

Integrated 6C-Multisensory and Growth Mindset Model for Strengthening Reading and Writing Literacy in Indonesian Elementary Schools

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Abstract—The low interest in reading and the uneven distribution of basic literacy skills among early grade elementary school students indicate the need for a more holistic, contextual, and developmentally responsive learning model. This study aims to develop a literacy model that integrates the principles of 6C, multisensory approaches, and growth mindset. The research employed a Design and Development (D&D) approach, which consisted of the following stages: problem identification, model design, development, trial implementation, and evaluation. The sample comprised 70 first- and second-grade students from four elementary schools located in West Java, DKI Jakarta, and Banten provinces. Data collection techniques included tests, classroom observations, and questionnaires. Quantitative data analysis was carried out through normality testing, t-tests, and descriptive analysis, while qualitative data were analyzed thematically by examining teachers' observation notes and students' responses to identify patterns in learning experiences, perceptions, and challenges in implementing the model. The findings reveal that the literacy model developed in this study significantly improved students' reading and writing literacy skills, with the average gain categorized as moderate. Additional findings emphasize that students became more enthusiastic, willing to take risks, and felt supported through the use of multisensory learning materials. Teachers also reported that the approach facilitated differentiated instruction tailored to students' needs. Furthermore, the integration of growth mindset encouraged motivation and perseverance in task completion. Overall, the integrated 6C, multisensory, and growth mindset literacy model not only produced significant improvements in learning outcomes but also fostered positive, adaptive, and developmentally appropriate learning experiences for early grade elementary students.

Index Terms—6C, elementary schools, growth mindset, reading and writing literacy, multisensory

I. INTRODUCTION

Reading and writing literacy constitutes the fundamental foundation of primary education and serves as an essential

indicator of human development success in the 21st century. Literacy does not merely encompass the mechanical skills of reading and writing, but also involves the ability to comprehend, interpret, analyze, and reflect on information across various contexts of life (Ídil et al., 2024). In a broader perspective, literacy is a prerequisite for active participation in a knowledge-based society, the cultivation of critical thinking skills, and adaptation to rapid social change. Therefore, literacy among primary school children should not be viewed solely as a classroom learning target but as the cornerstone of the lifelong educational process. Nevertheless, the urgency of literacy is not aligned with the actual achievements of students in many parts of the world. The results of the Programme for International Student Assessment (PISA) 2022 reported by the OECD indicate a significant decline in reading scores compared to the 2018 cycle. The average reading score of 15-year-old students in OECD countries was recorded at 476 points, a decrease of approximately 10 points from 2018 (OECD, 2023). This decline is not isolated but rather nearly universal, signaling a degradation in global literacy quality. Moreover, PISA 2022 highlights a widening disparity: students from lower socio-economic backgrounds experienced sharper declines in performance compared to their more advantaged peers (Acido & Caballes, 2024). These findings underscore that literacy is not only a cognitive concern but also a matter of educational equity and social justice. If the global trend is alarming, the condition in Indonesia presents an even more pressing challenge. The PISA 2022 results place Indonesia among the countries with reading literacy performance below the OECD average, indicating that a significant proportion of Indonesian students continue to struggle with text comprehension, connecting information, and engaging in critical reasoning (OECD, 2023). This low performance is consistent with previous PISA cycles (2018 and 2015), where Indonesia persistently ranked at the lower end in reading literacy (Kuang & Sahin, 2023). This suggests that despite numerous national education policies, literacy challenges have yet to be systematically addressed.

The literacy problem in Indonesia, particularly at the primary school level, can be traced to several factors. First, literacy instruction remains dominated by traditional methods that emphasize memorization and information reproduction, leaving students less encouraged to think critically and reflectively (Wajdi et al., 2022). Second, literacy learning often fails to accommodate the diversity of students' learning styles. Primary school children possess varying learning preferences: some grasp texts more effectively through visual input, others through auditory input, and still others through physical or manipulative activities. Without differentiation, many students are left behind and lose their motivation to learn. Third, motivation itself constitutes a serious obstacle: many Indonesian students perceive reading as a tedious activity, which contributes to low reading interest and weak writing skills (Sujinah et al., 2019). These challenges demand innovation in literacy learning models. An approach is needed that can simultaneously address the cognitive, affective, and social needs of students. One promising conceptual framework is the 6C model, which consists of critical thinking, creativity, collaboration, communication, citizenship, and character. These six competencies are widely recognized as the core skills of the 21st century that all students must acquire (van Laar et al., 2017). In the context of literacy, the 6C framework not only strengthens reading and writing skills but also fosters critical reasoning, creativity in expressing ideas, collaborative abilities, and positive character traits that are relevant to social life. In addition to the 6C framework, a multisensory approach has also proven effective in literacy instruction, particularly for primary school students who are still at the stage of concrete operational development (Kesselring & Müller, 2011). The multisensory approach engages multiple senses (visual, auditory, kinesthetic, tactile) in learning activities. For instance, when learning to read, students do not only look at the text but also listen to the sound of letters, write words, or manipulate letter cards. Cuturi et al. (2022) demonstrated that multisensory strategies significantly improve reading comprehension among students with diverse learning needs. This approach has also been shown to enhance memory retention and emotional engagement because learning experiences become more enjoyable and meaningful. The psychological dimension is equally important in strengthening literacy. Growth mindset, introduced by Dweck (2006), emphasizes the belief that abilities can be developed through effort, appropriate strategies, and persistence. Unlike a fixed mindset, which perceives ability as an innate and unchangeable trait, a growth mindset fosters optimism and resilience in facing learning difficulties. In the context of reading and writing literacy, students with a growth mindset are more willing to attempt new texts, less likely to become frustrated when they fail to understand, and more persistent in improving their writing skills (da Silva & da Fonseca, 2021). Thus, integrating a growth mindset into literacy instruction is believed to enhance students' intrinsic motivation while reducing the psychological barriers that frequently arise.

Several previous studies have contributed significantly to enriching literacy teaching strategies in primary schools. For example, Cuturi et al. (2022) found that multisensory strategies effectively improved reading skills among children with diverse learning needs by engaging multiple sensory modalities, thereby facilitating easier and more enjoyable text comprehension. Similarly, Munusamy and Gurusamy (2023) showed that integrating 21st-century competencies (6C) into literacy instruction played a significant role in enhancing students' critical thinking and collaborative skills. In another study, Rammstedt et al. (2024) confirmed that applying a growth mindset fostered students' motivation and perseverance in overcoming reading and writing difficulties. Although these findings provide a solid foundation, existing literacy research still exhibits several limitations. First, most studies remain partial, focusing exclusively on one aspect, either multisensory, 6C, or growth mindset, without connecting it to the other equally important dimensions. Second, there has been little effort to design a literacy learning model that integrates all three approaches into a single, comprehensive framework, even though theoretically they complement each other: 6C supports cognitive and social

competencies, multisensory strategies accommodate diverse learning styles, and growth mindset strengthens affective and motivational dimensions. Third, most studies are still limited to small-scale contexts or pilot projects, providing insufficient evidence of their effectiveness when applied more broadly in classroom practice.

Furthermore, literacy research in Indonesia rarely situates its studies explicitly within the global discourse, such as the PISA 2022 report, which revealed a decline in international literacy performance along with widening socio-economic disparities in achievement (OECD, 2023). Yet PISA findings carry critical implications, highlighting that literacy is not merely a local challenge but a global issue that requires innovative instructional models capable of addressing 21st-century demands. Accordingly, there exists a clear research gap: the absence of an integrated literacy model at the primary school level that combines the 6C framework, multisensory strategies, and growth mindset principles, and that is empirically tested within real classroom contexts as a response to global literacy challenges identified in PISA 2022. This study seeks to fill that gap by developing an Integrated 6C-Multisensory and Growth Mindset Model as a comprehensive effort to strengthen reading and writing literacy among primary school students in Indonesia.

II. METHOD

A. Research Design

This study employed a Research and Development (R&D) approach by Borg and Gall (1989), with a Design and Development (D&D) framework. The selection of this approach was based on the primary objective of the research, namely to produce a new instructional model that can be implemented in elementary schools to strengthen reading and writing literacy, rather than merely testing relationships between variables or analyzing existing phenomena. Richey and Klein (2007) emphasized that Design and Development (D&D) research in education serves to bridge theory and practice, with a strong emphasis on iterative processes that begin with problem identification and culminate in product effectiveness evaluation. The research process was carried out through 4 systematic stages, namely **problem identification** (The researchers conducted a comprehensive literature review, analyzed international reports such as PISA 2022, and performed a needs assessment in six elementary schools across three Indonesian provinces. Data were collected through questionnaires, interviews, observations, document analysis, and Focus Group Discussions (FGDs) to examine literacy learning processes, teacher challenges, and both teacher and student needs in literacy instruction), **design** (the researchers developed the initial draft of the *Integrated 6C-Multisensory and Growth Mindset Literacy Model* by integrating literacy theory, 21st-century competencies, multisensory learning strategies, and growth mindset principles), **development** (The conceptual framework was translated into a prototype consisting of instructional tools such as lesson plans, learning modules, student worksheets, teacher guides, and assessment instruments.), **trial implementation** (The model was tested through two stages: small-scale trials and large-scale field trials), and **evaluation** (scale trial stages to provide continuous improvement, while summative evaluation followed the field trial to assess the model's overall validity, practicality, and effectiveness). Each stage was conducted in a sequential and interrelated manner, oriented toward continuous improvement.

B. Sampling

The population of this study comprised all elementary schools located in three provinces of Indonesia: DKI Jakarta, Banten, and West Java. These regions were purposively selected on the grounds that they represent the diversity of educational contexts in urban and peri-urban areas, which face relatively complex literacy challenges. Furthermore, these regions were chosen because of their heterogeneous literacy achievement levels, as reflected in the Education Report published by the Ministry of Education, Culture, Research, and Technology. The research subjects were focused on teachers and students in grades 1 and 2 of elementary schools. This grade level was selected because it is at this stage that basic literacy skills (reading and writing) are systematically introduced. A total of four schools were involved in the study: one school in West Java, which served as the site for the small-scale trial, and three schools in DKI Jakarta and Banten, which served as the sites for the large-scale trial. The sample consisted of 70 students from grades 1 and 2. The study was conducted during the first semester of the 2025/2026 academic year, specifically between August and September 2025. The sampling technique employed was purposive sampling, which is the selection of samples based on predetermined criteria. The criteria in this study were as follows: (1) elementary schools with literacy achievement categorized as moderate or low, based on the results of the Education Report; and (2) both public and private elementary schools, in order to capture a more diverse picture of literacy teaching practices across different school types. This consideration was deemed important because schools with moderate or low literacy achievement are considered to have a greater need for innovative literacy models, thereby making the development of the integrated 6C-Multisensory and Growth Mindset model particularly relevant and well-targeted.

C. Instruments

The research instruments employed in this study included an early grade reading test, a basic literacy skills test, a reading and writing literacy test, an expert validation questionnaire, and a teacher response questionnaire. In the early grade reading test, students were given five tasks, as outlined below.

TABLE 1
EARLY GRADE READING TEST TASKS

Task 1	Reading letters (30 letters)	
Task 2	Reading syllables (10 syllables)	
Task 3	Reading words (10 words)	
Task 4	Listening comprehension (3 questions related to the text)	
Task 5	Reading fluency:	1. 31 words
		2. 57 words
	Reading comprehension	1. 3 questions
		2. 5 questions

The scoring rubric for the test was calculated as the number of correct responses divided by the total number of items, multiplied by 100. An important note during the assessment process was that the examiner should carefully observe the student’s behavior and make annotations regarding any particular conditions, such as stuttering, articulation difficulties, visual impairment (e.g., wearing thick glasses or using assistive devices), restlessness or lack of focus, repeated requests for the teacher to repeat instructions, evidence of concentration on the task, or instances where students relied more on verbalizing words aloud rather than silent reading. The guidelines for administering the early grade reading test were adapted from the Early Grade Reading Assessment (EGRA).

The basic literacy skills test was adopted from Apriliana et al. (2022) and further developed and modified from the Early Grade Literacy Competency Instrument, the Early Grade Reading Assessment (Dubeck & Gove, 2015), and the National Reading Panel (Cunningham, 2001). The detailed indicators are presented as follows.

TABLE 2
INDICATORS OF THE BASIC LITERACY SKILLS TEST

No	Aspects	Indicators	Number of items
1	Language comprehension	Able to express thoughts/intentions orally with correct language (Expressive language)	4
		Able to understand oral language expressed by others (Receptive language)	4
2	Phonemic awareness	Able to identify initial and final phonemes of words (Identification of Onset Sound)	4
		Able to segment words into syllables (Phoneme Segmentation)	4
3	Basic reading skills	Understanding print concepts (Concept about Print)	3
		Recognizing letter names (Letter Name Knowledge)	2
		Recognizing letter sounds (Letter Sound Knowledge)	1
		Reading syllables	2
4	Basic writing skills	Recognizing familiar words	2
		Able to hold and use writing tools to draw lines and curves	2
		Able to write letters	2
		Able to copy words	2
5	Reading interest/motivation	Able to write independently at least two known words	2
		Student initiative to read independently	3
		Response to storybooks	3
6	Reading comprehension	Asking and answering questions	1
		Ability to understand both explicit and implicit meanings of sentences in a fictional story (based on the title and content of the passage)	5

The reading and writing literacy test instrument for Grade 1 and 2 students referred to OECD’s PISA framework (Auld et al., 2022), with the details presented below.

TABLE 3
INDICATORS OF READING AND WRITING LITERACY TEST

No	Competency	Sub-Competency	Item Distribution	Number of Items
1	Access and Retrieve Information	Accessing and searching for information in a text	1, 2	2
		Searching for and selecting relevant information	3	1
2	Interpret and Integrate	Understanding texts literally	4, 5	2
		Making inferences, connections, and predictions across single or multiple texts	6, 7	2
3	Evaluate and Reflect	Evaluating the quality and credibility of content in single or multiple texts	8	1
		Evaluating the format of text presentation	9	1
		Reflecting on content for decision-making, establishing choices, and linking text to personal experience	10	1
Total				10

The test items were presented in multiple-choice format. Scoring employed a Likert scale ranging from 1 to 4.

The expert validation questionnaire for evaluating the model referred to Joyce and Marsha (2009), covering aspects such as model rationale, objectives, underlying principles, syntax, instructional impacts, and evaluation. The teacher response questionnaire was designed to assess the practicality of the model and its accompanying materials during classroom implementation. Both questionnaires used a 4-point Likert scale for scoring.

D. Data Analysis

Data analysis in this Design and Development (D&D) study was conducted progressively, aligned with each phase of product development. During the preliminary study phase, data obtained from observations, interviews, needs assessment questionnaires, and literature reviews were analyzed qualitatively using descriptive methods, with the aim of mapping the actual field conditions and establishing the urgency of the product to be developed. This phase provided the conceptual foundation and justification for model development. In the design phase, data were collected through expert validation (expert judgment). Expert assessments were analyzed using descriptive statistics, such as calculating mean scores or percentages, and then interpreted into categories of very valid, valid, less valid, or invalid. Qualitative data in the form of comments and suggestions from experts were used to refine the model draft. In the development phase, data analysis focused on the results of the limited trial. Data consisted of teacher and student responses, observation notes, and test results, which were analyzed using both quantitative and qualitative approaches. Quantitative analysis emphasized practicality and preliminary effectiveness, while qualitative analysis highlighted feedback for further revision. In the implementation phase, data were derived from broader field trials. Quantitative analysis was conducted to assess the effectiveness of the product, such as by measuring learning gains, mastery percentages, or gain scores. When necessary, inferential statistics such as t-tests or ANOVA were employed to examine significant differences. Meanwhile, qualitative data from observations and user feedback were analyzed thematically to reinforce the interpretation of findings.

III. RESULTS

The results of this study are presented according to the stages of product development under the Design and Development (D&D) framework. Each stage generated findings that contributed to product refinement until a final model that is valid, practical, and effective was achieved.

A. Problem Identification

At this stage, data were collected through questionnaires, interviews, observations, document studies, and Focus Group Discussions (FGDs). The needs analysis was conducted in six elementary schools located in Jakarta, Cimahi City (partner), and Banten, with each region represented by two schools categorized as having low to moderate literacy scores, and including both public and private institutions. The results of the problem identification are illustrated in the diagram below.

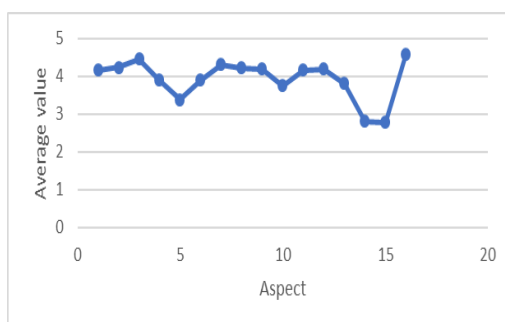


Figure 1. Results of Identification of Objective Conditions of Learning Needs

The analysis of literacy teaching processes (indicators 1–3) objectively revealed that the average score of the first indicator was 4.17 regarding teachers' practice of explaining the objectives of literacy activities at the beginning of lessons. Teachers' explanation of literacy objectives at the beginning of lessons obtained an average score of 4.24, and teachers' reflective discussions with students at the end of literacy activities obtained an average score of 4.46. Regarding instructional models used by teachers (indicators 4–6), it was found that teachers employed innovative models utilizing diverse resources, including textbooks, folktale books, children's magazines, teaching modules, student worksheets, audiovisual media, and digital applications. However, their use was not yet systematic within a coherent instructional model. The application of project-based approaches in reading and writing literacy instruction remained relatively low. The analysis of the integration of the 6C framework into literacy instruction showed that most teachers had integrated critical thinking, though a small proportion rarely provided opportunities for critical reasoning. This indicates that critical thinking skills are beginning to develop but are not yet evenly distributed. Communication was implemented well, with students trained to express ideas both orally and in writing. Collaboration was practiced, though not consistently in all classrooms. Character education was relatively consistent, but in some cases teachers instilled

values incidentally rather than as part of a planned instructional design. Citizenship was found to be the weakest among the 6Cs. The use of diverse learning resources not only enriched students’ literacy experiences but also enabled teachers to tailor strategies to students’ needs, characteristics, and contexts. In this study, resources and instructional tools were categorized into five groups: (A) Books & Texts, (B) Print & Digital Media, (C) Audiovisual & Multimedia, (D) Technological Tools & Aids, and (E) Environment & Real-Life Activities.

Survey results indicated that the most significant barriers were student-related, including uneven basic literacy skills, low motivation, and lack of concentration. This demonstrates the presence of a significant learning gap between students who are ready and those who are not. Teacher-related barriers concerned methods and time constraints, affirming the need to transform literacy instruction from conventional (rote-based) practices toward meaningful, expressive, and contextual learning. In terms of facilities, limited access to digital tools and insufficient parental collaboration weakened the sustainability of literacy learning beyond the classroom. Survey findings also revealed that most teachers expressed a need to strengthen the growth mindset, particularly in reading and writing literacy instruction. This suggests that despite their teaching experience, teachers still face gaps in mastering innovative, contextual literacy strategies that align with the developmental characteristics of early-grade students and the principles of growth mindset. Based on the student literacy questionnaires, it was found that Grade 1 and 2 students’ interest in literacy was relatively high, particularly in reading and social interaction. This was reflected in the high number of students who responded “I really like it” to the statement “I enjoy learning with my friends” (222 students), as well as the consistency of positive responses regarding helping peers, sharing materials, and being polite. These data suggest strong potential among students in collaboration, communication, and character (components of the 6C framework). However, certain challenges remain: interest in writing and creativity in producing independent work were lower compared to reading. In addition to interest in reading and writing, students’ basic literacy abilities were also observed, as presented in the following table.

TABLE 4
RESULTS OF OBSERVATION OF BASIC LITERACY ABILITIES

No	Aspect	Mean
1	Ability to understand language	86,25
2	Sharpness in discriminating forms	53,75
3	Understanding of basic reading skills	82,17
4	Possession of basic writing skills	90
5	Reading interest/motivation	40
6	Reading comprehension	62

In general, students’ foundational abilities in language, reading, and writing are adequate; however, the most pressing challenges lie in low reading motivation and only moderate visual form discrimination. Subsequent development efforts should prioritize enhancing reading motivation through engaging media and methods, as well as strengthening reading comprehension to achieve a more balanced literacy skill set.

B. Design

At this stage, an initial draft of the model was developed. The research team conducted a literature review and document analysis. After identifying relevant concepts and theories, the initial draft was prepared and discussed with partner schools through a Focus Group Discussion (FGD). The FGD aligned understandings, elicited ideas, and refined the model design based on partner input. The team then prepared content for multisensory teaching materials. To further strengthen the draft reading–writing literacy model, the researchers conducted benchmarking at the Literacy Study Center of Universitas Negeri Surabaya (UNESA), East Java. The integrated reading–writing literacy model, 6C, multisensory, and growth mindset, is depicted in the following table.

TABLE 5
DESIGN OF THE INTEGRATED 6C–MULTISENSORY AND GROWTH MINDSET READING–WRITING LITERACY MODEL

Phase	Phase Name (Indonesian/English)	Learning Objectives	Main/Multisensory Activities	6C Emphases	Theoretical Foundations
1	L - <i>Link</i> (Connecting Schemata)	Activate prior knowledge and connect it to new material	Student experience Q&A, picture flashcards, story talk, themed songs	Critical Thinking	Constructivism (Piaget, Bruner)
2	E - <i>Explore</i> (Exploration of Audiovisual)	Provide engaging models and concrete examples	Teacher read-aloud (modeling), viewing videos/animated texts, storytelling with raised letters	Communication, Creativity	Social-Cognitive (Vygotsky), Behaviorism (Skinner)
3	A - <i>Act</i> (Interactive Multisensory Action)	Engage all learning modalities (visual, auditory, kinesthetic) to strengthen mastery	Interactive literacy games, interactive digital reading (e-storybook), "Record Your Voice" (reading & retelling), digital drawing & writing	Creativity, Character	Multisensory Theory (Orton-Gillingham), Learning Modalities
4	R - <i>Reflect</i> (Reflection & Scaffolding)	Provide graduated support and foster metacognitive awareness	Guided reading groups, staged worksheets (supported → independent), partner reading	Collaboration, Critical Thinking, Character	Zone of Proximal Development (Vygotsky)
5	N-E - <i>Nurture-Expressive</i> (Ekspression & Confident)	Build confidence, self-expression, and positive self-assessment	Draw favorite story part + sentence, retell the text, self-awarded "star"	Character, Communication, Creativity, Citizenship	Constructivism, Growth Mindset (Dweck)

Multisensory activities in reading–writing literacy instruction are mapped below.

TABLE 6
MAPPING OF MULTISENSORY ACTIVITIES IN READING–WRITING LITERACY INSTRUCTION

Instructional Phase	Multisensory Modalities	Example Activities	Format in Platform	Supporting Media/Tools
L – Link (Schema Activation)	Auditory, Visual	Student experience Q&A, picture flashcards, story talk, themed songs	1. Daily theme opener video; 2. "Morning Story" audio	Short video, MP3 songs, thematic images
E – Explore (Visual–Auditory Exploration)	Visual, Auditory	Teacher read-aloud (modeling), watch video/animation, storytelling with raised letters/images	3. Interactive story animation; 4. "Read Together" mode	Literacy animations, interactive e-books, voice pointers
A – Act (Interactive Multisensory)	Visual, Auditory, Kinesthetic, Tactile	Interactive literacy games, interactive digital reading (e-storybook), "Record Your Voice," digital drawing & writing	5. Physical worksheet + video instructions; 6. Daily "Play-to-Read"	Letter tiles, phonemic cards, movement-cue audio
R – Reflect (Gradual Scaffolding)	Visual, Auditory, Collaborative	Guided reading groups, staged worksheets (supported → independent), partner reading	7. "Stepwise Independent Practice" mode; 8. Teacher audio feedback	Interactive Google Slides, 3-level rubric (supported–reduced–independent)
N-E – Nurture–Expressive (Expression & Appreciation)	Visual, Auditory, Affective	Draw favorite story part + sentence, retell the text, self-awarded star	9. Daily expression column; 10. Student expression gallery; 11. Daily achievement badge	Expressive drawing templates, narrative fields, "Self-Star" digital stickers

An overview of the designed multisensory teaching materials is illustrated in the following figures.



Figure 2. Letter Recognition



Figure 3. Interactive Reading

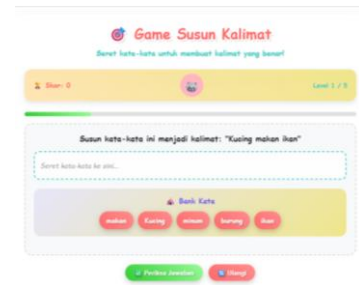


Figure 4. Sentence-Building Game

After finalizing the draft, the model proceeded to the development phase.

C. Development

In the development phase, the model underwent expert validation by three experts: a primary education literacy/model expert from Indonesia University of Education (UPI) and an Indonesian language expert from the Literacy Study Center at State University of Surabaya (UNESA). The percentages of expert/practitioner validation are shown below.

TABLE 7
RESULTS OF EXPERT AND PRACTITIONER VALIDATION OF THE READING-WRITING LITERACY

No	Component	Va1	Va2	Result	Category
1	Model	78.67%	82.60%	80.63%	Usable with revisions
2	Teaching Materials	77.5%	-	77.5%	Usable with revisions

Note: Va = Expert Validation

TABLE 8
SUMMARY OF EXPERT FEEDBACK ON THE LITERACY MODEL AND MULTISENSORY PLATFORM

No	Expert Code	Feedback
1	Va1 Model	Design activities that generate meaningful and enjoyable experiences for Grades 1–2; media must align with students’ multisensory needs.
2	Va2 Model	Provide a clear rationale for integrating 6C; assess teachers’ comprehension of the dense model; include a foundational model (e.g., Whole Language); refine model naming; avoid over-reliance on technology; include leveled readers; focus on basic literacy.
3	Va1 Media	Some platform videos have rigid narration; registration/login features are absent; ensure visual design consistency; clarify simple navigation; address accessibility and ensure data security.

Based on this feedback, the researchers revised the draft so that the model became ready for implementation. During this phase, data were collected using expert validation questionnaires. Validity and reliability testing was also conducted for the Grade 1 and 2 (early grade) reading–writing literacy assessment instrument with 10 students. The item validity results are presented in Table 9.

TABLE 9
ITEM VALIDITY RESULTS FOR THE READING-WRITING LITERACY TEST

Item no.	t _{count}	t _{table}		Inf.
1.	0,800	0,632	Valid	Used
2.	0,664	0,632	Valid	Used
3.	0,937	0,632	Valid	Used
4.	0,776	0,632	Valid	Used
5.	0,675	0,632	Valid	Used
6.	0,776	0,632	Valid	Used
7.	0,776	0,632	Valid	Used
8.	0,705	0,632	Valid	Used
9.	0,846	0,632	Valid	Used
10.	0,7	0,632	Valid	Used

Based on the above, the reading–writing literacy instrument items were declared valid. Reliability, calculated using Cronbach’s alpha, yielded $\alpha = 0.696$ for reading comprehension, exceeding 0.05, thereby indicating acceptable reliability. After revising the draft model, the model was ready for implementation. The integrated reading–writing literacy model was named LEARN-E.

D. Trials

Field trials were conducted on the expert-validated model. A limited trial was first implemented in one elementary school in Cimahi, West Java, with three sessions (3 × 2 class periods). Results are summarized in Table 10.

TABLE 10
DESCRIPTIVE STATISTICS OF PRETEST AND POSTTEST

Variable	N	Mean	SD
Pretest	10	47.9	4.38
Posttest	10	57.5	4.35

As shown in Table 10, the pretest mean was 47.9 (SD = 4.38), indicating that before the intervention students’ reading–writing literacy ability was in the moderate-low range with relatively homogeneous variance. Following the intervention, the posttest mean increased significantly to 57.5 (SD = 4.35). The mean gain of 9.6 points, along with a small standard deviation of the difference (0.97), suggests that nearly all students improved in a relatively uniform manner. The average N-Gain was 0.185, which falls into the low category (< 0.30). Teacher response questionnaires indicated that, overall, the media received very good ratings (85%–95%). The highest-rated aspects included compliance with intellectual property (95%), content free of sensitive or inappropriate elements (91.7%), and coherence of skills, flow, structure, and sequencing (90%). Lower ratings were noted for the appropriateness of images (71.7%), logical quality of illustrations (85%), and the use of advance organizers (88.3%), indicating a need for technical refinements. Teachers generally recommended child-friendly fonts (non-cursive), improved and higher-contrast illustrations, and the addition of music or sound effects. Following this feedback, the researchers revised the model and multisensory materials. The large-scale trial was then prepared. The large-scale trial was conducted in the final week of September 2025, with three sessions (3 × 2 class periods). In this phase, the effectiveness of the integrated 6C literacy model was tested. Pretest–posttest mean differences were analyzed; normality was tested using Kolmogorov–Smirnov

(sample size = 60). This implementation phase involved Grade 1 and Grade 2 classes. The t-test results comparing pretest and posttest scores for Grade 1 and 2 reading–writing literacy are presented in Table 11.

TABLE 11
NORMALITY TEST OF PRETEST AND POSTTEST MEAN SCORES IN READING–WRITING LITERACY SKILLS

Group	Kolmogorov-Smirnov ^a	df	Sig.
Pretest	0,124	60	0,22
Posttest	0,121	60	0,29

Based on the data presented in the table above, the significance (Sig.) value for the pretest is 0.124 and for the posttest is 0.121. Both values are greater than 0.05, indicating that the pretest and posttest data are normally distributed. This means that the assumption of normality is satisfied. Consequently, parametric tests could be applied to compare the pretest and posttest results.

TABLE 12
RESULTS OF PAIRED-SAMPLE T-TEST

Data Pair	t	df	Sig. (2-tailed)
Pretest–Posttest	-9.507	60	0,000

The data indicate that the Sig. (2-tailed) value is 0.000 (< 0.05), which signifies a statistically significant difference between the pretest and posttest results. The calculated N-Gain is 0.583, categorized as medium. Based on the t-test results, it can be concluded that the Propepa LEARN-E model is effective in significantly improving the reading–writing literacy skills of Grade 1 and 2 students.

The results of student reading skills observation are presented in Table 13.

TABLE 13
OBSERVATION RESULTS OF READING SKILLS

No	Aspect	Mean
1	Letter recognition	75
2	Syllable reading	30,5
3	Word reading	2,9
4	Listening comprehension	21,8
5	Reading fluency 1	20,7
6	Reading comprehension 1	9
7	Reading fluency 2	21
8	Reading comprehension 2	12,8

The results of the basic literacy skills test for Phase A students are shown in Table 14.

TABLE 14
RESULTS OF BASIC LITERACY SKILLS TEST

No	Aspect	Mean
1	Ability to understand language	96,75
2	Phonemic discrimination	77,87
3	Basic reading skills	89
4	Basic writing skills	98,5
5	Reading interest/motivation	70,5
6	Reading comprehension	82,9

Based on the percentage data across 11 indicators, student achievement was relatively high, with nearly all indicators exceeding 87%, ranging from 81% to 95.77%. The highest scores were achieved on indicators 8 (95.77%) and 4 (95.20%), indicating mastery in these areas. Conversely, the lowest score was found in indicator 11 (81%), suggesting the need for targeted instructional improvement. Overall, the data indicate strong consistency, with averages close to 91–92%, classifying the achievement profile as highly satisfactory. Nonetheless, the variation among indicators highlights that although core competencies are strong, certain areas still require intervention to prevent learning gaps. For example, indicators with lower achievement (81% and 87.74%) may benefit from reinforcement strategies such as multisensory approaches, interactive digital media, or scaffolding techniques.

This study has reached only the trial stage. A full evaluation has not yet been conducted, as it will form part of subsequent research. The tested and revised product will be further implemented in future studies to assess its comprehensive effectiveness.

IV. DISCUSSION

Preliminary findings indicate that early-grade reading–writing literacy instruction has shown positive developments, particularly in lesson planning. Teachers consistently explained literacy objectives at the beginning and conducted reflection sessions at the end of activities. This aligns with Vygotsky (1978), who posited that clear learning objectives help establish the child’s zone of proximal development, with the teacher acting as a scaffolder to guide literacy

experiences (Spencer, 2024). However, despite using diverse learning resources, teachers' instructional models remain fragmented and lack a coherent pedagogical framework. Moreover, crucial cognitive processes play a fundamental role in coordinating linguistic processing during reading (Fong, 2023; Tal & Shaul, 2024; Pham et al., 2025). The limited use of project-based models shows that literacy instruction is still largely routine-focused, rather than fostering meaningful, contextual learning. Integration of the 6C competencies also varied: while critical thinking, communication, collaboration, and character development were evident, implementation was inconsistent across classrooms. This suggests that 21st-century skills are beginning to find space in literacy instruction (Anggraeni et al., 2022), but have not yet been internalized systematically. Citizenship emerged as the weakest dimension, reflecting teachers' limited ability to link literacy to broader socio-cultural contexts. This finding is consistent with reports by the Indonesian National Commission for UNESCO (2014) and González-salamanca et al. (2020) which noted that primary-level literacy education often remains focused on technical reading-writing skills rather than fostering social awareness. Furthermore, mastery of reading fluency requires deliberate attention to the processes of knowledge acquisition (Ukumo & Berlie, 2024).

The LEARN-E literacy model (Link, Explore, Act, Reflect, Nurture-Expressive) was designed to align with early-grade students' cognitive profiles. For Grade 1 students, in Piaget's transitional stage from preoperational to concrete operational, the priority is concrete, visual, and multisensory activities. The Link stage, through Q&A, flashcards, and thematic songs, helps activate prior knowledge in ways suited to their reliance on direct experiences. Similarly, the Explore and Act stages engage them with read-alouds, interactive animations, and kinesthetic games to strengthen letter-shape discrimination and boost reading motivation, previously identified as weak. For Grade 2 students, who are more established in the concrete operational stage, the priority is to develop reading comprehension and independent reading interest (Maulani et al., 2021). The Reflect stage provides scaffolding through partner reading and staged practice, enabling them to practice comprehension at their developmental level. Meanwhile, the Nurture-Expressive stage fosters creative writing, drawing, and retelling, crucial since preliminary findings indicated Grade 2 students had adequate reading fluency but moderate comprehension and lower creative writing. Thus, LEARN-E accommodates different needs: for Grade 1, emphasizing multisensory stimulation; for Grade 2, emphasizing comprehension and expressive literacy for balanced skill growth. The limited trial in semi-urban areas demonstrated that LEARN-E was well received by both teachers and students. The main challenges stemmed from limited digital facilities and varied student motivation (Valcárcel Jiménez et al., 2024). Nevertheless, effectiveness was evident in Grade 1 students' enthusiasm for visual media, phonemic cards, and kinesthetic games, confirming that low-tech multisensory strategies can be effective in semi-urban contexts, where teachers often rely on physical rather than digital media (Puspita et al., 2025). This suggests that contextual adaptation is key, with low-tech multisensory tools sufficient in semi-urban areas (Birgisdottir et al., 2020). By contrast, the large-scale trial yielded greater improvements in comprehension and expressive writing, supported by digital facilities and varied learning environments in urban schools. Where infrastructure was adequate, audiovisual tools and e-storybooks were optimally integrated, enabling Grade 2 students to develop comprehension through discussion and creative writing. In other schools, improvements were evident in collaboration and communication, supported by school-parent partnerships. This highlights geographic influence: in semi-urban schools, success relied on simple multisensory media, while in metropolitan schools, success relied on broader digital integration. Overall, however, the LEARN-E model was effective in strengthening basic literacy skills across contexts, from letter and word recognition to comprehension (Prawiyogi et al., 2025).

V. CONCLUSION

This study developed and tested the LEARN-E literacy model, integrating multisensory approaches, 21st-century competencies (6C), and growth mindset. Findings from preliminary studies, limited trials in Cimahi, and large-scale trials in Jakarta and Tangerang demonstrated the model's capacity to strengthen early-grade literacy skills in ways tailored to students' developmental stages. For Grade 1 students, the model effectively improved reading motivation and letter-shape discrimination; for Grade 2 students, it enhanced comprehension and expressive writing. Overall, LEARN-E contributes to transforming literacy instruction from fragmented conventional practices toward a more holistic, innovative, and contextualized approach. By aligning cognitive development with 21st-century competencies, the model not only strengthens technical reading-writing skills but also fosters motivation, creativity, and social awareness. These findings affirm that LEARN-E has the potential to serve as an adaptive pedagogical framework for diverse elementary school contexts. Nonetheless, the study's limitations lie in its restricted sample, confined to urban and semi-urban areas, limiting generalizability. Moreover, the research remains at the trial stage without long-term evaluation, leaving sustainability unmeasured. Future research should extend trials to rural and remote (3T) areas to test model flexibility, conduct longitudinal evaluations to assess sustained impacts, and incorporate parental/community involvement to build a more sustainable literacy ecosystem. Subsequent studies may also adopt experimental designs with control groups to strengthen validity.

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