad Imam Muttaqin and Ali Atmari, "Strengthening Literacy Management among Pesantren-Based Madrasah Teachers through the Gerakan Satu Madrasah Satu Buku Programme," *Khidmatuna: Jurnal Pengabdian Masyarakat* 6, no. 2 (2026): 17–42, <https://doi.org/10.54471/khidmatuna.v6i2.3902>.

⁵ Andi Alamsyah et al., "Literacy on the Unified Global Hijri Calendar and Basic Hisab Training at a Muhammadiyah Islamic Boarding School," *Khidmatuna: Jurnal Pengabdian Masyarakat* 6, no. 2 (2026): 43–62, <https://doi.org/10.54471/khidmatuna.v6i2.3906>.

⁶ Abdul Illah Abdul Jabbar and Patrick Felicia, "Gameplay Engagement and Learning in Game-Based Learning: A Systematic Review," *Review of Educational Research* 85, no. 4 (2015): 740–79, <https://doi.org/10.3102/0034654315577210>; Douglas Bruce Clark, Emily Elizabeth Tanner-Smith, and Stephen Scott Killingsworth, "Digital Games, Design, and Learning: A Systematic Review and Meta-Analysis," *Review of Educational Research* 86, no. 1 (2016): 79–122, <https://doi.org/10.3102/0034654315582065>; Jan Lorenz Plass, Bruce David Homer, and Charles K Kinzer, "Foundations of Game-Based Learning," *Educational Psychologist* 50, no. 4 (2015): 258–83, <https://doi.org/10.1080/00461520.2015.1122533>.

⁷ Manar S. Alotaibi, "Game-Based Learning in Early Childhood Education: A Systematic Review And Meta-Analysis," *Frontiers in Psychology* 15 (April 2, 2024): 1–11, <https://doi.org/10.3389/fpsyg.2024.1307881>; Umit Tokac, Elena Novak, and Christopher George Thompson, "Effects of Game-Based Learning on Students' Mathematics Achievement: A Meta-Analysis," *Journal of Computer Assisted Learning* 35, no. 3 (2019): 407–20, <https://doi.org/10.1111/jcal.12347>; Pieter Wouters et al., "A Meta-Analysis of the Cognitive and Motivational Effects of Serious Games," *Journal of Educational Psychology* 105, no. 2 (2013): 249–65, <https://doi.org/10.1037/a0031311>.

Physical board games may be especially appropriate in low-technology settings. Number-board-game research shows that learning is strengthened when movement, counting, symbols, and verbal encoding are aligned, rather than when children merely move tokens by chance.⁸ Play-based research also indicates that academic learning typically requires active adult guidance, purposeful materials, and carefully calibrated support rather than unrestricted play alone.⁹ These findings informed the use of a large physical board in the present program: the board generated movement and anticipation, while tiered challenge cards and facilitator prompts carried the literacy and numeracy content.

The partner institution is affiliated with Muhammadiyah and combines educational support with *Al-Islam and Kemuhammadiyah* (AIK) formation. Muhammadiyah character education aims to connect knowledge, worship, morality, and socially responsible action rather than placing religious values outside ordinary learning.¹⁰ AIK mentoring has similarly been described as a setting in which Islamic values are translated into recurring educational practice.¹¹ Moral learning is more credible when values are observable in conduct, relationships, and institutional routines, not merely repeated as definitions.¹² Community programs published in *Khidmatuna* offer comparable evidence: Farid et al., embedded Islamic values in concrete healthy-living practices,¹³ while Larassari et al., used interactive and

⁸ Elida Velez Laski and Robert Siegler Siegler, "Learning from Number Board Games: You Learn What You Encode," *Developmental Psychology* 50, no. 3 (2014): 853–64, <https://doi.org/10.1037/a0034321>; Geetha Boodapati Ramani and Robert Siegler Siegler, "Promoting Broad and Stable Improvements in Low-Income Children's Numerical Knowledge through Playing Number Board Games," *Child Development* 79, no. 2 (2008): 375–94, <https://doi.org/10.1111/j.1467-8624.2007.01131.x>.

⁹ Angela Pyle, Christopher DeLuca, and Erica Danniels, "A Scoping Review of Research on Play-Based Pedagogies in Kindergarten Education," *Review of Education* 5, no. 3 (2017): 311–51, <https://doi.org/10.1002/rev3.3097>; Deena Skolnick Weisberg et al., "Making Play Work for Education," *Phi Delta Kappan* 96, no. 8 (2015): 8–13, <https://doi.org/10.1177/0031721715583955>.

¹⁰ Ika Maria Tsalitsah and Romelah Romelah, "Pendidikan Karakter Muhammadiyah: Studi Madrasah Ibtidaiyah Muhammadiyah 25 Pekuwon, Bojonegoro," *TADARUS: Jurnal Pendidikan Islam* 10, no. 2 (2021): 50–61, <https://doi.org/10.30651/td.v10i2.12892>.

¹¹ Muhammad Ridwan Simatupang, "Penanaman Nilai-Nilai Islam Pada Siswa Melalui Kegiatan Mentoring Al-Islam Dan Kemuhammadiyah Di Sekolah Menengah Pertama Muhammadiyah 48 Medan," *Tsaqila: Jurnal Pendidikan Dan Teknologi* 3, no. 1 (2023): 17–24.

¹² Siti Rahmah, "Akhlak Dalam Keluarga," *Alhadharah: Jurnal Ilmu Dakwah* 20, no. 2 (2021): 27–42, <https://doi.org/10.18592/alhadharah.v20i2.5609>.

¹³ Muhammad Farid et al., "Pendampingan Implementasi Pola Hidup Bersih Dan Sehat Sebagai Nilai-Nilai Agama Islam Di Sentul Lumajang," *Khidmatuna: Jurnal Pengabdian Masyarakat* 4, no. 2 (May 15, 2024): 169–208, <https://doi.org/10.54471/khidmatuna.v4i2.3245>.

participatory activities to link emotional literacy with empathy and respect.¹⁴ Mulyana et al., also showed that varied child-centered activities within a participatory religious-education program could strengthen involvement, togetherness, and discipline.¹⁵

An initial assessment at the Muhammadiyah Semampir orphanage institution identified three connected problems. First, the 12 participating children displayed substantial variation in reading, sentence writing, and basic arithmetic. Second, routine support relied largely on repeated reading and written exercises, with limited use of concrete or kinesthetic media. Third, AIK values were present in institutional life but had not been systematically embedded in foundational literacy and numeracy practice. The intervention therefore required more than an attractive game: it needed to preserve collective participation, differentiate academic difficulty, connect tasks with everyday experience, and make AIK values visible in the social organization of learning.

The novelty of Mentari Snakes and Ladders lies in this integrated design rather than in claiming that snakes and ladders has never been used educationally. The medium combines a floor-sized kinesthetic board, color-coded and tiered reading-writing-numeracy tasks, contextual simulations, peer assistance, and four operational AIK values: *shiddiq* (honesty), *amanah* (responsibility), *ta'awun* (cooperation), and *takaful* (social care). Safitri et al. (2024) demonstrated the value of community assistance for innovative mathematics learning materials, but the present program extends the design problem to a mixed-grade residential setting and combines academic differentiation with embedded character interaction.

The study addressed three questions. Asked how the AIK-integrated Mentari game was implemented as a context-responsive and differentiated medium in a orphanage setting. Examined what descriptive changes were observed in selected foundational literacy and numeracy indicators after five sessions. Examined how

¹⁴ Lestari, Mawardi, and Sunaryo, "Literasi Dasar Untuk Meningkatkan Minat Baca Siswa Kelas Empat Di Sekolah Dasar."

¹⁵ Siti Nur Khadijah Tri Mulyana et al., "Penguatan Praktik Pendidikan Al-Qur'an Anak Melalui Ekstrakurikuler Dan Les Tambahan Dengan Metode Participatory Action Research Di Taman Pendidikan Al-Qur'an As-Salam Ngablak Lor," *Khidmatuna: Jurnal Pengabdian Masyarakat* 5, no. 2 (2025): 127–42, <https://doi.org/10.54471/khidmatuna.v5i2.3210>.

shiddiq, amanah, ta'awun, and takaful were manifested during the program. Separating these questions is methodologically important: successful implementation does not by itself prove academic effectiveness, and observed behavior during a game does not establish permanent character change.

Theoretical Framework

The framework combines four complementary ideas: aligned game-based learning, guided experiential learning, differentiation by readiness, and embedded values education. These ideas explain different parts of the intervention and prevent the game from being treated as a single undifferentiated technique.

First, game-based learning requires alignment between mechanics and instructional objectives. Plass et al., describe learning games as environments in which cognitive, motivational, affective, and sociocultural processes interact.¹⁶ Challenge and feedback can sustain attention, but they become educational only when they direct the learner toward the intended knowledge or behavior. Abdul Jabbar and Felicia's systematic review similarly emphasizes engagement as a multidimensional process rather than simple enjoyment.¹⁷ Hamari et al., found that engagement and the balance between skill and challenge were more directly connected to learning than immersion alone.¹⁸ Accordingly, dice rolling and movement in Mentari served as an entry structure; reading, writing, calculation, explanation, and reflection determined the learning value of each turn.

Second, the program used guided experiential learning. Kolb's cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation offers a useful explanation of how a short game sequence can support learning.¹⁹ A child attempted a task, experienced a consequence, received feedback, discussed the strategy or value involved, and reapplied the insight in a later turn. The

¹⁶ Plass, Homer, and Kinzer, "Foundations of Game-Based Learning."

¹⁷ Abdul Jabbar and Felicia, "Gameplay Engagement and Learning in Game-Based Learning: A Systematic Review."

¹⁸ Juho Hamari et al., "Challenging Games Help Students Learn: An Empirical Study on Engagement, Flow, and Immersion in Game-Based Learning," *Computers in Human Behavior* 54 (2016): 170–79, <https://doi.org/10.1016/j.chb.2015.07.045>.

¹⁹ David Allen Kolb, *Experiential Learning: Experience as the Source of Learning and Development* (Prentice-Hall, 1984).

study did not test Kolb's model as an outcome variable and therefore does not claim confirmation of experiential learning theory. The model was used as a design rationale for sequencing action, feedback, reflection, and reattempt.

Third, differentiation was necessary because participants from Grades 1-6 learned together. Differentiated instruction maintains common goals while varying content complexity, scaffolding, response mode, or pace according to readiness.²⁰ In Mentari, all participants shared the board, rules, and social space, but challenge cards varied in word length, sentence support, number size, context complexity, and permissible prompting. This arrangement sought equity rather than identical treatment. It also created an assessment boundary: scores from adaptively assigned cards could describe formative participation but could not validly rank children or serve as standardized pretest-posttest evidence.

Fourth, AIK values were embedded intentionally in the mechanics, facilitation, and peer interactions. The program therefore uses the term embedded values education rather than an entirely hidden curriculum. Putri explains that implicit institutional routines can shape religious character, but in the present intervention the target values were deliberately designed into visible rules and reflective prompts.²¹ *Shiddiq* was operationalized through honest responding and acknowledgment of error; *amanah* through task completion and care for materials; *ta'awun* through appropriate peer assistance; and *takaful* through attention to a peer's participation and well-being. This operational approach aligns with Muhammadiyah character education and with evidence that social and emotional competencies are more likely to develop through sequenced, active, focused, and explicit learning experiences than through moral

²⁰ Carol Ann Tomlinson, *The Differentiated Classroom: Responding to the Needs of All Learners* (Edisi Kedua) (Association for Supervision and Curriculum Development, 2014).

²¹ Eka Putri, "Implementasi Hidden Curriculum Dalam Pembentukan Karakter Religius Peserta Didik Di Madrasah Tsanawiyah Pondok Pesantren Modern Babussalam Desa Teluk Bakung Kecamatan Tanjung Pura," *Journal Millia Islamia* 1, no. 3 (2023): 201–11.

exhortation alone.²² Religious school environments can reinforce such learning when values are consistently modeled in routines and relationships.²³

Method

This study employed a single-cycle community-based design informed by participatory action-research principles. The partner institution participated in identifying learning needs, determining feasible schedules, reviewing the proposed learning medium, supporting implementation, and reflecting on the program. Nevertheless, the study did not complete multiple recursive cycles of participatory action research. It is therefore positioned as a community-based intervention informed by participatory principles rather than as a full-scale PAR study.

Participatory research emphasizes shared problem identification, collective action, reflection, and practical change rather than the passive inclusion of community members as program recipients.²⁴ Comparable community-education initiatives published in *Khidmatuna: Jurnal Pengabdian Masyarakat* have similarly used participatory diagnosis and collaborative implementation to adapt educational activities to local conditions.²⁵

²² Tsalitsah and Romelah, "Pendidikan Karakter Muhammadiyah: Studi Madrasah Ibtidaiyah Muhammadiyah 25 Pekuwon, Bojonegoro"; Joseph A Durlak et al., "The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions," *Child Development* 82, no. 1 (January 1, 2011): 405–32, <https://doi.org/10.1111/j.1467-8624.2010.01564.x>.

²³ Intan Larassari et al., "Promoting Emotional Literacy and Character Values in Elementary Students: A Service-Learning Approach at Bunklotok School," *Khidmatuna: Jurnal Pengabdian Masyarakat* 6, no. 1 (2025): 1–16, <https://doi.org/10.54471/khidmatuna.v6i1.3601>; Eka Nur Habibah et al., "Membangun Suasana Religius Di Sekolah: Studi Eksploratif Tentang Pengaruh Lingkungan Sekolah Terhadap Perkembangan Spiritual Siswa," *Jurnal Ilmiah Penelitian Mahasiswa* 3, no. 3 (2025): 340–50, <https://doi.org/10.61722/jipm.v3i3.947>.

²⁴ Fran Baum, Colin MacDougall, and Danielle Smith, "Participatory Action Research," *Journal of Epidemiology & Community Health* 60, no. 10 (October 1, 2006): 854–57, <https://doi.org/10.1136/jech.2004.028662>; Margaret Cargo and Shawna L. Mercer, "The Value and Challenges of Participatory Research: Strengthening Its Practice," *Annual Review of Public Health* 29, no. 1 (April 1, 2008): 325–50, <https://doi.org/10.1146/annurev.publhealth.29.091307.083824>; Steven Darryl Jacobs, "The Use of Participatory Action Research within Education-Benefits to Stakeholders," *World Journal of Education* 6, no. 3 (June 3, 2016), <https://doi.org/10.5430/wje.v6n3p48>.

²⁵ Mulyana et al., "Penguatan Praktik Pendidikan Al-Qur'an Anak Melalui Ekstrakurikuler Dan Les Tambahan Dengan Metode Participatory Action Research Di Taman Pendidikan Al-Qur'an As-Salam Ngablak Lor."

The study was conducted at the Muhammadiyah Semampir orphanage institution in Surabaya, Indonesia. The program combined intervention implementation with descriptive evaluation and did not include a comparison group. Activities were conducted on 7, 12, 22, 23, and 24 May 2026, with each session lasting approximately 90 minutes.

Twelve elementary-school-aged children residing at the institution participated in the program. The participants consisted of one Grade 1 child, three Grade 2 children, two Grade 3 children, three Grade 4 children, one Grade 5 child, and two Grade 6 children. They were included because they resided at the institution, were enrolled in elementary school, and were available during the scheduled program period.

The mixed-grade composition was treated as an essential contextual feature rather than merely a sampling limitation. It required a learning design that allowed participants with different academic readiness levels to engage in the same collective activity without being assigned identical tasks. Participant information is reported only in aggregate, and no names or individually identifiable profiles are presented.

Table 1. Participant and Program Profile

Characteristic	Description
Setting	Muhammadiyah Semampir orphanage institution, Surabaya, Indonesia
Participants	12 elementary-school-aged children
Grade distribution	Grade 1: 1; Grade 2: 3; Grade 3: 2; Grade 4: 3; Grade 5: 1; Grade 6: 2
Program dates	7, 12, 22, 23, and 24 May 2026
Duration	Five sessions; approximately 90 minutes per session
Core medium	A 50-square, floor-sized board with tiered literacy, writing, numeracy, and AIK prompts
Evaluation orientation	Descriptive criterion comparison and structured qualitative observation

Note. The grade distribution is presented in aggregate to reduce identifiability.

Two weeks before implementation, the team conducted a two-day needs assessment. The assessment included observation of routine learning activities, the physical learning environment, available educational materials, and patterns of child participation. Semi-structured discussions were conducted with the institutional

administrator and four purposively selected children representing different learning profiles.

Informal diagnostic tasks were also administered to identify participants' abilities in recognizing and reading simple words, producing sentence-level writing, and performing basic arithmetic operations. These activities were not treated as a standardized baseline test. Instead, evidence from observation, discussion, and diagnostic tasks was synthesized to identify the main instructional requirements of the program.

The assessment revealed substantial variation in reading, writing, and arithmetic abilities. Existing learning activities relied heavily on repeated reading and written exercises, while interactive media were limited. AIK values were present in the institution's general educational environment but had not been systematically integrated into literacy and numeracy activities. The institution also had limited access to digital learning technology, although a multipurpose room was available for collective activities.

Table 2. Needs-Assessment Findings and Mentari Design Responses

Needs-assessment finding	Evidence source	Instructional implication	Mentari design response
Marked variation in reading, writing, and arithmetic	Informal diagnostic tasks, observation, caregiver discussion	A single task level would exclude or underchallenge some participants	Tiered cards, graduated prompts, sentence frames, concrete objects, and flexible assistance
Routine activities relied heavily on repeated reading and written exercises	Observation and child/caregiver discussion	Low novelty and limited active participation	Large kinesthetic board, turn-taking, visible feedback, and multimodal response
AIK values were not systematically linked to academic tasks	Review of routine learning and caregiver discussion	Character instruction remained separate from literacy and numeracy practice	AIK symbols, behavior-based rules, ethical-choice cards, and guided reflection
Limited access to digital learning technology	Facility observation	A digital intervention would be difficult to sustain	Rollable tarpaulin board and reusable low-technology materials

Multipurpose room was underused as an educational space	Environmental observation	Existing space did not stimulate collective practice	Temporary transformation into a safe floor-game learning area
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The matrix demonstrates that each component of the intervention was developed in response to an identified contextual need. This connection between diagnosis and instructional design was intended to strengthen the practical relevance of the program.

The primary learning medium was a floor-sized Mentari Snakes and Ladders board made from reusable plastic tarpaulin. The board measured approximately 350 cm × 200 cm and contained 50 color-coded squares. Seventeen blue squares were allocated to reading activities, 17 green squares to writing activities, and 16 red squares to numeracy activities.

A large die and movable markers were used to facilitate kinesthetic participation. Small whiteboards, worksheets, play money, picture prompts, and familiar contextual objects were incorporated when required by particular tasks. The size of the board allowed participants to move physically through the game area, observe their peers’ strategies, and participate in a shared learning space.

Figure 1. Floor-Sized Mentari Snakes and Ladders Board



Challenge cards were organized at more than one level of difficulty. Reading activities ranged from recognizing familiar words and reading short sentences to answering literal comprehension questions. Writing activities progressed from copying words and completing sentence frames to producing short independent sentences.

Numeracy activities ranged from concrete counting and single-step operations to two-digit calculations and simple transaction-based problems.

Task differentiation was applied during learning activities rather than during the common outcome comparison. Facilitators selected cards according to participants' observed readiness and provided graduated assistance. Assistance could include rereading instructions, presenting concrete objects, offering sentence starters, or simplifying the number of steps in a task. Participants with greater readiness were given longer texts, more independent writing activities, or numeracy problems involving multiple operations.

Al-Islam and Kemuhammadiyah values were embedded in the game through symbolic, procedural, and reflective mechanisms. Selected ladders represented constructive behaviors, whereas selected snakes represented behaviors that disrupted learning or negatively affected others. The symbolism was intended to provide an accessible visual representation of the consequences of everyday actions.

Some challenge cards also presented short ethical situations related to four values: *shiddiq*, operationalized as honesty in answering and acknowledging errors; *amanah*, operationalized as responsibility for tasks, rules, and learning materials; *ta'awun*, operationalized as appropriate cooperation and peer assistance; *takaful*, operationalized as attention to and care for peers' participation.

Facilitators reinforced these values through brief reflective questions following relevant incidents during the game. For example, participants could be asked why acknowledging an incorrect answer represented honesty or how assisting a hesitant peer differed from simply providing the answer. The board symbols were therefore not assumed to teach values automatically. Their educational function depended on facilitator explanation, participant interaction, and repeated enactment during the learning process.



Figure 2. Examples of AIK-Integrated Reading, Writing, and Numeracy Challenge Cards

The intervention comprised five 90-minute sessions progressing from orientation to integrated academic and values-based practice. The first session introduced the board, rules, turn-taking procedures, and diagnostic activities. The second and third sessions focused respectively on differentiated reading–writing and numeracy tasks, while the fourth integrated all three domains through guided peer assistance. The final session combined an individual assessment, integrated gameplay, and reflection on *shiddiq*, *amanah*, *ta'awun*, and *takaful*.

Data were collected through needs-assessment records, initial diagnostic tasks, participants' written products, formative challenge-card logs, structured behavioral observations, brief written or orally assisted reflections, and a 45-minute final assessment. The final assessment consisted of 10 reading items, five picture-supported writing prompts, and 10 arithmetic items. Academic comparison focused on three criteria documented at both stages: reading simple two-syllable words without letter-by-letter spelling, writing a simple sentence with appropriate spelling and punctuation, and completing basic two-digit arithmetic operations. Challenge-card scores were treated only as formative evidence because task difficulty was adjusted to participants' readiness and was therefore not comparable across individuals. AIK-related behavior was observed through indicators of honesty, responsibility, cooperation, and social care.

Quantitative data were analyzed descriptively by comparing the number and percentage of participants meeting each academic criterion at the initial and final stages. Because the two assessments were not identical in format, inferential tests, effect sizes, normalized gain, and causal estimates were not calculated. Changes were reported in percentage points, while formative card scores were summarized separately to describe participation and practice rather than standardized achievement.

Qualitative data from observations, participant products, reflections, and discussions were categorized thematically around feasibility, participation, differentiation, contextual relevance, peer support, AIK-related behavior, and implementation constraints. The analysis followed the recursive procedures of thematic analysis, including repeated reading, initial coding, comparison across data sources, category refinement, and interpretive synthesis (Braun & Clarke, 2006). Facilitators reviewed the observation rubric, jointly scored sample responses, and cross-checked selected records. However, no formal inter-rater reliability coefficient was calculated, and the facilitators also served as implementers and observers. The findings therefore distinguish directly countable academic indicators from interpretive behavioral observations and do not claim causal effectiveness or permanent academic and character change.

The program was conducted with institutional authorization and caregiver supervision. Participant information was reported in aggregate, names were omitted, and photographs displaying identifiable faces were excluded. Although documentation permission was recorded, the archived materials did not contain a formal ethics-review decision or separately stored guardian-consent and child-assent forms. Future studies should formalize ethical review, guardian authorization where required, child assent, visual-publication consent, data-retention procedures, and participants' right to withdraw.

Results and Discussion

Differentiated and Context-Responsive Implementation

The implementation showed that the Mentari Snakes and Ladders game could accommodate children with different grade levels and academic readiness within a

shared learning activity. All participants used the same board, rules, turn-taking procedures, and learning space, while the complexity of the literacy and numeracy tasks was adjusted through tiered challenge cards, graduated prompts, and varying levels of facilitator assistance. This arrangement enabled children from Grades 1-6 to participate together without requiring them to complete identical tasks.

The intervention design was directly informed by the needs assessment. Differences in reading, writing, and arithmetic abilities led to the development of tiered cards and flexible scaffolding. The predominance of worksheet-based and repetitive learning activities encouraged the use of movement, visual materials, oral responses, concrete objects, and short written tasks. Limited access to digital technology also supported the selection of a reusable physical board. In addition, the availability of a multipurpose room allowed the institution to transform an existing space into a temporary collective learning area.

The floor-sized board changed the organization of learning activities. Participants rolled a large die, counted their movements, selected challenge cards, responded orally or in writing, and observed how their peers completed similar tasks. The physical format created opportunities for modeling, immediate feedback, and peer interaction. It also made both successful and incorrect responses more visible within the group.

To reduce the possibility of embarrassment, facilitators treated incorrect responses as part of the learning process. Assistance was provided gradually through repeated instructions, concrete examples, sentence starters, simplified steps, or opportunities to retry a task. Facilitators avoided immediately supplying the correct answer so that participants remained responsible for completing the task. This approach helped preserve participation while maintaining the academic purpose of each turn.

The game mechanics were directly connected to the learning activities. Chance determined the square on which a participant landed, but the continuation of the turn depended on completing a reading, writing, numeracy, or reflective task. The academic activity was therefore embedded within the game rather than presented as an additional worksheet after play. This alignment is important because game-based learning is more

educationally meaningful when rules, challenges, and feedback are connected to the intended learning objectives.²⁶

Differentiation occurred through variations in task content, complexity, and support. Reading cards ranged from familiar words and short sentences to literal comprehension questions. Writing activities progressed from copying and sentence completion to producing short independent sentences. Numeracy activities ranged from concrete counting and one-step operations to two-digit calculations and simple transaction problems. Participants who required more support received shorter instructions, sentence frames, visual prompts, or concrete materials, whereas more advanced participants received longer texts, more independent writing tasks, and calculations involving additional steps.

This structure allowed differentiation to occur without separating children into fixed ability groups. Participants with lower readiness remained involved in the same collective activity, while those with stronger academic skills continued to receive appropriate challenges. The shared learning environment was maintained, but the route through which each participant engaged with the content was adjusted. This approach reflects differentiated instruction, which emphasizes common learning goals while adapting task complexity and instructional support to learner readiness.²⁷

Contextual content further supported participation. Reading tasks used familiar words, names, signs, and short sentences related to the children's environment. Writing activities included pictures, everyday objects, and sentence frames. Numeracy tasks involved quantities, schedules, shared items, and simple purchasing situations. These activities connected foundational skills with situations that participants could recognize from daily life.

The activities are more appropriately described as contextual guided practice than as full problem-based learning. Participants were not required to investigate complex, open-ended problems over an extended period. Instead, the learning sequence consisted of completing a task, receiving feedback, discussing the response,

²⁶ Plass, Homer, and Kinzer, "Foundations of Game-Based Learning."

²⁷ Tomlinson, *The Differentiated Classroom: Responding to the Needs of All Learners (Edisi Kedua)*.

and applying the correction during a subsequent turn. This description more accurately reflects the instructional process implemented during the program.

Facilitator involvement remained essential throughout the sessions. Facilitators selected cards, adjusted task difficulty, monitored peer interaction, provided feedback, and maintained the connection between play and academic content. Previous studies have similarly shown that adult guidance is important when play is intended to support specific literacy and numeracy outcomes.²⁸ In this program, guidance was provided through short prompts and graduated assistance rather than direct completion of participants' tasks.

Several practical constraints emerged during implementation. Facilitators needed to select appropriate cards quickly while monitoring the wider group. Peer assistance occasionally shifted into direct answer-giving, requiring facilitators to clarify the difference between supportive prompting and completing another participant's task. Participants who finished their turns quickly also required short reinforcement activities while waiting. In addition, the physical size of the board required adequate floor space and continuous safety monitoring.

The implementation indicates that the usefulness of the medium depended not only on the board and challenge cards but also on the quality of facilitation. Effective replication would require clear descriptions of task levels, examples of acceptable prompts, procedures for peer assistance, turn-management strategies, and safety guidance. The adaptive challenge cards should also remain separate from the common assessment instrument because differences in task difficulty prevent direct comparison of formative scores across participants.

The Mentari game functioned as a shared, low-technology learning medium that combined differentiated academic tasks, contextual content, physical movement, peer interaction, and guided facilitation. Its main practical contribution was the ability to involve children with different readiness levels in one collective activity while maintaining literacy and numeracy tasks suited to their respective learning needs.

²⁸ Pyle, DeLuca, and Danniels, "A Scoping Review of Research on Play-Based Pedagogies in Kindergarten Education"; Weisberg et al., "Making Play Work for Education."

Changes in Foundational Literacy and Numeracy Performance

The academic records showed a consistent descriptive pattern across the three foundational domains assessed during the program. At the initial stage, only a small proportion of participants met the specified criteria for word reading, sentence writing, and two-digit arithmetic. By the final assessment, more participants were able to demonstrate each of these skills. The observed changes were not identical in their instructional processes, even though the numerical increase was similar across the three indicators. Reading practice relied primarily on repeated oral decoding and peer modeling, writing development was supported through sentence frames and guided production, while numeracy activities drew on movement, concrete objects, and contextual calculation.

The comparison was restricted to three criteria that could be identified in both the initial diagnostic records and the final assessment. These criteria were intentionally narrow: reading simple two-syllable words without letter-by-letter spelling, writing a simple sentence with appropriate spelling and punctuation, and completing basic two-digit arithmetic operations. The results therefore do not represent general literacy or numeracy proficiency. They describe changes in the number of children who met clearly specified performance indicators during the program period.

The initial diagnostic activities and final assessment were not identical in format. Consequently, the findings are presented as descriptive counts rather than standardized pretest–posttest scores. No inferential statistical test, effect size, or causal estimate was calculated. With a total of 12 participants, a change involving one child represents 8.33 percentage points. Participant counts are therefore more meaningful than percentages when interpreting the results.

Table 3. Initial and Final Performance on Common Literacy and Numeracy Criteria

Common performance criterion	Initial n (%)	Final n (%)	Absolute change	Interpretive boundary
Read simple two-syllable words fluently without letter-by-letter spelling	2 (16.67%)	7 (58.33%)	+41.66 percentage points	Does not establish broader comprehension or grade-level reading proficiency

Write a simple sentence with appropriate spelling and punctuation	1 (8.33%)	6 (50.00%)	+41.67 percentage points	Not based on a validated writing scale or blind scoring
Complete basic two-digit arithmetic operations	3 (25.00%)	8 (66.67%)	+41.67 percentage points	Does not establish mastery of all operations or transfer to unfamiliar contexts

Note. The initial diagnostic activities and final assessment were not identical in format. The table presents descriptive criterion counts rather than standardized pretest–posttest effects. With $N = 12$, one participant represents 8.33 percentage points.

The number of participants able to read simple two-syllable words without letter-by-letter spelling increased from 2 to 7. At the beginning of the program, several children relied heavily on segmented decoding. They identified individual letters or syllables but experienced difficulty combining them into a fluent spoken word. Others hesitated before reading aloud, particularly when they expected that an incorrect response would be observed by the group.

The reading cards provided repeated opportunities to encounter short printed words during an activity with an immediate purpose. Participants did not read isolated lists solely for assessment. They read because the response determined how their turn continued. Words were presented through familiar objects, names, signs, and short expressions connected to the residential environment. This contextual familiarity reduced the additional burden of interpreting unfamiliar content and allowed the children to concentrate on decoding and pronunciation.

Peer modeling also became visible during the sessions. Children who were already more fluent demonstrated how a word could be read as a complete unit rather than as disconnected letters. Participants with lower fluency could listen to the pronunciation, repeat the word, and encounter a similar pattern during a later turn. The facilitator did not immediately replace an incorrect response with the correct answer. Instead, assistance was provided through syllable segmentation, rereading, sound cues, or repetition after a peer model.

These mechanisms are consistent with the principle that learning through games depends on the repeated coordination of visual information, verbal response, feedback, and purposeful action. Board movement alone does not strengthen reading.

The educational contribution comes from what participants are repeatedly required to notice, pronounce, correct, and apply during play.²⁹ In the Mentari program, the board created the participation structure, whereas the reading cards and facilitator feedback supplied the instructional content.

Facilitator notes also indicated that three participants were able to read short sentences with minimal support by the end of the program. This observation provides additional evidence of progress, but it was not included in Table 4 because an equivalent sentence-reading criterion was not documented consistently at the initial stage. Including it as a formal pre–post outcome would therefore overstate the comparability of the evidence.

The improvement in word-level fluency should also be distinguished from reading comprehension. A child who can read a two-syllable word without spelling it letter by letter has demonstrated progress in decoding fluency, but this does not establish vocabulary knowledge, sentence comprehension, inferential understanding, or grade-level reading proficiency. Future evaluation should separate reading accuracy, fluency, and comprehension through equivalent word lists, timed reading tasks, and short comprehension questions.

The number of participants who could produce a simple sentence with appropriate spelling and punctuation increased from 1 to 6. Initial written products showed several recurring difficulties, including incomplete sentence structure, confusion between visually similar letters, inconsistent capitalization, irregular word spacing, and the omission of final punctuation. Some participants were able to copy words but experienced difficulty generating a complete sentence independently.

Writing activities were therefore arranged progressively. Early cards required participants to copy familiar words, label pictures, or complete missing letters. Subsequent tasks used sentence frames and picture prompts before asking participants to compose short independent sentences. This sequence reduced the cognitive demands of generating ideas and organizing written language simultaneously. Children who needed more support could begin with a partially completed sentence, while

²⁹ Laski and Siegler, “Learning from Number Board Games: You Learn What You Encode”; Plass, Homer, and Kinzer, “Foundations of Game-Based Learning.”

participants with stronger readiness were asked to construct a sentence with less guidance.

Small whiteboards also contributed to the writing process. They allowed participants to attempt a response, erase it, and revise it without treating the first attempt as a permanent failure. This low-stakes format was particularly useful for children who were reluctant to write in conventional worksheets. Immediate feedback could be provided on capitalization, spelling, spacing, and punctuation before a similar task appeared during a later turn.

The result suggests that repeated, scaffolded production may have supported children in moving from isolated word-level responses toward short sentence construction. It does not, however, demonstrate broad writing proficiency. The criterion combined several elements sentence formation, spelling, capitalization, spacing, and punctuation that may not have developed at the same rate. A child could produce an understandable sentence while still making spelling errors, or use correct punctuation while relying heavily on a sentence frame.

A more rigorous writing assessment should therefore evaluate these components separately. Future rubrics could distinguish idea generation, sentence completeness, vocabulary use, letter formation, spelling accuracy, capitalization, spacing, and punctuation. Separate scoring would clarify whether the program primarily strengthened willingness to write, transcription accuracy, or the ability to construct meaningful sentences.

The writing pattern is compatible with the view that foundational writing develops through guided and repeated production rather than through correction after a single final exercise. Concrete prompts and familiar contexts can reduce task complexity and enable children to allocate more attention to written form. Indonesian community-learning initiatives have similarly emphasized the importance of contextual materials and sustained assistance when children are developing basic academic skills.³⁰

³⁰ Latifah and Rahmawati, "Penerapan Program Membaca, Menulis, Dan Berhitung Untuk Meningkatkan Literasi Numerasi Siswa Kelas Rendah Di Sekolah Dasar"; Muttaqin and Atmari, "Strengthening Literacy Management among Pesantren-Based Madrasah Teachers through the Gerakan Satu Madrasah Satu Buku Programme."

The number of participants who could complete basic two-digit arithmetic operations increased from 3 to 8. At the initial stage, some children could complete single-digit calculations but became uncertain when operations involved larger numbers, regrouping, or verbal contexts. Difficulties were also observed when participants had to determine which arithmetic operation was required by a short story problem.

The numeracy cards combined symbolic calculations with concrete and contextual tasks. Participants counted objects, moved according to the number shown on the die, compared quantities, completed basic operations, used play money, and responded to simple purchasing situations. These activities connected numerical symbols with visible quantities and everyday actions. For participants who experienced difficulty, facilitators used concrete objects, number decomposition, repeated counting, or simplified one-step questions before returning to the original task.

Movement across the board also required participants to count spaces and monitor numerical position. Although this activity was not treated as a formal achievement measure, it provided repeated exposure to number sequences and one-to-one counting. Research on numerical board games suggests that learning benefits emerge when physical movement, counting, and numerical representation are systematically coordinated rather than when games rely on chance alone (Ramani & Siegler, 2008). Meta-analytic evidence likewise indicates that mathematics games can support learning, although the magnitude of their contribution varies considerably according to design, instructional guidance, duration, and assessment quality.³¹

One of the most contextually meaningful activities was the honesty-stall simulation. Participants alternated between buyer and seller roles, calculated prices or change, handled play money, and checked whether the transaction was accurate. The activity combined arithmetic with a recognizable social situation and linked numerical

³¹ Tokac, Novak, and Thompson, "Effects of Game-Based Learning on Students' Mathematics Achievement: A Meta-Analysis"; Peter Vankus, "Influence of Game-Based Learning in Mathematics Education on Students' Affective Domain: A Systematic Review," *Mathematics* 9, no. 9 (2021), <https://doi.org/10.3390/math9090986>.

correctness with *shiddiq*. The task demonstrated how numeracy could be practiced as part of daily decision-making rather than as an isolated worksheet exercise.

The simulation nevertheless occurred within the learning program and did not test whether participants could transfer the same skill to an unfamiliar purchasing situation. Similarly, the ability to complete selected two-digit operations does not establish mastery of all operation types, understanding of place value, or competence in solving multi-step problems. Five participants were reported as completing simple contextual story problems at the final stage, but no equivalent initial count was available. This observation should therefore remain supplementary rather than being treated as a matched outcome.

The numeracy findings are consistent with studies emphasizing that concrete media, contextual problems, and structured assistance can support children's early mathematical development.³² The evidence from this program suggests that the physical game provided repeated occasions for calculation and feedback, but it does not isolate which feature the board, concrete materials, adult assistance, peer support, or repeated practice contributed most strongly to the observed change.

Challenge-card records provided additional information about how participants engaged with reading, writing, and numeracy activities during the sessions. These records were not equivalent to the common initial and final assessment criteria. Card difficulty was adjusted according to the participant's readiness, meaning that children did not necessarily answer tasks of the same complexity.

The formative scores are therefore presented only to describe the distribution of responses during practice. They should not be used to rank participants, compare ability levels, or estimate learning gains. A lower score may reflect exposure to more difficult tasks rather than weaker academic performance.

³² Ramani and Siegler, "Promoting Broad and Stable Improvements in Low-Income Children's Numerical Knowledge through Playing Number Board Games"; Fitria Dwi Safitri et al., "Pendampingan Lembar Kerja Peserta Didik Inovatif Matematika Dengan Model Pembelajaran Problem Based Learning Melalui Aplikasi Google Classroom Di Sekolah Dasar Negeri 2 Kalikebo," *Khidmatuna: Jurnal Pengabdian Masyarakat* 4, no. 2 (2024): 111–24, <https://doi.org/10.54471/khidmatuna.v4i2.2860>; Turnip and Wijayaningsih, "Pengembangan Dadu Quick Response Code Untuk Alternatif Pengenalan Membaca, Menulis, Dan Berhitung Anak Usia 5-6 Tahun."

Table 4. Formative Challenge-Card Score Summary

Domain	Mean	Median	Observed range	Use in interpretation
Reading	5.50	5.00	2-10	Describes engagement with adaptively assigned reading cards; not a standardized ability score
Writing	5.67	6.00	2-10	Describes performance on differentiated writing practice
Numeracy	5.00	4.00	2-10	Describes performance on differentiated arithmetic practice

Note. Correct responses were recorded as 2 points and incorrect responses as 0. Because participants received cards of different difficulty, the scores are formative records and should not be interpreted as standardized measures of ability.

The relatively broad ranges across the three domains confirm that participants did not respond uniformly to the learning activities. Some children demonstrated stronger performance in reading than in numeracy, while others were more successful in concrete calculations than in sentence writing. This variability supports the use of differentiated tasks. It also shows why a single composite score would have concealed important differences among the academic domains.

The formative data were most useful for instructional adjustment. Repeated difficulty with a specific card type indicated that the facilitator needed to simplify the instruction, provide an example, introduce a concrete object, or return to an earlier level. Conversely, repeated success indicated that a participant could be moved to a more complex task. The challenge-card records therefore functioned as ongoing formative feedback rather than as a formal test.

The increase across all three common criteria was approximately 41.7 percentage points. The similarity of these figures should not be interpreted as evidence that reading, writing, and numeracy developed at the same rate or through the same process. It is primarily a mathematical consequence of the small sample and the observed changes in participant counts.

The instructional pathways differed across domains. Reading appeared to benefit from repeated oral practice, visible print, immediate correction, and peer modeling. Writing was supported by pictures, sentence frames, erasable writing surfaces, and repeated short production. Numeracy drew on concrete materials, physical counting, contextual transactions, and guided decomposition of arithmetic

problems. Treating the three indicators as one combined achievement score would therefore weaken rather than strengthen the analysis.

The findings are consistent with previous studies showing that foundational learning becomes more meaningful when academic tasks are varied, concrete, contextualized, and supported through active facilitation.³³ They also align with community-engagement studies in *Khidmatuna: Jurnal Pengabdian Masyarakat*, which emphasize the connection between partner needs, locally relevant learning materials, and continuous mentoring.³⁴

Nevertheless, consistency with previous research does not establish that the observed changes were caused exclusively by the Mentari game. Participants received additional attention from facilitators, repeated similar skills across five sessions, became more familiar with the task format, and interacted with peers who could model responses. Increased motivation may also have resulted partly from the novelty of the board and learning materials. Some children may have performed better during the final assessment because they wished to meet facilitator expectations.

Peer support presents an additional interpretive issue. Assistance may have helped participants complete tasks during the sessions without necessarily producing independent mastery. Although the final assessment was administered individually, repeated guided practice could still have produced short-term familiarity rather than durable learning. A delayed follow-up would be necessary to determine whether the observed performance remained after the novelty and intensive facilitator support had diminished.

The results therefore provide preliminary evidence of academic development within the program rather than proof of effectiveness. More participants met the specified reading, writing, and numeracy criteria at the final stage, and the formative

³³ Latifah and Rahmawati, "Penerapan Program Membaca, Menulis, Dan Berhitung Untuk Meningkatkan Literasi Numerasi Siswa Kelas Rendah Di Sekolah Dasar"; Plass, Homer, and Kinzer, "Foundations of Game-Based Learning"; Turnip and Wijayaningsih, "Pengembangan Dadu Quick Response Code Untuk Alternatif Pengenalan Membaca, Menulis, Dan Berhitung Anak Usia 5-6 Tahun."

³⁴ Muttaqin and Atmari, "Strengthening Literacy Management among Pesantren-Based Madrasah Teachers through the Gerakan Satu Madrasah Satu Buku Programme"; Safitri et al., "Pendampingan Lembar Kerja Peserta Didik Inovatif Matematika Dengan Model Pembelajaran Problem Based Learning Melalui Aplikasi Google Classroom Di Sekolah Dasar Negeri 2 Kalikebo."

records show sustained exposure to differentiated academic practice. Stronger evaluation would require parallel initial and final assessment forms, item-level scoring, attendance and implementation-fidelity records, independent or double-coded assessment, and delayed measurement. Within these limits, the findings show that the Mentari program created a structured environment in which children repeatedly practiced foundational literacy and numeracy through differentiated, contextual, and guided activities.

Embedded AIK Values in Learning Interaction

The implementation of the Mentari game showed that AIK values became observable when they were connected to concrete decisions during learning. Honesty was not presented only as a verbal definition, but appeared when participants reported an answer, moved according to the number shown on the die, or acknowledged an error. Responsibility became visible when a participant completed an assigned challenge, followed the rules, and handled the learning materials appropriately. Cooperation emerged through peer explanation and shared problem solving, while social care appeared when children noticed and supported peers who were hesitant or experiencing difficulty.

This integration distinguished the AIK component from a separate moral-education lecture. The values were embedded in the rules, symbols, challenge cards, peer interactions, and facilitator feedback. Selected ladders represented constructive actions, while selected snakes represented actions that disrupted learning or disadvantaged others. Nevertheless, the symbols did not function automatically. Their educational meaning depended on whether facilitators connected a concrete incident with the relevant value and invited participants to reflect on the consequences of their behavior.

Structured observation records indicated that the four targeted behaviors were demonstrated by more participants at the final stage than during the initial sessions. These records describe behavior observed within the program rather than stable personality traits. The same facilitators implemented and observed the activities, and the children were aware that honesty, responsibility, cooperation, and care were

expected. The findings should therefore be interpreted as changes in observable participation during the learning sessions, not as proof of permanent character internalization.

Table 5. Structured Observations of AIK-Related Behavior

AIK value	Operational behavior	Initial n (%)	Final n (%)	Absolute change
<i>Shiddiq</i>	Honest responding, accurate movement, and acknowledgment of error	4 (33.33%)	10 (83.33%)	+50.00 percentage points
<i>Amanah</i>	Completion of assigned tasks and responsibility for rules and materials	3 (25.00%)	9 (75.00%)	+50.00 percentage points
<i>Ta'awun</i>	Appropriate cooperation, prompting, explanation, and shared problem solving	5 (41.67%)	11 (91.67%)	+50.00 percentage points
<i>Takaful</i>	Attention to a peer's difficulty, encouragement, and concern for participation	4 (33.33%)	10 (83.33%)	+50.00 percentage points

Note. The same facilitators implemented and observed the program, and no formal inter-rater reliability coefficient was calculated. The counts describe structured observations during the sessions and should not be interpreted as measures of stable character traits.

Shiddiq was operationalized as honest responding, accurate movement on the board, and acknowledgment of errors. During the initial sessions, facilitator notes recorded several situations in which participants moved beyond the number shown on the die, looked at a peer's answer, or hesitated to admit that a response was incorrect. These incidents were not addressed solely as violations of game rules. Facilitators used them as opportunities to explain that honesty remained important even when an incorrect answer resulted in a less favorable position in the game.

The number of participants consistently demonstrating the specified behavior increased from 4 to 10. This pattern suggests that repeated exposure to situations requiring honest reporting made the value more visible and actionable. Each turn required participants to decide whether to report an answer accurately, accept correction, and follow the consequences of the rule. The game therefore transformed honesty from an abstract moral statement into a recurring behavioral choice.

Facilitators also attempted to reduce the fear associated with admitting mistakes. Incorrect responses were framed as part of learning rather than as evidence of inability. Participants were allowed to listen to an explanation, revise a response, or

attempt a similar task later. This was important because honesty may be discouraged when children believe that acknowledging an error will lead to embarrassment or exclusion. By maintaining psychological safety, the program created conditions in which admitting an incorrect answer could be treated as responsible learning behavior.

A participant's final reflection associated honesty with a sense of calm. Although this statement cannot demonstrate long-term internalization, it indicates that the child was able to connect the moral term with an experienced situation. The finding is consistent with the broader view that moral education becomes more meaningful when values are related to daily conduct rather than presented only as definitions to be memorized.³⁵

The observed change should nevertheless be interpreted within the learning context. The program did not investigate whether participants demonstrated the same level of honesty in school, household routines, or peer interactions outside the sessions. The result therefore supports the conclusion that honest behavior became more consistently observable during the activity, not that permanent moral transformation had occurred.

Amanah was reflected in participants' willingness to complete assigned challenges, wait for their turns, follow the agreed rules, and take care of the board, cards, writing tools, and other materials. The number consistently demonstrating these behaviors increased from 3 to 9.

The game structure made responsibility visible because every turn had an identifiable owner and a clear sequence. Participants rolled the die, moved according to the result, selected a card, completed the task, and returned the materials before the next turn began. A participant who refused a task, abandoned it prematurely, or handled the materials carelessly disrupted the progress of the wider group. Responsibility was therefore connected to an immediate social consequence rather than framed only as an individual obligation.

The program records also indicated that participants became more willing to complete challenge cards during the middle and later sessions. This pattern should not

³⁵ Rahmah, "Akhlik Dalam Keluarga"; Tsalitsah and Romelah, "Pendidikan Karakter Muhammadiyah: Studi Madrasah Ibtidaiyah Muhammadiyah 25 Pekuwon, Bojonegoro."

be treated as an additional quantitative outcome because task-completion percentages and participant-level observations represented different units of analysis. Nevertheless, the records provide qualitative support for the interpretation that clearer routines and repeated participation strengthened task ownership.

Graduated assistance also contributed to the development of responsibility. Participants were not released from a task immediately when they experienced difficulty. Instead, facilitators simplified instructions, provided examples, offered sentence starters, or used concrete objects. The aim was to help the participant complete the assigned challenge without replacing the participant's effort. This distinction was important because excessive assistance could weaken responsibility by allowing a child to depend entirely on the facilitator or a more capable peer.

The observed pattern suggests that *amanah* was supported by predictable routines, visible task ownership, and appropriate assistance. However, completing a task within a structured game does not establish broader responsibility in everyday life. The program did not assess punctuality, household duties, schoolwork completion, or care for shared property outside the learning sessions. The finding should therefore remain limited to responsibility demonstrated during the intervention.

Ta'awun showed the highest final observation count, increasing from 5 to 11 participants. The mixed-grade composition created frequent opportunities for cooperation because participants differed considerably in reading fluency, writing ability, and arithmetic readiness. Children with stronger skills could model pronunciation, explain an arithmetic step, or help clarify an instruction.

The educational value of this cooperation depended on how assistance was provided. Facilitators distinguished between support that preserved the learner's agency and support that replaced the learner. Acceptable assistance included rereading an instruction, offering a comparable example, identifying the first step, or asking a guiding question. Directly supplying the answer was discouraged because it could enable task completion without strengthening the participant's understanding.

This distinction is particularly important in mixed-ability learning. Unregulated peer assistance may conceal an ability gap because a less-prepared participant appears to complete a task that was actually solved by another child. In contrast, appropriately

structured assistance can extend the learner's current capability while preserving responsibility for the final response. The Mentari program therefore treated cooperation as a form of guided participation rather than answer sharing.

The shared board also reduced the extent to which the game operated as purely individual competition. Although participants had separate turns, progress depended on maintaining an orderly group, supporting peers, and allowing each child to remain involved. More fluent participants could contribute without being permanently separated into a tutor role, while less-prepared participants received support without being removed from the collective activity.

The observed increase is compatible with the sociocultural dimension of game-based learning, in which knowledge is constructed through explanation, modeling, feedback, and joint participation rather than solely through individual reward (Plass et al., 2015). It also aligns with participatory education programs reported in *Khidmatuna: Jurnal Pengabdian Masyarakat*, where collaborative activities and direct practice were used to strengthen children's engagement, discipline, and social interaction.³⁶

Even so, the final count does not demonstrate that all peer assistance was academically effective. Some support may have reflected social enthusiasm without improving understanding. Future observation rubrics should distinguish among prompting, explaining, modeling, answer-giving, and jointly completing a task. Such distinctions would make it possible to evaluate not only whether cooperation occurred but also whether it supported learning.

Takaful was operationalized as attention to a peer's difficulty, encouragement, willingness to share materials, and concern for whether all participants could remain involved. The number consistently displaying these behaviors increased from 4 to 10.

Examples recorded during the sessions included lending stationery, encouraging a child whose marker moved down a snake, allowing a hesitant participant additional time, and checking whether a peer understood the instruction before the

³⁶ Larassari et al., "Promoting Emotional Literacy and Character Values in Elementary Students: A Service-Learning Approach at Bunklotok School"; Mulyana et al., "Penguatan Praktik Pendidikan Al-Qur'an Anak Melalui Ekstrakurikuler Dan Les Tambahan Dengan Metode Participatory Action Research Di Taman Pendidikan Al-Qur'an As-Salam Ngablak Lor."

game continued. Two participants also stated in their reflections that learning together was preferable because friends could help one another. These examples suggest that the game created a supportive group climate in which participation became a shared concern.

Takaful was distinguished from *ta'awun* according to the function of the behavior. *Ta'awun* referred primarily to assistance directed toward solving or completing an academic task. *Takaful* referred to concern for the peer as a participant, including emotional encouragement and efforts to prevent exclusion. A child who explained how to calculate an answer demonstrated cooperation; a child who reassured a frustrated peer and helped that peer remain engaged demonstrated social care.

The distinction is analytically important because the two values may appear similar in practice. A single incident may contain both, but the behavioral intention differs. Without clear operational boundaries, observers could code the same behavior inconsistently. Future rubrics should therefore include concrete behavioral examples, decision rules, and the possibility of assigning more than one code only when the evidence justifies it.

The recorded examples do not establish that bullying, social exclusion, or conflict decreased outside the sessions. Nor do they show that caring behavior became stable across different situations. Such conclusions would require systematic observation by caregivers during ordinary routines and a longer follow-up period. The current evidence supports only the conclusion that concern for peers became more visible during the learning activities.

The main contribution of the AIK component was its connection to recurring decisions within the learning process. Honesty influenced how participants reported answers and followed the die. Responsibility influenced whether they completed tasks and respected shared rules. Cooperation influenced how they provided academic support. Social care influenced whether hesitant or less-prepared children remained included.

This mechanism prevented AIK from functioning merely as decorative terminology attached to an academic game. The values shaped rules, facilitator feedback, peer interaction, transaction simulations, and reflection. A single turn could

require a participant to read a card, calculate a response, acknowledge an error honestly, wait responsibly, and assist a peer appropriately. Academic practice and values education therefore occurred within the same sequence of activity rather than competing for separate instructional time.

The ladders and snakes served as accessible symbolic cues, but the symbols alone did not constitute character education. Their meaning was produced through facilitator explanation and discussion. A ladder represented more than a reward for a correct answer; it could be connected to a constructive action that supported the group. Similarly, a snake represented more than losing a position; it could prompt reflection on behavior that disrupted fairness or participation.

For this reason, the intervention is more accurately described as embedded values education rather than a fully hidden curriculum. The values were intentionally incorporated into the design, but participants encountered them through ordinary learning decisions and social interactions. This interpretation is consistent with Muhammadiyah-oriented character education, which connects religious understanding with moral conduct and social responsibility.³⁷

Comparable programs published in *Khidmatuna* also demonstrate that religious and character education becomes more concrete when connected with action. Farid et al., integrated Islamic values into healthy-living and environmental practices.³⁸ Larassari et al., linked interactive activities with emotional literacy and empathy.³⁹ Mulyana et al., used participatory religious-learning activities to support togetherness and discipline.⁴⁰ Across these contexts, values were made observable through practice rather than left as abstract moral language.

³⁷ Muhammadiyah Elementary and Secondary Education Council, *Muhammadiyah Education Guidelines* (Muhammadiyah Central Leadership, 2017); Tsalitsah and Romelah, "Pendidikan Karakter Muhammadiyah: Studi Madrasah Ibtidaiyah Muhammadiyah 25 Pekuwon, Bojonegoro."

³⁸ Farid et al., "Pendampingan Implementasi Pola Hidup Bersih Dan Sehat Sebagai Nilai-Nilai Agama Islam Di Sentul Lumajang."

³⁹ Larassari et al., "Promoting Emotional Literacy and Character Values in Elementary Students: A Service-Learning Approach at Bunklotok School."

⁴⁰ Mulyana et al., "Penguatan Praktik Pendidikan Al-Qur'an Anak Melalui Ekstrakurikuler Dan Les Tambahan Dengan Metode Participatory Action Research Di Taman Pendidikan Al-Qur'an As-Salam Ngablak Lor."

The pattern is also conceptually consistent with social and emotional learning research. Durlak et al., found that stronger programs tend to use sequenced, active, focused, and explicit learning processes.⁴¹ The Mentari intervention reflected these principles in a limited form. The five sessions provided a sequence, participants enacted behaviors rather than listening passively, four values were given explicit attention, and facilitators used reflection to name the connection between the behavior and the value. However, the duration and assessment procedures were far more limited than those of standardized social-emotional learning programs. The comparison is therefore conceptual rather than evidence of equivalent outcomes.

Several methodological issues limit the interpretation of the AIK findings. First, the facilitators were also the observers. Their familiarity with the program goals may have increased the likelihood of interpreting ambiguous behavior positively. No formal inter-rater reliability coefficient was calculated, so the consistency of observations cannot be independently established.

Second, participants were aware that AIK-related behavior was expected. Increased honesty, responsibility, cooperation, or care may partly reflect social desirability or the desire to receive facilitator approval. Observation itself may also have influenced behavior.

Third, several constructs overlapped. *Shiddiq* and *amanah* could both be recorded when a participant honestly completed a task. *Ta'awun* and *takaful* could both appear when a participant helped a peer. Future evaluation should code specific incidents, provide behavioral anchors for each value, and use two independent observers for at least a sample of sessions.

Fourth, the program did not include follow-up observation outside the game. It is therefore unknown whether the observed behaviors continued during ordinary study, household responsibilities, school attendance, or informal peer interaction. A stronger design should combine session observation with caregiver reports, children's explanations, and delayed follow-up.

⁴¹ Durlak et al., "The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions."

Within these limits, the results show that the AIK values were not merely stated in the learning materials. They became visible through increasingly consistent behaviors during the five sessions. The strongest practical contribution lies in the mechanism of integration: the same activity could involve academic practice, moral choice, peer interaction, and guided reflection. The findings support the use of the Mentari game as a practical model for making AIK-related behavior observable and discussable within foundational literacy and numeracy learning, while stopping short of claiming permanent character change.

Conclusion

The Mentari Snakes and Ladders program demonstrates how a low-technology educational game can be adapted to support foundational literacy, numeracy, and AIK-related interaction among children in a mixed-grade orphanage setting. Its main contribution lies in integrating a shared kinesthetic board with differentiated reading, writing, and arithmetic tasks, contextual activities, guided peer assistance, and reflective discussion of *shiddiq*, *amanah*, *ta'awun*, and *takaful*. This arrangement enabled children with different levels of academic readiness to participate in the same learning environment without requiring them to complete identical tasks. The novelty of the program therefore does not lie in the snakes-and-ladders format itself, but in the systematic alignment of differentiated instruction, contextual practice, social participation, and Islamic character education.

Descriptive comparisons indicated that the number of participants meeting the specified performance criteria increased from 2 to 7 for reading simple two-syllable words, from 1 to 6 for writing a simple sentence, and from 3 to 8 for completing basic two-digit arithmetic operations. Structured observations also showed that honesty, responsibility, cooperation, and social care were demonstrated more consistently during the later sessions. These findings suggest that the program was feasible and potentially useful as a medium for repeated academic practice and values-based interaction. However, they should not be interpreted as evidence of causal effectiveness, statistical significance, grade-level mastery, or permanent character development because the study involved only 12 participants, five sessions, non-

identical initial and final assessments, adaptive learning tasks, no comparison group, facilitator-conducted observations, and no formal inter-rater reliability estimate.

Future research should employ parallel or equivalent assessment forms, item-level scoring rubrics, documented attendance and implementation fidelity, and independent or double-coded observations. Longer intervention periods and delayed follow-up assessments are needed to determine whether the observed academic and behavioral patterns persist after the novelty of the game and intensive facilitator support have diminished. Multisite studies involving larger and more diverse groups could also compare the integrated game with conventional academic assistance or other game-based approaches, while examining which components differentiation, physical movement, contextual tasks, peer support, or AIK reflection contribute most strongly to the outcomes. Future implementation should additionally formalize ethical review, guardian authorization where required, child assent, publication consent, and data-protection procedures before program evaluation begins.

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