The effect of Library-Assisted Instruction (LAI) on reading ability and reading attitude of elementary school students in Indonesia

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ABSTRACT

This study aimed to examine the effectiveness of Library-Assisted Instruction (LAI) that integrates subject-related reading through collaborative teaching between classroom teachers and teacher-librarians, utilizing both classroom and school libraries. A quasi-experimental design was implemented with 44 second-grade students from an elementary school in Batu City, East Java, Indonesia, divided into an experimental group (n = 22) and a control group (n = 22). The intervention was based on eight learning themes from the integrated curriculum textbook "My Daily Task," delivered over 560 minutes across eight sessions. The experimental group received LAI while the control group followed conventional instruction. Reading ability and reading attitude were measured using adapted Korean instruments suitable for the Indonesian context. Data were analyzed using SPSS 26 with a significance level of $\alpha = .05$. Results showed a statistically significant improvement in reading ability ($t = 6.26$, $p < .001$) and reading attitude ($F = 28.180$, $p < .001$) in the experimental group compared to the control group. These findings confirm that LAI with subject-linked reading enhances both reading competence and affective engagement in early elementary education.

I. Introduction

With the Fourth Industrial Revolution, information and knowledge have become central to national development, necessitating an education system that shifts from teacher-centered instruction to fostering higher-order thinking, enabling students to locate, evaluate, and synthesize information independently. School libraries and classroom literacy corners are therefore essential resources for developing these competencies; Indonesia's integrated elementary curriculum aims to prepare students to be productive, creative, and socially responsible citizens (Permendikbud nomor 57 tahun 2014), and the Gerakan Literasi Sekolah introduced pojok literasi to cultivate lifelong learning and character development (Permendikbud nomor 23 tahun 2015). Despite the National Library of Indonesia's 2015 standards for elementary school library operations (Perpustakaan Nasional Republik Indonesia, 2015), national data indicate limited library provision and recognition: only 118,599 of 254,432 registered schools had libraries, 56,507 held official library identification numbers, and only 176 schools were government-accredited by 2015 (Pratama, Roemintoyo, and Sumarni, 2018).

Previous Indonesian studies on library-assisted instruction have primarily examined the roles and collaboration between teachers and teacher-librarians (Zu Zulaikha, 2006; Isrowiyanti, 2011), while extensive research from the United States and Korea demonstrates that library-activity instruction (LAI) can improve academic achievement, self-directed learning, and reading attitudes (Park, 2004; Cho, 2006; Baughman and Hackley, 2000; Lance, 2001). Given Indonesia's limited library infrastructure and librarian capacity, there is a need to develop LAI models aligned with the integrated curriculum and national literacy policies, using pojok literasi as an accessible alternative. This study, therefore, evaluates the effectiveness of a curriculum-linked, teacher–librarian collaborative LAI using the second-grade integrated textbook Tema Tugasku to improve students' reading ability and reading attitude.

A. Research Problem

The research addresses the following questions: (1) Is a Library-Assisted Instruction (LAI) program that uses the four subthemes of the second-grade, first-semester textbook Theme 3: My Daily Tasks effective in improving elementary students' reading ability? (2) Is the same LAI

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program effective in improving elementary students' reading attitude?

B. Theoretical Background

1) Library-Assisted Instruction (LAI)

According to Whang and Cheon (2021), Library Assisted Instruction (LAI) refers to collaborative teaching-learning activities in which subject teachers and librarians work together as equals, utilizing library resources such as facilities, materials, and services to achieve subject-learning goals. The role of the school library has evolved alongside educational and social developments, and its integration into the school curriculum remains a central concern. Scholars have highlighted that the nature of library participation in the curriculum determines the content and methods of LAI (Lee, K., 2005).

Historically, in the United States, Fargo (as cited in Lee, K., 2005) proposed cooperation between school libraries and teachers in 1947, followed by Krentzman (1950) and Hunt (1950), who emphasized the librarian's strategic and coordinating roles in curriculum development. Later, AASL and AECT (1975) formalized the librarian's participation in curriculum and instructional design. The concept of Cooperative Program Planning and Teaching (CPPT), introduced by Haycock in 1978 (Lee & Yoo, 2007; Mills, 1991), further underscores librarians' active involvement in instruction based on library resources. During the 1980s, the focus shifted toward integrating information literacy education into the curriculum (AASL & AECT, 1988). Loertscher, as cited in Lee (2005), emphasized that LAI, reading education, and information literacy instruction enhance students' creativity, problem-solving, and self-directed learning abilities.

Over time, the librarian's role has evolved from providing curriculum support to collaborating with subject teachers in teaching. Doll (2005) categorized librarian participation levels as Isolation, Cooperation, Coordination, and Collaboration, while Dickingson (2006) simplified them to Cooperation, Coordination, and Collaboration. At its highest level, LAI represents a fully collaborative process in which librarians and teachers jointly plan, implement, and evaluate instruction. This collaboration enables diverse learning models, such as inquiry-based, discussion-based, problem-solving, and collaborative learning to be applied flexibly, depending on group size and learning context.

2) Reading ability

Ironically, reading has become increasingly important in the digital age, where knowledge and information are mainly digitized. The human brain possesses a reading neural circuit, and due to brain plasticity (Kolb, B., Gibb, R., & Robinson, E., 1998), reading activates multiple brain areas to support understanding and memory (Brian, W., & Rosemary, L., 2017). However, excessive exposure to digital devices may contribute to attention deficits and learning disabilities in children (Im, C., & Jang, A., 2017). Maryanne (2018) emphasized that before the age of twelve, children's reading neural circuits are highly influenced by environmental factors, including the reading target (writing system and content), medium (print or screen), and reading process (education). She argued that deep reading is essential for developing independent thinking, imagination, and an internal knowledge base. Thus, reading enables children to understand the world through complex and divergent thinking processes.

Reading ability is defined as the capacity to comprehend and reconstruct an author's message through linguistic and visual texts, grounded in language, cognition, and knowledge (Yoon, C., 2010). According to Han, W., Lee, H., and Choi, H. (2007), reading ability comprises five elements: reading aloud skill, vocabulary, comprehension, reasoning, and evaluation ability. Read-aloud skill refers to accurately reading letters, words, and sentences aloud while recognizing sound-symbol correspondence. Vocabulary encompasses understanding and appropriately using words in various contexts. Comprehension involves grasping the text's flow, meaning, and main ideas. Reasoning entails inferring unstated information from explicit text content, and evaluating ability represents the critical and emotional understanding of the text, including judgment of validity, relevance, and value (Han et al., 2007).

Since Indonesia lacks a diagnostic tool to assess reading ability in lower elementary students, Professor Han Bok-Hee and 20 teachers developed the Reading Ability Assessment at the Korea Reading Clinic Center and adapted it for use in Indonesia. Based on Piaget's cognitive development theory (as cited in Suh, W., & Lee, H., 1983), reasoning and evaluating skills emerge during the formal operational stage (ages 11–12). Therefore, the assessment for second graders excludes reasoning and evaluating elements, while adding emotional and attention components. Consequently, the sub-areas of the Reading Ability Assessment include read-aloud skills, vocabulary, comprehension ability, and emotional and attentional abilities during reading.

3) Reading attitude

Reading attitude is defined as a learned tendency in which individuals consistently respond to books and reading with positive or negative reactions depending on the situation (Kang, S., & Oh, K., 2016, pp. 238–239). It comprises three elements: a cognitive element reflecting beliefs or opinions about reading, an emotional/affective element representing feelings or evaluations toward reading, and a behavioral element indicating actions or intentions to read (Ok, I., 1999). Reading attitude is considered a key determinant of reading behavior and directly influences reading intention (Center for Korean Literature & Language Education, 2006). Broadly, it encompasses the overall reading culture, including books, individuals, surrounding reading attitudes, and various reading activities.

Matthewson (2004) developed a model of reading attitude that integrates emotional and cognitive processes, identifying three key components: feelings about reading, behaviors that prepare for reading, and beliefs about reading. The model suggests that reading attitude, external motivation, and internal emotional states all influence reading behavior. Furthermore, the formation of reading attitudes varies among individuals and is shaped by four major factors: reading experience, beliefs about reading outcomes, beliefs about others' expectations, and the reading environment (Park, J., 2003).

The school reading environment, encompassing school reading policies, teachers' reading guidance, library operations, reading activities, and Library-Assisted Instruction (LAI), has been found to exert a more substantial influence on students' reading attitudes than the home environment. Based on this premise, this study aims to examine the effectiveness of LAI, which integrates traditional instruction with subject-linked reading, in enhancing students' reading attitudes. As Indonesia lacks a standardized tool for measuring reading attitude, the Reading Attitude Assessment for elementary school students, developed by Korea Reading Accreditation Reading Well Co., Ltd. (Shim, M., 2012), was adapted for local use. The assessment includes two sub-domains: reading attitude for entertainment and reading attitude for learning, and, consistent with Ok Jung-In's framework, it comprises cognitive, emotional/affective, and behavioral elements.

C. *Prior Research*

1) Indonesia

In Indonesia, discussions on the role of school libraries and the cooperative relationship between teachers and teacher-librarians began to develop after the 2000s. Sri Zulaikha (2006) categorized the functions of teacher-librarians into three areas: (1) active participation in the curriculum for information literacy instruction, (2) fostering students' reading interest and engaging in classroom learning activities, and (3) professional management of library resources and services. Although the Indonesian Ministry of Education established standards for school library staffing in 2008 through a ministerial decree, the regulations outlined only librarians' roles and duties, without addressing collaboration between librarians and subject teachers.

Isrowiyanti (2011) emphasized that elementary school libraries should support teachers and students in teaching and learning by providing diverse information resources. Mashuri (2015) noted that the concept of a teacher-librarian remains unfamiliar in Indonesia, highlighting the need for national policies and training systems to improve librarians' pedagogical competence. His research revealed that among 516,652 schools in Indonesia, 237,198 have libraries, yet only 272 employ librarians. Furthermore, many school libraries are still used merely as book storage facilities rather than as learning resource centers (jpnn.com, 2022). According to the Standards for School Librarians (Standar Tenaga Perpustakaan Sekolah/Madrasah, 2008), qualifications for school librarians range from Diploma 2 to Diploma 4 or high school graduates with short-term certified training. Mashuri (2015) thus emphasized the importance of government-level policies in enhancing librarians' educational literacy and revitalizing school libraries.

Blasius Sudarsono, as cited in Christiani, L. (2021), introduced the concept of the librarian teacher at the 2017 National Seminar in Bandung, explaining that the term refers to teachers assigned additional library duties due to reduced teaching hours. As library science departments emerged in universities, graduates assumed library management roles in schools, but their involvement remained limited to administrative tasks. Sudarsono emphasized that Indonesian librarian teachers must manage school libraries effectively and efficiently to support teaching and learning activities, aligning with international best practices.

Overall, Indonesian studies on the roles of teachers and librarians in library revitalization remain limited. Research on Library Assisted Instruction (LAI) linked to the school curriculum has not yet been conducted. Existing studies often evaluate Indonesian school libraries by comparing them with those in the U.S. and Australia, where teacher-librarian relationships have progressed from cooperation and coordination to collaboration. In contrast, research and practice in Indonesia remain primarily at the stages of cooperation and coordination.

2) South Korea

In Korea, research on Library Assisted Instruction (LAI) has been actively conducted since the 1990s. Previous studies can be categorized into three main areas: (1) the relationship between the school curriculum and the role of the school library, (2) the educational effects of LAI, and (3) reading attitude studies related to LAI.

The first group of studies focuses on the school curriculum and the role of the school library, including the level of collaboration between teachers and librarians and the design of LAI programs. Han (1995) was among the first to academically present teacher–librarian cooperation in Korea. He introduced Haycock's (1975) Cooperative Program Planning and Teaching model, framing it as a strategic concept that emphasizes teacher-librarians' participation in curriculum implementation to revitalize resource-based learning. Following this approach, Songgok Girls' High School (1999) developed an operational model that established one-to-one collaboration between teacher-librarians and subject teachers through progressive stages of cooperation, coordination, and collaboration.

Lee (2006) defined the stages of LAI as instruction preparation and planning, introduction, deployment, and arrangement, specifying the roles of teacher-librarians, subject teachers, and students at each stage. He further described LAI as a collaborative teaching-learning

approach in which teacher-librarians and subject teachers jointly design, implement, and evaluate instruction. Song (2007) analyzed reports on LAI implementation in 17 schools after 2003, identified limitations in teacher-librarians' roles as data managers, and proposed integrated curriculum development procedures. Song (2008a) further argued for integrating information literacy instruction into the curriculum, while Song (2010) proposed instructional design strategies to strengthen collaboration between teacher-librarians and subject teachers.

Subsequent research extended the applications of LAI to elementary education. Kim (2012) developed a textbook-based LAI program for fifth- and sixth-grade students, while Woo (2012) examined classroom-related LAI implementation through information literacy instruction for fourth-grade students. Overall, these studies indicate that collaboration between teacher-librarians and subject teachers in Korea evolved from simple cooperation to coordination, and ultimately to full partnership. Previous studies emphasize that teacher-librarians should participate in every stage of curriculum integration. Furthermore, researchers have developed LAI curricula and teaching-learning design models applicable to educational practice.

The second research area focuses on the educational effects of LAI. Park (2004) and Cho (2006) examined improvements in academic achievement through LAI, drawing on Baughman's (2000) findings. Park (2004), in a study involving fifth-grade elementary students, found that LAI enhanced academic performance regardless of students' initial academic level. Moreover, students with lower academic performance showed greater improvement in learning attitudes within the affective domain. Similarly, Cho (2006), who studied first-grade middle school students, confirmed that LAI positively influenced academic achievement as well as interest, confidence, and curiosity in mathematics. Park (2006) also conducted experimental research on the educational effects of LAI in elementary schools, while Lee (2004), S. G. Lee (2005), Lee (2007), and Yoo (2007) found that LAI enhanced students' self-directed learning abilities.

The third category of studies examines reading attitudes. Lee (2009) reported that first-year middle school students who received subject-related reading instruction demonstrated increased interest in science and reading. He emphasized the need for further research and the development of teaching-learning models that integrate subject-linked reading. Hyun J. Lee (2005) found that response-based reading activities using picture books had a positive impact on the reading attitudes and self-concept of high school students. Similarly, Kang and Oh (2016) demonstrated that reading education improved the self-esteem, reading attitude, and motivation of second-year high school students, leading to higher satisfaction levels.

A review of these studies indicates that no research has yet examined the educational effects of LAI in Indonesia. In contrast, research in Korea and the United States has shown that LAI can enhance academic achievement and self-directed learning skills, as well as improve reading attitudes. However, most of these studies have focused on fifth-grade elementary and second-year high school students. Considering Indonesia's educational policies, specifically the Integrated Curriculum and the School Literacy Movement, it is possible to implement both initiatives concurrently in the academic field. Therefore, it is necessary to develop LAI programs that enable teacher-librarians and teachers to collaborate on subject-related reading. Such development is crucial for fostering lifelong learning competencies in the knowledge-information era. It provides a strong rationale for conducting experimental studies on the effects of LAI in improving reading ability and attitudes, particularly among lower elementary school students.

II. Method

Research design

This quasi-experimental study tests the effectiveness of LAI by comparing the reading ability and reading attitude of the LAI group with those of the teacher-centered teaching group in a traditional classroom. In this study, the independent variable is LAI, and the control variables are the reading ability and the reading attitude.

Table 1. Experimental design of the research.

Division	pretest	test treatment	posttest
G1	O1	X1	O2
G2	O1	X2	O2

G1: Experimental group (LAI)
G2: Control group (traditional instruction)
O1: Pre-test (reading ability test, reading attitude test)
O2: Post-test (reading ability test, reading attitude test)
X1: LAI (560 minutes for 8 weeks)
X2: Traditional instruction (560 minutes for 8 weeks)

A. Research subjects

The subjects of this research comprised 22 participants in the experimental group and 22 in the control group, drawn from two second-grade classes at C Elementary School in Batu City, East Java, Indonesia. As a result of confirming the prior homogeneity of school grades that can affect the program's effectiveness, in this study, the mean pre-school grade of the experimental group was 83.68, and the mean pre-school grade of the control group was 86.32. It was confirmed that the school performance between the two groups was the same ($t = -1.68$, $p = .10$), as shown in Table 2.

Table 2. Homogeneity of pre-academic performance between experimental and control groups.

Variable	GROUP	*N*	*M*	*SD*	*t*	*P*
School Evaluation Result	Experimental	22	83.68	4.94	-	.10
	Control	22	86.32	5.45	1.68	

B. Research procedures

1) Instruction design process for LAI

The LAI instruction design process for this research was based on the instructional diagram presented by Hee OK Huh (as cited in Lee and Yoo, 2007). According to Song (2010), the model was developed based on the systematic instructional design model shown in Figure 1, which modified the instructional design strategy for collaborative teaching. The systematic instructional design model has the stages of initialization, analysis, design, development, and execution (Lee and Yoo, 2007).

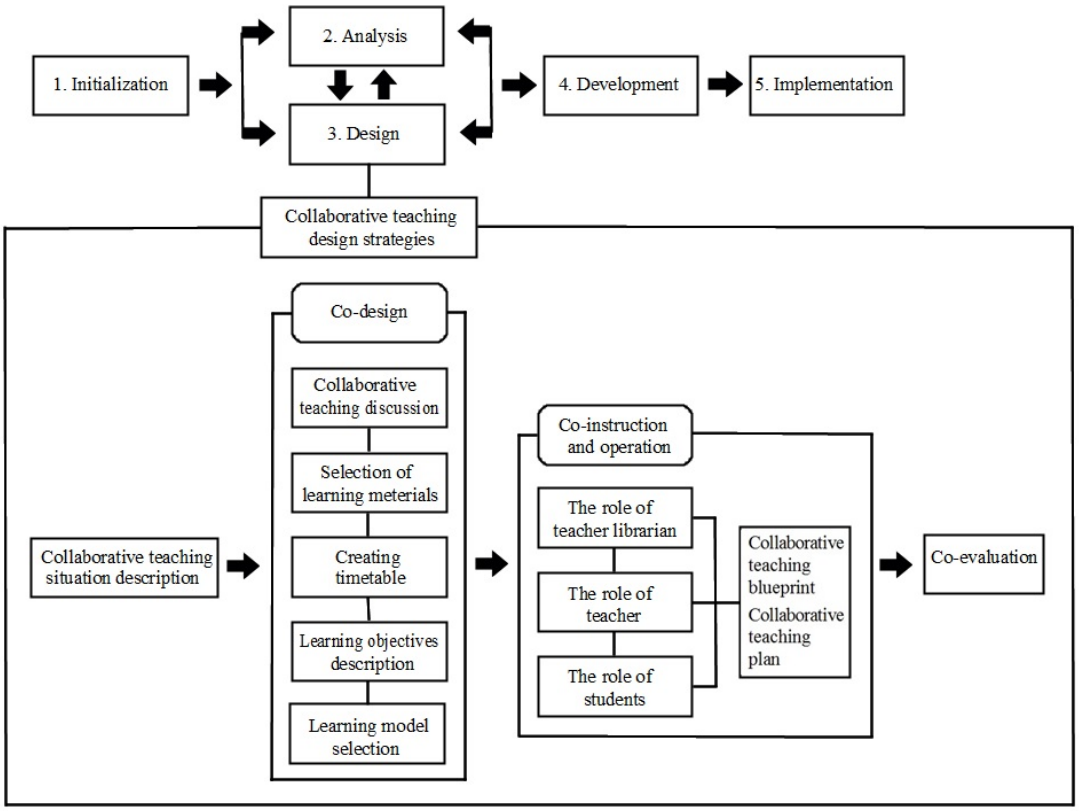

Fig. 1. Collaborative teaching design strategies and instructional design process diagram.

In the initialization stage, participants were second-grade elementary students from a school in Batu City, East Java, Indonesia. The second-grade integrated textbook Theme 3: My Daily Tasks contains four subthemes: (1) My Daily Tasks at Home, (2) My Daily Tasks at School, (3) My Duty as a Religious Person, and (4) My Tasks in Social Life. From these subthemes, eight learning topics were selected and organized into eight lessons for the experimental program. The LAI curriculum design was grounded in the 2017 revised edition of the 2013 *Buku Tematik Terpadu Kurikulum*. Learning objectives, content, target learners, classroom environment, and available materials and tools were analyzed and iteratively revised in consultation with the school's teacher-librarian, homeroom teacher, and school head.

The instructional design followed collaborative LAI principles to maximize teacher–librarian partnership. Building on Lee (2006), Song's instructional design stages (Collaborative instruction situation description, co-design, Co-instruction, and Co-Evaluation) and the resource-based, curriculum-integration approach (Song, 2010) guided the co-design process. Co-design activities included situational analysis, learner profiling, timetable development, specification of learning goals aligned with the textbook units, selection of teaching and learning methods and models, and delineation of teacher-librarian and student roles. Discussion and collaborative teaching were adopted as primary methods, complemented by small-group problem-solving sessions and whole-class presentations. The teacher-librarian and teacher jointly selected multimedia and print resources (videos, newspaper articles, and books) linked to each subtheme. Approximately 700 library titles were classified by subtheme and topic and logged for both classroom and library access. The introduction phase emphasized motivation, response solicitation, and role assignment to activate student engagement; the co-evaluation phase combined student presentations with joint feedback from teachers and the librarian. The LAI blueprint for subtheme 1 (My Daily Tasks at Home) was developed from this design process, shown in Table 3.

Table 3. Instructional Design LAI (Collaborative Teaching): Learning Plan.

		Curriculum	**'My daily task'**	**Participation Class**	**Experimental group**
Instructional Design	Inviting to Collaborative Teaching	Sub-theme 1 : 'My daily task at home'	Information Literacy Ability	Applied Step	task check, information approach, Task solution
		Learning content 4 : 'Siti helps mom with shopping'		Learning skills/abilities	make a book, Read a book, Presenting by group
		Lesson Period	2nd Grade/ semester 2	Lesson hours	70 minute
	Choice of Learning Materials	Printed Material	Textbook for 2nd grade, Kemendikbud, Revised 2017 Beaumont, E. (2019). *Saat Berbelanja.* Jakarta: BIP Parker, V. (2010). *Serba-serbi Sayuran*, Solo: Tiga Serangkai Parker, V. (2010). *Serba-serbi Buah-buahan*, Solo: Tiga Serangkai		
		Audio visual Material			
		Material from the website	* 'Anak membantu ibu belanja'. from https://www.youtube.com/watch?v=3zL9oG07_oM * 'Disuruh belanja' from https://www.youtube.com/watch?v=BZoM0CwBCmM * 'Nussa; MAKAN JANGAN ASAL MAKAN' from https://www.youtube.com/watch?v=QxbF-tXyLd4 * 'Adab Makan dan Minum|Adi & Ida' from https://www.youtube.com/watch?v=3bByrIquvr4		
		Audio-Visual educational teaching aids	Projector		
	Creating schedule	70 minute- creative collaborative time (8:40-9:50)			
	Learning objective	1. Use 'shopping and shopping' correctly in sentences. 2. Compare the prices of vegetables when shopping. 3. Knowing the tastes of friends. (Fruit and fruit juice) 4. Know shopping manners.			
	Learning model	LAI : Individual learning, small group formation and large group formation / investigative learning, discussion learning and problem solving learning.			
Collaborative Teaching	Subject Teacher	Preparation of formation tables according to each small group, evaluation table of participation in learning activities, evaluation table of the level of perfection of book making.			
	Teacher librarian	Printed Materials, Preparation of book-making materials, and Projector, Material from the website			
	Student	Make a book according to the instructions after reading the book .			
Collaborative Evaluation	Subject teacher	The level of understanding of the themes and problems, the attitude of learning participation, the level of perfection in making books.			
	Teacher librarian	Attitude of learning participation, level of perfection of book making, frequency of library use.			

To conduct experimental instruction during the development stage, the learning content and learning goals were analyzed and reconstructed within the sub-theme and learning-theme sets established during the initialization stage. As a result, the teaching-learning materials implemented over eight sessions were developed. The teacher librarian and the subject teacher jointly evaluated students' learning results. It then evaluated the learning process, assessing student participation in class and the learning products.

In the implementation stage, before class, the teacher librarian prepared books and reading materials to enhance reading ability, reading attitude, and learning outcomes, as well as audio and website materials related to the instruction. Subject-related books were distributed to students and selected one week before instruction, and placed in the classroom library. In class, based on the books related to the subject in instruction, small-group games were conducted on individual book-making, small-group book-making, newspaper-making, and book content.

2) Experimental instruction procedure

This research was conducted during the first semester of the second year in July 2019. Reading ability and reading attitude were pre-tested in 44 students, and after verifying homogeneity, 22 participants from the experimental group and 22 participants from the control group were selected. The experiment was conducted over 560 minutes for eight weeks, during which the experimental group received LAI, while the control group received traditional instruction. After the experiment, the effects of reading ability and reading attitude were analyzed by comparing pre- and post-test scores between the experimental and control groups.

3) Research tools and data analysis

Indonesia lacks standardized Reading Ability Assessment or Reading Attitude Assessment Instruments for elementary school students. Therefore, in consideration of the Indonesian situation, this study utilized the 'Reading Ability Assessment' developed by Prof. Han, Bok-Hee, designed explicitly for second-grade elementary students, and the 'Reading Attitude Assessment' created by Korea Reading Accreditation Reading Well Co., Ltd. (Shim, 2012). This test tool consists of 20 questions on a Likert 5-point scale (5 points: Always, 1 point: Not at all). The 'Reading Ability Assessment' consists of 20 questions, divided into four sub-domains: Reading Aloud Skill (3 questions), Vocabulary (3 questions), Reading Comprehension Ability (5 questions), and Emotional Concentration (9 questions).

The 'Reading Attitude Assessment' comprises 20 questions. The sub-components of The Reading Attitude for Fun (10 questions) comprise the following elements: emotional/affective (4 questions), cognitive (3 questions), and behavioral (3 questions). The Reading Attitude for Learning (10 questions) consists of an emotional/affective component (4 questions), a cognitive component (3 items), and a behavioral component (3 items).

III. Results and Discussion

A. Verification of the effect of reading ability

Before examining the effects of reading ability and reading attitude on the experimental and control groups, the prior homogeneity of the reading ability and reading attitude scores between the two groups was assessed. The preliminary examination confirmed that the variables' averages ranged from 2.64 to 3.66. In addition, skewness was from -.52 to .44 with an absolute value below 3, and kurtosis was -.99 to .87. As all variables had a value below 10, this confirmed that a normal distribution and that there was no problem in performing the independent sample t verification and ANCOVA verification, known as parameter validation.

Table 4. Descriptive statistics, normal distribution of prior reading ability, and reading attitude in the experimental group and the comparative group.

	N	*Min*	*Max*	*M*	*SD*	*Skew*	*Kurt*
Reading Aloud Skill	44	2.33	5.00	3.66	.58	.01	.16
Vocabulary	44	1.00	4.67	3.11	.83	-.29	.49
Reading Comprehension	44	1.00	4.00	2.64	.78	-.02	-.99
Emotional Concentration	44	2.33	4.56	3.30	.46	.36	.28
Reading Ability (Total)	44	1.95	4.00	3.16	.40	-.52	.87
Reading Attitude for Fun	44	1.58	5.00	3.21	.71	.20	-.10
Reading Attitude for Instruction	44	2.00	5.00	3.30	.67	.36	-.22
Reading Attitude (Total)	44	2.15	5.00	3.26	.63	.44	.01
RANGE	44	1.00~2.33	4.00~5.00	2.64~3.66	.40~.83	-.52~.44	-.99~.87

In this research, prior homogeneity was confirmed using an independent-samples t-test. If the preceding homogeneity was established, the program's effect was confirmed using an independent sample t-test in a post-hoc analysis. If prior homogeneity was not secured, ANCOVA analysis using the initial test results as a covariate was performed to confirm the program's results. The prior homogeneity test for this study is presented in Table 5.

Table 5. The experimental group and the control group's prior reading ability and reading attitude homogeneity test.

Pre Test	Group	*N*	*M*	*SD*	*T*	*P*
Reading Aloud Skill	Experimental	22	3.55	.59	-1.31	.20
	Control	22	3.77	.57		
Vocabulary	Experimental	22	3.30	.83	1.54	.13
	Control	22	2.92	.80		
Reading Comprehension	Experimental	22	2.65	.82	.11	.91
	Control	22	2.63	.76		
Emotional Concentration	Experimental	22	3.25	.49	-.61	.54
	Control	22	3.34	.44		
Reading Ability (Total)	Experimental	22	3.15	.45	-.08	.94
	Control	22	3.16	.35		
Reading Attitude for Fun	Experimental	22	3.56	.80	3.66***	.00
	Control	22	2.87	.37		
Reading Attitude for Instruction	Experimental	22	3.67	.63	4.31***	.00
	Control	22	2.93	.50		
Reading Attitude (Total)	Experimental	22	3.61	.67	4.34***	.00
	Control	22	2.91	.35		

[a.] *** p<.00

Result of the prior homogeneity test: the Reading Ability secured prior homogeneity, but the Reading Attitude did not secure prior homogeneity.

From the result of testing the homogeneity of the two groups in the pre-test of the reading ability, the experimental group (M=3.15, SD=.45) and the control group (M=3.16, SD=.35) showed no significant difference (t=-.08, p=.94). Accordingly, the two groups were judged to be homogenous. An independent-samples t-test was performed to compare post-test scores between the experimental and control groups. In Table 6, the post-test reading ability scores of the experimental group (M = 4.05, SD = .54) were higher than those of the control group (M = 3.18, SD = .36), and this difference was statistically significant (t = 6.26, p < .001).

Table 6. Verification of the pre- and post-score changes for Reading Ability of the experimental group and the control group

Variable	variable	GROUP	N	M	SD	T	P
Reading Ability	Pre Test	Experimental	2	3.1	.4	-.08	.9
			2	5	5		4
		Control	2	3.1	.3		
			2	6	5		
	Post Test	Experimental	2	4.0	.5	6.26*	.0
			2	5	4	**	0
		Control	2	3.1	.3		
			2	8	6		

b. *** p<.001

The results of the homogeneity test for Reading Aloud Skill in the pre-test indicated no significant difference between the experimental group (M = 3.55, SD = 0.59) and the control group (M = 3.77, SD = 0.57), t(?) = –1.31, p = 20. Therefore, the two groups were considered homogeneous before the intervention. To examine differences in performance following the treatment, an independent-samples t-test was conducted to compare the post-test scores of the experimental and control groups. As presented in Table 7, the post-test mean score for the experimental group (M = 4.27, SD = 0.64) was significantly higher than that of the control group (M = 3.35, SD = 0.49), t(?) = 5.39, p < .001. This finding suggests that the intervention had a positive, statistically significant effect on students' reading-aloud skills.

From the result of verifying the homogeneity of the two groups in the vocabulary pre-test, the experimental group (M=3.30, SD=.83) and the control group (M=2.92, SD=.80) had no significant difference (t=1.54, p=.13). Thus, the two groups were judged to be homogenous. An independent t-test was performed to compare the post-test scores between the experimental and control groups. The following table compares vocabulary changes among elementary school students by group. As shown in Table 8, the post-test vocabulary scores of the experimental group (M = 3.94, SD = .66) were higher than those of the control group (M = 3.24, SD = .64), and this difference was statistically significant (t = 3.56, p < .001).

Table 7. Verification of pre- and post-score changes for the Reading Aloud skill of the experimental group and the control group

Variable	Variable	Group	N	M	SD	t	P
Reading Aloud Skill	Pre Test	Experimental	2	3.5	.5	-1.31	.2
			2	5	9		0
		Control	2	3.7	.5		
			2	7	7		
	Post Test	Experimental	2	4.2	.6	5.39*	.0
			2	7	4	**	0
		Control	2	3.3	.4		
			2	5	9		

c. *** p<.001

Table 8. Verification of pre- and post-score changes for the Vocabulary of the experimental group and the control group.

Variable	variable	Group	N	M	SD	t	p
Vocabulary	Pre Test	Experimental	2	3.3	.8	1.54	.1
			2	0	3		3
		Control	2	2.9	.8		
			2	2	0		
	Post Test	Experimental	2	3.9	.6	3.56*	.0
			2	4	6	**	0
		Control	2	3.2	.6		
			2	4	4		

d. *** p<.001

The results of the homogeneity test for Reading Comprehension in the pre-test indicated no significant difference between the experimental group (M = 2.65, SD = 0.82) and the control group (M = 2.63, SD = 0.76), t(?) = 0.11, p = .91. This finding confirms that the two groups were homogeneous before the intervention. Therefore, the two groups were homogeneous. An independent-samples t-test was conducted to compare post-test scores between the experimental and control groups. The following table compares the Reading Comprehension of elementary school students by group. In Table 9, the post-test score for Reading Comprehension in the experimental group (M = 3.99, SD = .75) was higher than that of the control group (M = 2.69, SD = .72). This difference was statistically significant (t = 5.84, p < .001).

Table 9. Verification of the difference in Reading Comprehension between the experimental group and the control group

Variable	variable	GROUP	*N*	*M*	*SD*	*t*	*p*
Reading Comprehension	PRE TEST	Experimental	2	2.6	.8	.11	.9
			2	5	2		1
		Control	2	2.6	.7		
			2	3	6		
	POST TEST	Experimental	2	3.9	.7	5.84	.0
			2	9	5	***	0

Variable	variable	GROUP	N	M	SD	t	p
		Control	22	2.69	.72		

e. *** p<.001

The results of the homogeneity test for Emotional Concentration in the pre-test indicated no significant difference between the experimental group (M = 3.25, SD = 0.49) and the control group (M = 3.34, SD = 0.44), t(?) = – 0.61, p = .54. Therefore, the two groups were considered homogeneous before the intervention. To examine the effects of the treatment, an independent-samples t-test was conducted to compare the post-test scores of the experimental and control groups. The results are presented in the following table, which illustrates the changes in Emotional Concentration among elementary school students by group. In Table 10, the post-test score of Emotional Concentration for the experimental group (M = 4.04, SD = .61) was higher than that of the control group (M = 3.37, SD = .46), and this difference was statistically significant (t = 4.12, p < .001).

Table 10. Verification of pre- and post-score changes for Emotional Concentration in the experimental group and the control group.

Variable	variable	GROUP	N	M	SD	t	P
Emotional concentration	PRE TEST	Experimental	22	3.25	.49	-.61	.54
		Control	22	3.34	.44		
	POST TEST	Experimental	22	4.04	.61	4.12***	.00
		Control	22	3.37	.46		

f. *** p<.001

B. Verification of the effect of reading attitude

The Reading Attitude showed a higher mean in the experimental group (M = 3.61, SD = .67) than in the control group (M = 2.91, SD = .35) in the pre-test. In the post-test, the experimental group also showed a higher mean than the control group. Since homogeneity was not ensured in the pre-test results, the posterior mean with the pre-score adjusted as a covariate was checked. The results showed that the adjusted mean of the experimental group (M = 3.66, SE = .05) was higher than that of the control group (M = 3.22, SE = .05). In Table 11, the difference between the groups was statistically significant after controlling for the prior score in the post-test scores for Reading Attitude Total (F = 28.180, p < .001).

In the pre-test for the Reading Attitude for Fun test, the experimental group (M=3.56, SD=.80) showed a higher mean than the control group (M=2.87, SD =.37). For the post-test the experimental group (M=3.93, SD=.53) also showed a higher mean than the control group (M=2.95, SD=.33). Since homogeneity was not ensured in the pre-test results, the posterior mean adjusted with the pre-score as a covariate was checked. The results showed that the adjusted mean of the experimental group (M = 3.74, SE = 0.06) was higher than that of the control group (M = 3.14, SE = 0.06). In Table 13, the mean difference between the groups was statistically significant after controlling for prior post-test Reading Attitude for Fun scores (F = 39.383, p < .001).

Table 11. Pre-post scores and adjusted post-test scores for Reading Attitude in the experimental group and the control group

variable	GROUP	N	Pretest	Post test	Estimated Marginal
			M(SD)	M(SD)	M(SE)
Reading Attitude	Experimental	22	3.61(.67)	3.93(.56)	3.66(.05)
	Control	22	2.91(.35)	2.95(.34)	3.22(.05)

Table 12. Covariate analysis results for Reading Attitude in the experimental group and the control group.

Variable	Source	Type III Sum of Squares	df	Mean Square	F	p
Reading Attitude	Reading Attitude	6.778	1	6.778	126.118***	.000
	GROUP	1.514	1	1.514	28.180***	.000
	Error	2.203	41	.054		
	Total	19.389	43			

g. *** p<.001

Table 13. Pre-post scores and adjusted post-test scores for Reading Attitude for fun in the experimental group and control group

variable	Group	N	Pretest	Post test	Estimated Marginal
			M(SD)	M(SD)	M(SE)
Reading Attitude for Fun	Experimental	22	3.56 (.80)	3.93 (.53)	3.74 (.06)
	Control	22	2.87 (.37)	2.95 (.33)	3.14 (.06)

In the pre-test assessing Reading Attitude for Instruction, the experimental group (M = 3.67, SD = 0.63) demonstrated a higher mean score than the control group (M = 2.93, SD = 0.50), indicating a more positive initial disposition toward instructional reading activities. Following the intervention, the post-test results showed a continued advantage for the experimental group (M = 3.91, SD = 0.67) compared to the control group (M = 2.96, SD = 0.45), suggesting an overall improvement in reading attitude. However, because homogeneity of variance was not established in the pre-test scores, an analysis of covariance (ANCOVA) was conducted to control for pre-existing differences. After adjusting for the pre-test scores as a covariate, the experimental group maintained a higher adjusted mean (M = 3.61, SE = 0.08) than the control group (M = 3.26, SE = 0.08). This result indicates that even after statistical adjustment, the experimental group's reading attitude improved more substantially, underscoring the effectiveness of the instructional approach employed in the treatment condition, as shown in Table 14.

Table 14. Covariate analysis results for Reading Attitude for fun in the experimental group and the control group.

Variable	Source	Type III Sum of Squares	df	Mean Square	F	P
Reading Attitude for Fun	Reading Attitude for Fun	4.96	1	4.96	65.88***	.00
	GROUP	2.97	1	2.97	39.38***	.00
	Error	3.09	41	.08		
	Total	18.53	43			

h. *** p<.001

Table 15. Pre-post scores and adjusted post-test scores for Reading Attitude for Instruction in the experimental group and the control group

variable	Group	N	Pretest	Post test	Estimated Marginal
			M(SD)	M(SD)	M(SE)
Reading Attitude for Instruction	Experimental	22	3.67 (.63)	3.91 (.67)	3.61 (.08)
	Control	22	2.93 (.50)	2.96 (.45)	3.26 (.08)

In Table 16, the mean difference between groups was statistically significant after controlling for the influence of the prior score on the post-test scores for Reading Attitude for Instruction (F = 8.326, p < .01).

Table 16. Covariate analysis results for Reading Attitude for Instruction in the experimental group and control group.

Variable	Source	Type III Sum of Squares	df	Mean Square	F	p
Reading Attitude for Instruction	Reading Attitude for Instruction	9.232	1	9.232	85.089***	.000
	GROUP	.903	1	.903	8.326**	.006
	Error	4.448	41	.108		
	Total	23.677	43			

IV. Conclusion

Descriptive statistics indicated that reading ability and reading attitude scores approximated a normal distribution, permitting parametric analyses. A pretest comparison of school performance revealed no significant difference between groups (experimental M = 83.68, control M = 86.32; t = −1.68, p = .10), indicating baseline equivalence in academic achievement. Pretest homogeneity testing for the outcome variables revealed that reading ability was homogeneous across groups (t = −0.08, p = .94), whereas reading attitude was not. For reading ability, an independent-samples t-test on posttest scores showed a statistically significant advantage for the experimental group (M = 4.05, SD = 0.54) relative to the control group (M = 3.18, SD = 0.36; t = 6.26, p < .001), indicating a strong effect of the LAI on reading ability. For reading attitude, because pretest scores were not homogeneous, an ANCOVA was performed with the pretest as a covariate. ANCOVA results showed a statistically significant group effect (F = 28.18, p < .001). Adjusted posttest means controlling for pretest differences were higher for the experimental group (adjusted M = 3.66, SE = 0.05) than for the control group (adjusted M = 3.22, SE = 0.05), indicating a significant positive effect of LAI on reading attitude. The library-assisted Instruction program, which implemented subject-related reading through collaborative teacher–librarian design, produced substantial improvements in both reading ability and reading attitude among second-grade students. The experimental intervention yielded higher posttest reading ability scores and adjusted reading attitude scores than conventional instruction. These findings support the

effectiveness of curriculum-linked, collaborative LAI for enhancing early elementary students' reading competence and affective disposition toward reading.

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