Strengthening Children's Numeracy Literacy and Reading Interest through Interactive Multimedia in a Residential Community

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Abstract

Children in residential communities may have limited access to varied literacy and numeracy activities outside school, particularly when learning is presented through conventional worksheets and verbal explanation. This community empowerment program aimed to strengthen numeracy literacy and reading interest through interactive multimedia for 30 children aged 6–11 years in Fantasy Residence, Batam, Indonesia. Conducted from 30 March to 30 April 2026, the program used a participatory and educational approach consisting of needs observation, partner coordination, socialisation, guided reading, digital storytelling, short educational videos, interactive quizzes, contextual numeracy games, visual activity sheets, and reflective evaluation. Evidence was collected through structured observation, question-and-answer sessions, documentation, participant task completion, and partner reflection. Relative to the initial activities, the implementation showed stronger visible engagement when children interacted with visual, auditory, and game-based materials. Participants were more willing to answer questions, retell story content, identify relevant information, and attempt contextual numeracy tasks. The neighbourhood partner also obtained a simple activity model and reusable learning materials. The program demonstrates that low-cost, facilitator-guided multimedia can support enjoyable community learning, although future programs should include age-group differentiation and formal pre- and post-assessment.

Keywords: *children's literacy; community learning; interactive multimedia; numeracy literacy; reading interest*

Introduction

Literacy and numeracy are foundational capabilities that enable children to participate meaningfully in school, family, and community life. Reading literacy involves more than recognising written words; it includes locating information, understanding relationships among ideas, interpreting messages, and using texts for purposeful action. Numeracy similarly extends beyond mechanical calculation. It requires children to recognise quantitative information, select relevant operations, interpret patterns or representations, and use numbers to solve practical problems. Indonesian guidance on literacy and numeracy therefore encourages learning experiences that are contextual, integrated across activities, and connected to children's daily environments rather than restricted to isolated exercises (Asrijanty, 2020; Dewayani et al., 2021). These capabilities are especially important during the primary-school years because children are developing both basic fluency and the confidence to apply what they know in increasingly varied situations.

Opportunities to develop these capabilities do not occur only in classrooms. Residential communities can become complementary learning spaces where children read together, discuss stories, play educational games, and solve problems related to familiar objects or situations. Such community-based activities are valuable because children's learning habits are influenced by the environments in which they spend time after school. A neighbourhood that provides safe, enjoyable, and recurring learning activities can help make reading and numeracy visible as shared practices rather than merely school obligations. The Indonesian school literacy movement has similarly highlighted the importance of supportive physical, social-affective, and academic environments and of collaboration among educators, families, and communities (Dewayani et al., 2021; Setiawan & Dewayani, 2019). A community service program can contribute by bringing

practical learning resources and facilitation strategies to a local setting while involving community partners in continuation planning.

Preliminary observation in Fantasy Residence, Batam, indicated that children's enthusiasm was inconsistent during conventional reading and arithmetic activities. Some participants readily responded to colourful pictures, spoken stories, or games but disengaged when activities depended mainly on lengthy text, repetitive calculation, or one-way explanation. Their responses suggested that the issue was not simply unwillingness to learn. Rather, the available activity format did not always match children's need for concrete examples, short learning sequences, interaction, and immediate feedback. The observation also showed differences associated with the wide age range of 6–11 years. Younger children needed more visual cues and oral guidance, whereas older children could engage with more complex questions but still benefited from competition, collaboration, and contextual challenges. These conditions created a practical need for flexible materials that could be adjusted while retaining a common program structure.

Interactive multimedia was selected as the central medium because it can combine text, images, narration, animation, video, and learner response in a coordinated experience. Multimedia learning is most useful when verbal and visual information are selected and organised to support understanding rather than simply to decorate a presentation (Mayer, 2020). In community activities, interactive multimedia can also help facilitators move between whole-group attention and active participation. A short video can introduce a concept, a digital story can support guided reading, and a quiz can invite every child to make a choice or explain an answer. However, digital presentation alone does not guarantee learning. Research comparing digital and print reading shows that design quality and adult mediation strongly influence children's comprehension; distracting features may reduce learning, while relevant enhancements and guided discussion can be beneficial (Furenes et al., 2021). The present program therefore treated multimedia as a facilitator-supported resource rather than a replacement for human interaction or printed reading.

The program also incorporated game-like numeracy tasks and interactive quizzes. Gamification research suggests that well-designed game elements can produce positive effects on cognitive, motivational, and behavioural outcomes, although these effects depend on meaningful task design and should not shift attention away from the learning goal (Sailer & Homner, 2020). Studies in Indonesian elementary contexts have likewise reported that animated videos, contextual interactive multimedia, and educational games can support attention, participation, mathematics learning, and numeracy-related outcomes (Putra & Rambe, 2023; Raudha et al., 2024; Syawaluddin et al., 2020). For this community program, games were therefore used in a limited and purposeful way: children classified objects, completed number patterns, selected operations for everyday situations, compared quantities, and explained how they reached an answer. Points, turns, or small rewards were used to sustain participation, but discussion and reasoning remained central.

Reading-interest activities were developed around digital stories, illustrated slides, short texts, oral questions, vocabulary prompts, and retelling. Digital storytelling may attract children's attention because images, voice, sequence, and narrative meaning are presented together. Indonesian studies have found opportunities for digital storytelling to foster children's reading interest and motivation, particularly when adults provide guidance and when the multimedia features remain connected to the story (Indriani & Suteja, 2023; Kurniawan, 2021). In the present program, children did not merely watch a story. They predicted events, identified characters and settings, located explicit information, inferred simple causes, responded to vocabulary, and retold the sequence in their own words. These activities transformed multimedia viewing into an interactive literacy event.

Four interconnected problems were therefore addressed. First, some children showed limited sustained interest in reading activities presented conventionally. Second, numeracy concepts were not always connected to practical contexts that children recognised. Third, the community

had limited variation in multimedia-supported learning activities. Fourth, there was no simple continuation model for repeated reading and numeracy practice after the main service period. The program responded by combining motivational introduction, multimedia-supported guided practice, contextual games, participant feedback, and partner involvement. It aimed not only to deliver one series of sessions but also to demonstrate an adaptable model that the neighbourhood and parents could continue using with commonly available devices and materials.

Accordingly, this community service program aimed to strengthen children's engagement with numeracy literacy and reading through facilitator-guided interactive multimedia in Fantasy Residence. The specific objectives were to: (1) provide enjoyable reading and numeracy experiences for children aged 6–11 years; (2) increase visible participation in activities requiring comprehension, communication, and contextual problem solving; (3) introduce the community partner to reusable multimedia and visual learning resources; and (4) formulate practical follow-up actions for sustaining literacy and numeracy practice. Because the available evaluation evidence was observational rather than experimental, the program focused on implementation quality, participant response, practical outputs, and community contribution. It did not attempt to claim causal or standardised achievement gains.

Materials and Method

Target Community and Setting

The target community consisted of 30 children living in Fantasy Residence, Batam, Indonesia. Participants were between 6 and 11 years of age and included 19 girls and 11 boys. They represented different stages of primary education and therefore varied in reading fluency, calculation experience, attention span, and ability to work independently. The neighbourhood association of Fantasy Residence served as the community partner. Its representatives supported communication with parents, participant mobilisation, use of the venue, and coordination of the activity schedule. Parents and nearby residents also contributed by encouraging attendance and maintaining a safe and positive learning environment.

The program was implemented from 30 March to 30 April 2026. This period included initial observation, location survey, permission and coordination, material preparation, socialisation, core learning sessions, evaluation, and follow-up discussion. Core learning was delivered through a series of flexible sessions within the one-month period. Because session timing was adjusted to participant and community availability, the source activity record did not specify a uniform number or duration for all sessions. Activities were organised in a shared neighbourhood space that allowed children to sit in a group, view a projected or television-based display, work with paper materials, and move into smaller groups when necessary. The setting was deliberately informal but structured. Facilitators established simple participation rules, such as listening when a story was played, taking turns during games, explaining answers respectfully, and helping younger participants without directly giving them the answer.

Table 1

Profile of the Target Participants

Characteristic	Description
Number of participants	30 children
Age range	6–11 years
Gender	19 girls and 11 boys
Community location	Fantasy Residence, Batam, Indonesia
Implementation period	30 March–30 April 2026
Community partner	Fantasy Residence neighbourhood association

Materials, Media, and Instruments

The learning materials were designed to integrate reading, listening, speaking, visual interpretation, and basic numeracy. The multimedia set included short educational videos, digital stories, illustrated presentation slides, interactive quizzes, and simple game displays. Printed support materials included short passages, picture cards, number cards, visual activity sheets, and contextual problem prompts. The equipment comprised a laptop or computer, projector or television screen, speaker, extension cable, whiteboard, markers, participant stationery, and small appreciation items. The materials were selected for low-cost replication. Most activities could be repeated with a laptop and screen, or adapted into printed cards when digital equipment was unavailable.

The design followed three practical principles. First, multimedia elements had to be relevant to the learning task. Narration, images, and animation were used to clarify a story event, illustrate a quantity, or signal feedback rather than provide unrelated entertainment. Second, content was divided into short segments so facilitators could pause for prediction, explanation, or checking. Third, activities required an observable participant response. Children pointed, selected, read aloud, matched, calculated, explained, retold, or created a simple answer. This principle prevented the program from becoming passive screen viewing and aligned the media with active learning and guided processing (Mayer, 2020).

Evidence-collection instruments consisted of an observation guide, attendance and participant-profile records, facilitator notes, task and response records, activity documentation, oral question prompts, and a partner reflection guide. The observation guide focused on indicators that could be identified consistently during a community activity: willingness to join, attention to instructions, frequency of voluntary responses, ability to follow story sequence, participation in group reading, attempts to solve contextual numeracy problems, cooperation with peers, and persistence after an incorrect response. The instrument was not intended as a standardised literacy or numeracy test. It was used to organise descriptive evidence of implementation and participant engagement.

Table 2
Multimedia and Learning Used in the Program

No.	Material or medium	Main use
1	Short educational videos	Introducing concepts through concise visual and auditory explanations and prompting discussion.
2	Digital stories and illustrated slides	Supporting guided reading, prediction, vocabulary, comprehension, and retelling.
3	Interactive quizzes	Providing immediate response opportunities and checking understanding in an enjoyable format.
4	Contextual numeracy games	Practising number operations, classification, patterns, measurement, comparison, and problem solving.
5	Visual activity sheets and cards	Linking screen-based activities with individual or small-group reading and calculation tasks.

Implementation Method

A participatory and educational approach was used. The university team acted as planners and facilitators, while the neighbourhood partner contributed local knowledge, participant coordination, and logistical support. The approach was participatory because the program focus was confirmed through observation and communication with the partner, and because children were expected to act, respond, and collaborate rather than receive a lecture. It was educational because each activity was connected to specific literacy or numeracy behaviours and included guided explanation, practice, and feedback.

Implementation consisted of five stages. The first stage was a location survey and needs observation. The team identified the available space and equipment, observed children's response to different activity formats, and noted age-related variation. The second stage was permission, coordination, and socialisation with the neighbourhood association and parents. The team explained the objectives, dates, types of activities, and need for regular attendance. The third stage was preparation of materials and equipment. Digital content was checked for length, clarity, age appropriateness, and compatibility with the available display and audio equipment. Printed cards and worksheets were organised by difficulty so facilitators could provide simpler or more challenging prompts.

The fourth stage was core implementation. Sessions generally began with a short motivational or activating activity, followed by multimedia input, guided questioning, participant practice, and a brief review. In reading activities, facilitators introduced a topic, played or displayed a story in segments, asked prediction and comprehension questions, and invited participants to retell key events. In numeracy activities, facilitators presented a familiar situation, such as grouping objects, comparing prices, reading a simple chart, identifying patterns, or choosing an operation, and then used quizzes or games for practice. Children worked individually, in pairs, or in small groups depending on task complexity. The fifth stage was evaluation and follow-up discussion. Facilitators reviewed participant responses and task completion, while the partner considered which activities and materials could be repeated.

Facilitation was differentiated informally. Younger children received shorter instructions, larger visual cues, concrete counting aids, and more oral support. Older children were asked to explain reasoning, identify more than one possible strategy, or assist peers through questions rather than answers. This flexible grouping was necessary because a single residential community program included several school grades. The differentiation was not a separate curriculum, but it helped prevent tasks from being too difficult for younger children or too repetitive for older ones.

Evidence Collection

Evidence was collected throughout the program rather than only at the end. Facilitators recorded attendance, participant characteristics, responses during guided questions, completion of visual worksheets, involvement in games, and notable changes in willingness to participate. Observation records were completed by several facilitators during the activities and were subsequently compared and discussed in team reflection to identify recurring patterns. Documentation was used to confirm that planned activities occurred, and team reflection was used to compare observations across facilitators. At the end of activities, children were asked short oral questions about what they had learned, which activity they found most interesting, and which task remained difficult. The neighbourhood partner was also invited to reflect on participant response, logistical feasibility, and continuation options.

The evidence was analysed descriptively. Facilitator notes were grouped into four categories: participation and attention, reading-related response, numeracy-related response, and community or partner involvement. Recurring observations were compared with activity records and participant work. The team used these categories to identify implementation patterns, practical outcomes, and challenges. No formal pre-test and post-test were administered, and no inferential statistical analysis was conducted. Consequently, the results are reported as observed improvements in engagement, task participation, and demonstrated response during the program, not as measured gains in standardised literacy or numeracy proficiency.

Implementation and Results

The program was implemented according to the planned sequence from preparation to reflection. The location survey confirmed that the neighbourhood space could support a group display and small-group work, although the arrangement needed to remain flexible because children

differed in age and height. Coordination with the neighbourhood association enabled the team to communicate the schedule and encourage family support. This partnership reduced practical barriers to attendance and helped facilitators understand when children were most available. The socialisation stage also clarified that the activities were not an additional formal class. They were designed as guided community learning experiences that complemented school learning through stories, games, and contextual tasks.

During the initial activities, participant response varied. Some children immediately volunteered answers, while others watched peers before participating. Long verbal explanations led to visible restlessness among several younger participants. When a short video, illustrated scene, or interactive prompt was introduced, attention became more focused and children more readily predicted what would happen or selected an answer. This observation influenced subsequent facilitation. Explanations were shortened, visual prompts were displayed earlier, and questions were inserted at shorter intervals. The adjustment illustrates the importance of treating implementation as responsive rather than rigid. Multimedia was effective not simply because it was digital, but because it provided a shared object of attention around which facilitators could ask questions and organise participation.

The reading-interest component combined digital stories, illustrated slides, short print passages, and oral interaction. Facilitators first activated background knowledge by showing a cover image or key object and asking participants what the story might be about. Stories were then presented in manageable segments. At selected points, children identified characters, settings, actions, and explicit details. They were asked to predict the next event, explain a character's decision, identify new vocabulary from context, or place picture cards in story order. After viewing or reading, participants retold the story individually or collaboratively. Younger children often relied on pictures and key words, whereas older children could produce a more connected sequence and explain cause-and-effect relationships.

Across the reading activities, facilitators observed that participants became increasingly willing to respond. Children who initially waited for group answers began offering short individual responses, particularly when questions were tied to visible images. For example, facilitator notes indicated that several children who initially responded only with the group later volunteered to arrange picture cards in sequence and explain the story ending in short sentences. The combination of narration and illustration helped less-fluent readers participate in comprehension discussion without being excluded by decoding difficulty. At the same time, printed text remained part of the activity. Facilitators pointed to selected sentences, asked children to locate information, and invited stronger readers to read aloud. This balance was important because the program aimed to increase interest in reading, not substitute all reading with video. The most productive moments occurred when a digital story led children back to words, sequence, and meaning.

Retelling served as both a literacy activity and an informal indicator of understanding. At the beginning, several children repeated isolated details without a clear sequence. With picture prompts and facilitator questions such as what happened first, why a character acted, and how the story ended, children were better able to reconstruct the narrative. Some participants also connected story events to personal experience. These responses suggested that the interactive format supported active meaning-making. Because there was no standardised comprehension test, the program cannot quantify the extent of improvement; nevertheless, the quality and frequency of observable story-related responses provided practical evidence that the children were engaging with content rather than merely watching it.

The numeracy component used numbers and representations within familiar situations. Activities included grouping objects, matching quantities to numerals, completing simple patterns, comparing values, choosing operations for short scenarios, interpreting picture-based data, and estimating or measuring familiar objects. The tasks were displayed through slides or quiz screens

and then reinforced with cards, a whiteboard, or visual worksheets. Facilitators regularly asked children to explain how they knew an answer. This requirement shifted the activity from speed alone toward reasoning. An answer was treated as a starting point for explanation, and alternative strategies were welcomed when appropriate.

Game formats increased visible participation in numeracy sessions. Children took turns selecting cards, moving through a task sequence, or answering for a small group. The competitive element was kept light, and facilitators emphasised that a group could gain recognition for a clear explanation or helpful cooperation, not only for being first. When participants made mistakes, the multimedia display or facilitator feedback allowed immediate review. Children were invited to try again, use a picture, count concrete objects, or ask a peer to explain a strategy. This reduced the tendency to withdraw after an incorrect answer. By later sessions, more participants attempted problems before waiting for an older child to respond.

Context was particularly useful for children who were hesitant with abstract arithmetic. For example, a comparison problem could be represented with groups of objects, a simple purchasing situation, or a picture chart. Children could identify relevant quantities before performing an operation. Such tasks aligned numeracy with interpretation and decision making rather than isolated calculation. Older participants were sometimes asked to create a similar problem or explain why an incorrect option did not fit the situation. Younger children completed the same thematic activity using smaller numbers or concrete cards. The shared context allowed mixed-age participation while preserving different levels of challenge.

Participant attention was not uniform throughout every session. Younger children occasionally became distracted during transitions, and some participants were more interested in guessing rapidly than in explaining. Facilitators responded by shortening turns, alternating whole-group and small-group activity, and requiring a reason before awarding a point. These changes improved the balance between enjoyment and learning purpose. The team also found that sound and animation should be used selectively. When effects were too frequent, children focused on the display rather than the concept. When effects directly signalled correct feedback, story sequence, or a change in quantity, they supported understanding. This practical lesson informed the materials retained for community use.

The community partner was involved beyond venue provision. Representatives helped identify participant characteristics, encouraged attendance, maintained communication with parents, and supported orderly implementation. Their observations confirmed that children were particularly enthusiastic about stories, quizzes, and visual games. The partner also recognised that the model did not require expensive software. Reusable slides, short videos, picture cards, and printed activities could be operated with equipment already available or adapted to a television and mobile device. This increased the feasibility of continuation, although regular facilitation and adult preparation remained necessary.

The program produced several tangible outputs: a set of multimedia learning materials, illustrated reading prompts, contextual numeracy games, visual activity sheets, a simple observation guide, and an implementation sequence that could be repeated. The outputs were organised around short sessions rather than a rigid textbook unit. This made it possible for the partner or parents to select one story, one numeracy game, and one reflection question for a future activity. The university team also formulated follow-up suggestions, including a recurring neighbourhood reading hour, rotation of volunteer facilitators, use of everyday household or shopping contexts for numeracy, and periodic addition of new reading materials.

Overall, the evidence indicated four main results. First, children showed stronger visible attention and participation when media combined relevant visuals, short audio or narration, and opportunities to respond. Second, reading activities prompted more voluntary answers, sequence reconstruction, vocabulary discussion, and retelling than were observed during initial conventional

explanation. Third, contextual games encouraged children to attempt numeracy tasks, explain choices, and persist after errors. Fourth, the partner gained reusable resources and a practical model for continuing activities. These results concern engagement, demonstrated responses, and community capacity. They should not be interpreted as proof of long-term proficiency change without subsequent formal assessment.

Table 3

Program Stages, Evidence, and Main Result

No.	Stage	Participant or partner involvement	Evidence collected	Main result
1	Needs observation and coordination	Partner described local conditions; children's initial responses and available facilities were observed.	Observation notes, schedule agreement, participant profile.	Program focus and media were aligned with the mixed-age community setting.
2	Socialisation and preparation	Parents, partner, and participants received activity information; facilitators prepared age-adjustable materials.	Communication records, material checklist, attendance planning.	Community support and implementation readiness were established.
3	Guided reading and digital storytelling	Children predicted, located information, discussed vocabulary, sequenced events, and retold stories.	Facilitator notes, oral responses, worksheets, documentation.	More voluntary and sustained participation in story-based literacy activities was observed.
4	Contextual numeracy games and quizzes	Children classified, compared, calculated, interpreted visuals, explained strategies, and tried again after errors.	Task responses, game records, observation, participant work.	Children showed stronger willingness to attempt contextual numeracy tasks and explain answers.
5	Evaluation and follow-up	Children shared reflections; the partner discussed materials and continuation options.	Question-and-answer notes, partner reflection, follow-up plan.	A reusable community learning model and sustainability actions were prepared.

Discussion

The implementation suggests that interactive multimedia can strengthen the conditions under which children are willing to engage with reading and numeracy in a community setting. The most consistent pattern was not a simple preference for screens, but a preference for activities that were visible, segmented, responsive, and socially mediated. Children participated when they could see a meaningful image, hear a concise explanation, make a prediction, choose an answer, or explain an idea. This finding supports the multimedia learning principle that verbal and visual representations are beneficial when they guide attention to relevant relationships and when learners are prompted to process the information actively (Mayer, 2020). The program also showed that a neighbourhood setting can use these principles with relatively simple equipment and materials.

The reading component demonstrates why multimedia should be integrated with adult guidance. Digital stories attracted attention, but comprehension was developed through pauses, questions, print reference, vocabulary discussion, and retelling. This is consistent with research showing that digital reading outcomes depend on whether multimedia features support the story and whether an adult mediates the child's interaction with the text (Furenes et al., 2021). A digital book or story is not automatically superior to print. In this program, the screen provided shared visual and auditory input, while facilitators helped children identify structure and meaning. Printed passages and picture cards then gave children opportunities to return to text and reconstruct the story. The practical implication is that community volunteers should be trained in questioning and discussion, not only in operating digital equipment.

The observed development of voluntary responses and retelling aligns with previous Indonesian work on digital storytelling. Indriani and Suteja (2023) reported that children's interaction with digital stories could support reading interest, while also emphasising the need for parental or caregiver support. Kurniawan (2021) similarly found that digital storytelling attracted children's attention and motivation in early language learning. Dewi et al. (2023) further demonstrated that digital storytelling can integrate verbal, visual, and design resources within a multiliteracy-oriented learning process. Although their study concerned EFL speaking rather than community numeracy, its emphasis on multimodal meaning-making supports the present program's facilitator-guided use of digital stories. The present program extends these insights to a mixed-age residential group and combines digital storytelling with numeracy activities. It also illustrates that reading interest may be visible through behaviours such as choosing to respond, following a narrative sequence, asking about vocabulary, and attempting to retell. These behaviours are meaningful indicators for community practice, even though they do not replace a validated reading-motivation scale.

Contextualisation was central to the numeracy results. Children were more willing to reason when quantities were embedded in pictures, objects, simple transactions, comparisons, or familiar routines. This approach reflects the broader understanding of numeracy as the use of mathematical information in context (Asrijanty, 2020; Dewayani et al., 2021). It is also compatible with findings from realistic and contextual mathematics approaches in Indonesian elementary education. Fauzan et al. (2024) reported improved literacy and numeracy performance through realistic mathematics education, while Putra and Rambe (2023) found contextual interactive multimedia feasible and effective for elementary mathematics learning. Although the present program did not employ the same research designs or formal tests, the implementation pattern similarly suggests that context helps children connect symbols with meaning.

Animated and interactive representations supported numeracy when they clarified a process or relationship. Raudha et al. (2024) found that animated video media positively affected primary students' numeracy outcomes in a formal school study. In the community program, videos and animations were used more modestly as introductions and prompts rather than complete lessons. Their main contribution was to make a quantity, pattern, or situation visible to all participants at the same time. The strongest engagement occurred when the display was followed immediately by a choice, manipulation, or explanation. This supports a design principle for future community activities: media should be brief and followed by action. Long viewing periods risk transforming active learning into entertainment.

Game-like activities also contributed to participation and persistence. The observed willingness to try again after an error is important because children's confidence can be undermined when numeracy is experienced as a sequence of public right-or-wrong judgments. By using teams, turns, visual cues, and multiple attempts, facilitators created a lower-pressure route into problem solving. This result is consistent with evidence that gamification can positively influence cognitive, motivational, and behavioural outcomes when aligned with learning goals (Sailer & Homner, 2020). It also resembles the increased interest reported in elementary educational-game research (Syawaluddin et al., 2020). Nevertheless, the program revealed a potential limitation: some children initially prioritised speed or points over reasoning. Requiring explanations and rewarding cooperation helped correct this tendency.

The mixed-age composition was both a challenge and a resource. A task suitable for an 11-year-old may overwhelm a 6-year-old, while a very simple task may reduce the older child's interest. The program addressed this through common themes with differentiated prompts. Younger children counted, matched, or answered from pictures; older children explained, justified, or created problems. Peer assistance also supported participation, although facilitators needed to prevent older participants from dominating. For replication, community organisers should prepare

at least two difficulty levels and use flexible small groups. More systematic age-group differentiation would likely improve both instructional precision and evidence collection.

Community involvement was another key result. The neighbourhood partner's role in communication, participant mobilisation, and practical coordination made implementation possible. More importantly, the partner acquired a model that could be repeated. Community empowerment in this context did not mean transferring a complex technological package. It meant expanding the local capacity to organise a learning event, select appropriate resources, guide children's response, and evaluate participation. The reusable materials and continuation plan therefore represent a direct empowerment output. This aligns with Indonesian literacy guidance that views literacy culture as a collaborative and sustained effort rather than a one-time campaign (Dewayani et al., 2021; Setiawan & Dewayani, 2019).

The program also offers a useful distinction between access to media and capacity to use media pedagogically. A community may have smartphones, a television, or an internet connection, but these resources do not automatically produce meaningful learning. Facilitators need to select age-appropriate content, avoid distracting features, pause at productive moments, ask questions at different cognitive levels, and connect digital input with speaking, reading, writing, or problem solving. The materials developed in this program were intentionally simple so that these facilitation practices remained visible. Future training for neighbourhood volunteers or parents should therefore focus on activity design and interaction, not only on locating online content.

Several challenges should inform future implementation. First, attention fluctuated, especially among younger children and during transitions. Shorter activity cycles and clearer routines are recommended. Second, mixed-age groups require differentiated task sets. Third, equipment and sound must be tested in advance, with printed alternatives available. Fourth, sustainability depends on adult availability and the regular addition of new materials. Repeating the same quiz or story may reduce interest. A small community resource bank could help by rotating stories, numeracy contexts, and visual games. Fifth, participant safety and responsible media use should remain priorities; facilitators should pre-screen content and minimise unnecessary online exposure.

The evaluation design constitutes the principal limitation. The report provided rich descriptive implementation evidence but did not include validated pre- and post-tests, a comparison group, or repeated measures of reading interest and numeracy. The program therefore cannot determine the magnitude, durability, or causal source of learning change. Observer expectations may also have influenced interpretations of participation. Future community service programs should preserve the practical and enjoyable format while adding feasible evaluation tools. These could include brief age-appropriate baseline and endline tasks, a simple reading-interest scale, structured observation with inter-observer agreement, samples of participant work, and a delayed follow-up. Such evidence would enable stronger conclusions without turning the community activity into a high-pressure testing environment.

Despite these limitations, the results have practical value. Community service articles should not overstate impact when quantitative evidence is unavailable, but they can document how an intervention was adapted, what responses were repeatedly observed, which resources were produced, and what local capacity was strengthened. In this case, the implementation demonstrates a feasible pathway from passive or conventional activities toward guided multimedia learning. The value lies in the combination of relevant media, active response, contextual tasks, facilitator support, partner involvement, and continuation planning.

Contribution to Community

The direct contribution of the program was the provision of an organised, inclusive, and enjoyable learning opportunity for 30 children in Fantasy Residence. Participants encountered

reading and numeracy as interactive activities connected to stories, pictures, games, and everyday situations. This format allowed children with different levels of fluency to enter the activity through multiple forms of response. A younger child could point, count, or sequence pictures, while an older child could explain reasoning or retell a more complete narrative. The program therefore broadened participation without separating children from their neighbourhood peer group.

The program also contributed resources. The community received a set of digital and printable materials that could be reused and modified: short educational videos, digital stories, illustrated slides, interactive quizzes, number and picture cards, visual worksheets, contextual problem prompts, and a basic observation guide. These materials reduce the preparation burden for future activities. Because the resources use common devices and simple print materials, continuation does not depend on specialised software or a permanent computer laboratory. The partner can adapt the same structure to other topics, such as environmental awareness, health, local culture, or financial literacy.

A further contribution was the strengthening of local organisational capacity. Through coordination and reflection, the neighbourhood partner became familiar with a repeatable sequence: identify children's needs, select one focused objective, prepare a short multimedia input, organise guided response, provide practice, and close with reflection. This sequence can support a regular community reading and numeracy hour. Parents or volunteers can rotate responsibilities, while the neighbourhood association coordinates schedule and space. The university team's role may gradually shift from direct delivery to periodic mentoring and material renewal.

For sustainability, four follow-up actions are recommended. The first is a monthly or biweekly literacy-numeracy session of 45–60 minutes. The second is a small shared resource bank containing printed stories, picture cards, numeracy games, and offline digital files. The third is simple facilitator guidance with example questions for prediction, comprehension, comparison, and reasoning. The fourth is periodic monitoring of attendance, participation, and task response. A future cycle should add baseline and endline assessment while preserving the non-threatening atmosphere. The neighbourhood association is expected to coordinate the schedule and storage of the shared resource bank, parents or local volunteers can rotate as activity facilitators, and the university team can provide periodic mentoring and material renewal. Through these actions, the program can develop from a university-led event into a community-supported routine and potentially become a model for other residential neighbourhoods in Batam.

Conclusion

The community service program addressed inconsistent reading engagement, limited contextual numeracy practice, and limited variation in learning media among children in Fantasy Residence. Through a participatory approach, 30 children aged 6–11 years joined guided reading, digital storytelling, educational video, interactive quiz, contextual numeracy game, and visual worksheet activities from 30 March to 30 April 2026. Descriptive evidence showed stronger visible attention, voluntary response, story retelling, willingness to attempt numeracy problems, and persistence when multimedia was relevant and combined with facilitator guidance. The neighbourhood partner also gained reusable resources and a feasible implementation model. The program's contribution lies in demonstrating that low-cost multimedia can support community learning when it is short, purposeful, interactive, and connected to print, discussion, and everyday contexts. Future programs should differentiate materials more systematically by age, train community facilitators, establish recurring sessions, and use validated pre- and post-assessment to examine learning and reading-interest changes over time.

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References

Asrijanty. (2020). AKM dan implikasinya pada pembelajaran. Pusat Asesmen dan Pembelajaran, Badan Penelitian dan Pengembangan dan Perbukuan, Kementerian Pendidikan dan Kebudayaan.

Dewayani, S., Retnaningdyah, P., Antoro, B., Susanto, D., Ikhwanudin, T., Fianto, F., Muldian, W., Syukur, Y., & Setiakarnawijaya, Y. (2021). Panduan penguatan literasi dan numerasi di sekolah. Sekretariat Direktorat Jenderal Pendidikan Anak Usia Dini, Pendidikan Dasar, dan Pendidikan Menengah.

Dewi, D. S., Hartono, R., Saleh, M., & Wahyuni, S. (2023). Incorporating multiliteracy pedagogy elements into EFL speaking class through digital storytelling. Issues in Language Studies, 12(2), 79–97. https://doi.org/10.33736/ils.5545.2023

Fauzan, A., Harisman, Y., Yerizon, Y., Suherman, S., Tasman, F., Nisa, S., & Syaputra, H. (2024). Realistic mathematics education (RME) to improve literacy and numeracy skills of elementary school students based on teachers' experience. Infinity Journal, 13(2), 301–316. https://doi.org/10.22460/infinity.v13i2.p301-316

Furenes, M. I., Kucirkova, N., & Bus, A. G. (2021). A comparison of children's reading on paper versus screen: A meta-analysis. Review of Educational Research, 91(4), 483–517. https://doi.org/10.3102/0034654321998074

Indriani, S., & Suteja, H. (2023). Fostering reading interest through digital storytelling for young learners in early childhood. Journal of Education and Learning (EduLearn), 17(2), 221–228. https://doi.org/10.11591/edulearn.v17i2.18372

Kementerian Pendidikan dan Kebudayaan. (2020). Modul belajar literasi dan numerasi jenjang SD program kondisi khusus. Kementerian Pendidikan dan Kebudayaan.

Kurniawan, M. (2021). Digital storytelling: Teachers' guide to attract children's interest and motivation in kindergarten's English language learning. Satya Widya, 37(1), 16–24. https://doi.org/10.24246/j.sw.2021.v37.i1.p16-24

Mayer, R. E. (2020). Multimedia learning (3rd ed.). Cambridge University Press.

Putra, T., & Rambe, T. R. (2023). Development of interactive multimedia based on a contextual approach to mathematics learning to improve student outcomes. Pedagogik Journal of Islamic Elementary School, 6(2), 201–212. https://doi.org/10.24256/pijies.v6i2.4260

Raudha, A., Alim, J. A., & Fendrik, M. (2024). Impact of animated video media on enhancing numeracy skills among primary school students. Al-Jabar: Jurnal Pendidikan Matematika, 15(2), 611–621. https://doi.org/10.24042/ajpm.v15i2.23992

Sailer, M., & Homner, L. (2020). The gamification of learning: A meta-analysis. Educational Psychology Review, 32, 77–112. https://doi.org/10.1007/s10648-019-09498-w

Setiawan, R., & Dewayani, S. (2019). Seri manual GLS: Variasi kegiatan lima belas menit membaca di sekolah. Direktorat Jenderal Pendidikan Dasar dan Menengah.

Syawaluddin, A., Afriani Rachman, S., & Khaerunnisa. (2020). Developing snake ladder game learning media to increase students' interest and learning outcomes on social studies in

elementary school. Simulation & Gaming, 51(4), 432–442. https://doi.org/10.1177/1046878120921902