

Transforming Social Studies Learning through Flipbook-Based Electronic Textbooks to Strengthen Students' 6C Skills

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ABSTRACT

This study aims to analyze the effectiveness of using flipbook-based e-textbooks on 21st-century skills (6C) and student learning outcomes in Phase B Social Studies at the elementary school level. The study employed a quantitative approach using a pretest-posttest control group quasi-experimental design. The research sample consisted of 72 fourth-grade students from two elementary schools in Jambi City, divided into an experimental group and a control group. Data collection was conducted through tests, observations, and documentation, while data analysis utilized descriptive statistics, prerequisite tests, the Independent Samples t-test, the Mann-Whitney U Test, and N-Gain. The results showed that the use of flipbook-based e-textbooks had a significant effect on the 6C skills simultaneously (Sig. = 0.000), with all aspects of the 6C skills showing a significant improvement. Furthermore, the learning outcomes of students in the experimental group were better than those in the control group, although the effectiveness varied across schools. This study concludes that flipbook-based e-textbooks effectively support the implementation of the Merdeka Curriculum by improving learning outcomes and developing students' 6C skills in elementary schools.



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INTRODUCTION

The Programme for International Student Assessment (PISA) 2022 report revealed that Indonesian students' performance in reading literacy, mathematics, and science remained below the average of OECD countries. This condition indicates that students' higher-order thinking abilities, including 21st-century skills, still require substantial improvement from the elementary education level (OECD, 2023). Within the context of the Merdeka Curriculum, the development of the 6C competencies critical thinking, creativity, communication, collaboration, character, and citizenship has become increasingly important, as students are expected not only to acquire knowledge but also to think critically, collaborate effectively, communicate efficiently, and demonstrate strong character

and responsible citizenship. Therefore, the learning process requires innovative instructional approaches that can support the integrated development of these competencies.

Flipbook-based electronic textbooks offer the potential to create more interactive learning experiences by integrating text, images, videos, animations, and learning activities into a single digital platform. Previous studies have demonstrated that the use of flipbooks can enhance student engagement, facilitate conceptual understanding, and promote more independent, student-centered learning (Cahyono, 2023; Diniyati et al., 2024; Pratiwi et al., 2025; Yuni et al., 2025). These characteristics make flipbooks particularly suitable for Social Studies (IPS) instruction, which requires students not only to understand social phenomena but also to develop critical thinking, communication, collaboration, and problem-solving skills.

Nevertheless, a review of previous studies reveals several research gaps. Most studies on flipbook-based learning materials have primarily focused on their validity, practicality, or effectiveness in improving a single dimension of 21st-century skills, such as critical thinking, while comprehensive investigations of their effectiveness in enhancing all six dimensions of the 6C framework remain limited. Furthermore, research on the application of flipbooks in elementary Social Studies (IPS) education has rarely incorporated the dimensions of character and citizenship as integral components of 21st-century competencies. These limitations highlight the need for empirical research examining the effectiveness of flipbook-based electronic textbooks in fostering the comprehensive development of all six dimensions of the 6C framework simultaneously (Aprilia, 2021; Shaltina et al., 2026).

Based on these research gaps, this study aims to analyze the effectiveness of flipbook-based electronic textbooks in enhancing students' 6C skills in Phase B Social Studies (IPS) at the elementary school level. A quasi-experimental design employing a nonequivalent control group pretest–posttest approach was adopted to compare the development of students' 6C skills between those who learned using flipbook-based electronic textbooks and those who received conventional instruction. This approach is expected to provide empirical evidence regarding the effectiveness of flipbook-based electronic textbooks in fostering the comprehensive development of students' 21st-century skills.

This study contributes to the advancement of digital learning research in elementary education by extending the focus from merely examining the validity and practicality of instructional media to evaluating their effectiveness in enhancing all six dimensions of 21st-century skills simultaneously. In addition to strengthening the empirical evidence on the use of flipbook-based electronic textbooks in Social Studies (IPS) instruction, the findings are expected to serve as a valuable reference for teachers and schools in developing more innovative, interactive, and pedagogically effective digital teaching materials that align with the implementation of the Merdeka Curriculum and support the comprehensive development of students' 6C competencies.

LITERATURE REVIEW

This study is grounded in learning theory as its grand theory, which explains the process through which students acquire knowledge, skills, and attitudes through interactions with their learning environment. The conceptual framework is based on three major learning perspectives: behaviorism, cognitivism, and constructivism (Wahab & Rosnawati, 2021). Behaviorism views learning as a change in behavior resulting from stimulus–response interactions, making it relevant for fostering positive learning habits. Cognitivism emphasizes mental processes as the core of learning, whereby students process, organize, and integrate new information with their existing knowledge. Meanwhile, constructivism posits that knowledge is actively constructed through experience, exploration, and social interaction. Collectively, these three theoretical perspectives provide

a comprehensive foundation for explaining how flipbook-based electronic textbooks facilitate active, meaningful, and student-centered learning, thereby supporting the development of students' 21st-century skills.

As the middle-range theory, this study is based on the concepts of flipbook-based electronic textbooks and 21st-century skills (6C). Flipbook-based electronic textbooks are regarded as an innovative form of digital instructional material that integrates text, images, videos, animations, and interactive features to enhance the quality of students' learning experiences. In the context of Social Studies (IPS) instruction, flipbooks function not only as a medium for delivering learning content but also as a tool that promotes exploration, communication, collaboration, and self-directed learning in accordance with the principles of the Merdeka Curriculum (Cahyono, 2023; Diniyati et al., 2024; Pratiwi et al., 2025; Yuni et al., 2025). The dependent variable in this study is the 6C framework, comprising critical thinking, creativity, communication, collaboration, character, and citizenship. These six interrelated competencies are considered key indicators of successful 21st-century learning, as they reflect students' higher-order thinking abilities, social competencies, character development, and civic responsibility (Astuti, 2024).

A review of previous studies indicates that the use of digital media and innovative instructional approaches has positively influenced the development of students' competencies; however, several research gaps remain. Ekamaida et al., (2026) employed a quasi-experimental nonequivalent control group pretest–posttest design and found that STEM–Biology integrated physics instruction effectively improved students' 21st-century skills, with the experimental group achieving a higher N-gain score than the control group. Although this study shares methodological similarities with the present research in terms of its experimental design and quantitative analysis, it focused exclusively on the 4C competencies in physics education and did not encompass the dimensions of character and citizenship. Likewise, Shaltina et al., (2026) demonstrated through a quasi-experimental study that the Word Square learning model significantly improved students' reading abilities compared with conventional instruction. While the methodological approach of their study supports the use of an experimental design in the present research, its scope was limited to reading achievement rather than the comprehensive development of the 6C competencies.

Aprilia, (2021) demonstrated that a contextual flipbook-based learning medium significantly improved students' critical thinking skills through a quasi-experimental approach. However, the study examined only one dimension of 21st-century competencies, critical thinking, and therefore did not provide a comprehensive understanding of students' holistic competency development. Hikmawati et al., (2024) through a literature review, concluded that the use of e-books enhances students' learning motivation, accessibility, and learning autonomy; however, the study did not empirically evaluate the effectiveness of the instructional medium. Similarly, Nurhayati et al., (2024) emphasized, based on a literature review, the importance of 4C skills in Social Studies (IPS) instruction, yet their framework did not incorporate the dimensions of character and citizenship as integral components of 21st-century competencies. Furthermore, Lestari et al., (2024) employed a qualitative field research approach and found that 6C skills could be fostered through Islamic Religious Education at the senior high school level. Nevertheless, these findings cannot be readily generalized to the context of elementary Social Studies (IPS) instruction or to learning environments utilizing flipbook-based instructional media.

Based on the foregoing review, several theoretical and empirical research gaps remain. From a theoretical perspective, most previous studies have focused primarily on the development of 4C competencies or have examined only a single dimension of 21st-century skills, thereby failing to incorporate character and citizenship as integral components of the broader 6C competency framework. From an empirical perspective,

research on flipbook-based electronic textbooks has largely emphasized their validity, practicality, or effectiveness in improving learning outcomes and critical thinking skills, whereas quantitative investigations examining their effectiveness in fostering the comprehensive development of all six dimensions of the 6C framework in elementary Social Studies (IPS) education remain limited. Furthermore, few studies have evaluated the effectiveness of flipbook-based electronic textbooks using a quasi-experimental design within the context of implementing the Merdeka Curriculum for Phase B students in elementary schools.

This study offers a more specific contribution than simply extending the 4C framework to 6C. First, it evaluates a previously developed flipbook-based electronic textbook in an authentic Phase B Social Studies setting rather than focusing only on product validity or practicality. Second, it examines six competency dimensions critical thinking, creativity, communication, collaboration, character, and citizenship within one empirical quasi-experimental study, thereby connecting cognitive, social, character, and civic outcomes. Third, in contrast to [Ekamaida et al., \(2026\)](#), whose quasi-experimental study examined 4C skills in a STEM–Biology/physics context, the present study investigates the integrated 6C framework in elementary Social Studies and compares implementation across two school contexts. The contribution should therefore be understood as contextual and integrative rather than as a claim that flipbook-based learning or quasi-experimental methodology is itself novel.

METHODS

Research Design

This study employed a quantitative approach using a quasi-experimental method with a Nonequivalent Control Group Pretest–Posttest Design. A quantitative approach was selected because the study aimed to examine the effectiveness of flipbook-based electronic textbooks in improving students' 6C competencies and Social Studies learning outcomes through numerical data analyzed using statistical techniques. The quasi-experimental design was chosen because random assignment of participants was not feasible, as the classes had been predetermined by the schools before the study was conducted. Accordingly, the research compared an experimental group and a control group by administering pretests and posttests to objectively measure changes in students' learning outcomes. This design is considered appropriate for research conducted in authentic classroom settings, as it maintains a reasonable level of internal validity despite the absence of randomization ([Shaltina et al., 2026](#); [Sugiyono, 2024](#)).

Research Target/Subject

The study was conducted at two elementary schools in Jambi City, namely Elementary School 19/IV Jambi City and Elementary School 1 Jambi City, both of which have implemented the Merdeka Curriculum and possess adequate instructional facilities to support the use of digital learning media. The research was carried out according to the schedule specified in the research plan during the designated year of implementation.

The study population comprised 613 fourth-grade students, including 267 students from Elementary School 19/IV Jambi City and 346 students from elementary school 1 Jambi City. The sample was selected using a purposive sampling technique based on the characteristics of Phase B students under the Merdeka Curriculum, who had already developed the ability to read, comprehend information, and utilize digital instructional materials, making them suitable for the objectives of the study. The final sample consisted of 72 students from four classes: Classes IVA and IVB at Elementary School 19/IV Jambi

City (19 students in each class) and Classes IVA and IVB at Elementary School Pertiwi 1 Jambi City (17 students in each class).

The use of purposive sampling and intact classes without individual random assignment may introduce selection bias, as the experimental and control groups may have differed in characteristics beyond academic pretest scores. To minimize this threat, participants were selected from the same grade level and Phase B under the Merdeka Curriculum, while both groups followed the same learning objectives and assessment procedures using the same pretest and posttest instruments. Nevertheless, because random assignment was not applied, pre-existing differences between classes cannot be completely ruled out. Therefore, the findings are interpreted as differences between groups associated with the intervention rather than as definitive causal effects.

Research Procedure

The research instruments consisted of pretest–posttest assessments, 6C skills observation sheets, and documentation. The observation instrument was developed based on the six dimensions of 21st-century skills critical thinking, creativity, communication, collaboration, character, and citizenship which were operationalized into 20 assessment indicators using a four-point Likert scale. Prior to data collection, the instruments underwent expert validation, followed by validity testing using the Pearson Product–Moment correlation. Instrument reliability was assessed using the Split-Half method and corrected with the Spearman-Brown formula (Dianova & Anwar, 2024; Sugiyono, 2024).

Instruments and Data Collection Techniques

The research instruments consisted of a learning achievement test, 6C skills observation sheets, and expert validation forms. The achievement test was administered as both a pretest and a posttest to measure students' mastery of Social Studies (IPS) content, while the observation sheets were used to assess the development of students' 21st-century skills (6C) throughout the learning process. All instruments underwent expert validation prior to implementation and were subsequently evaluated for validity, reliability, item difficulty, and discrimination indices to ensure their appropriateness for data collection. The variables measured in this study included:

1. Dependent Variable (Y_1): The 6C skills were assessed using an observation sheet consisting of 30 operational indicators covering critical thinking, creativity, communication, collaboration, character, and citizenship. The observation was conducted by the researcher as the sole observer during the learning process in both the experimental and control classes. The researcher used the same observation instrument, operational definitions, and four-point scoring criteria Highly Demonstrated (4), Demonstrated (3), Less Demonstrated (2), and Not Demonstrated (1) across all classes to maintain consistency in the assessment process. Each indicator was scored based on the extent to which the observed behavior was demonstrated by the students during the learning activities. Likert scale:
2. Dependent Variable (Y_2): Social Studies (IPS) Learning Outcomes. Learning outcomes were measured using an objective achievement test administered before the intervention (pretest) and after the intervention (posttest) to determine students' improvement in mastering Social Studies content. The test blueprint was developed based on the learning outcomes and learning objectives of Phase B under the Merdeka Curriculum and was examined for validity, reliability, item difficulty, and discrimination power before being used in the study.

3. Independent Variable (X): Use of Flipbook-Based Electronic Textbooks. The treatment variable consisted of implementing flipbook-based electronic textbooks in Social Studies instruction for the experimental group, whereas the control group received conventional instruction using the standard instructional materials prepared by the teachers.

Data were collected through achievement tests and classroom observations. The achievement test was administered twice, namely before the intervention (pretest) and after the intervention (posttest). Classroom observations were conducted throughout the instructional process to monitor the development of each dimension of the 6C competencies based on the predetermined assessment indicators. Documentation served as supporting data and included instructional materials, student attendance lists, and records of research activities.

Data analysis technique

Data analysis was conducted using descriptive and inferential statistics. Prerequisite tests included normality and homogeneity tests prior to hypothesis testing. Differences between the experimental and control groups were analyzed using the Independent Samples t-test or the Mann-Whitney U test, depending on the characteristics of the data distribution. For the Mann-Whitney U test, effect size estimates and 95% confidence intervals were also considered to provide information regarding the magnitude and precision of between-group differences. All statistical analyses were performed using IBM SPSS Statistics.

The effectiveness of the flipbook-based e-textbooks was assessed using the normalized gain (N-Gain), which was calculated from the pretest and posttest scores for each student. The N-Gain results were used descriptively to determine the level of improvement and to classify the effectiveness of the intervention based on the established N-Gain categories. In this study, N-Gain was used as a descriptive measure of learning improvement rather than as the primary basis for inferential hypothesis testing. Therefore, differences in mean N-Gain between the experimental and control groups were interpreted descriptively in conjunction with the inferential results of the posttest comparison. This approach was used to describe the magnitude of students' learning improvement following the intervention while avoiding interpreting N-Gain category differences alone as evidence of statistically significant differences.

FINDINGS AND DISCUSSION

Findings

Descriptive Statistics

Descriptive statistics were employed to provide an overview of students' learning outcomes before (pretest) and after (posttest) the instructional intervention, as well as their achievement in 21st-century skills (6C) across the experimental and control groups. The descriptive analysis included the sample size (N), minimum score, maximum score, mean, and standard deviation (SD). This analysis was conducted to identify the general trends in the improvement of students' learning outcomes and 6C competencies following the implementation of the flipbook-based electronic textbook prior to conducting inferential statistical analyses.

Table 1. Descriptive Statistics on Student Learning Outcomes

Variable	N	Min	Max	Mean	SD
Elementary School 19/IV Jambi City					
Experimental Class Pretest	19	50	85	69,74	11,723
Experimental Class Posttest	19	85	100	96,05	4,275
Control Class Pretest	19	50	90	69,47	9,559
Control Class Posttest	19	75	100	86,84	8,201
Elementary School Pertiwi 1 Jambi City					
Experimental Class Pretest	17	40	85	64,71	12,180
Experimental Class Posttest	17	75	100	89,12	7,952
Control Class Pretest	17	20	90	63,82	18,752
Control Class Posttest	17	75	100	86,76	8,828

Based on table 1, the average pretest scores between the experimental and control classes at both schools were relatively similar, indicating that the students' initial abilities were at nearly the same level before the intervention was administered. At Elementary School 19 in Jambi City, the average pretest score for the experimental class was 69.74, while that for the control class was 69.47. Similarly, at Elementary School Pertiwi 1 in Jambi City, the average pretest score for the experimental class was 64.71 and for the control class was 63.82.

Following the learning process, there was an increase in posttest scores across all groups. However, the increase in the experimental class was higher than that in the control class at both schools. At Elementary School 19 in Jambi City, the experimental class's average posttest score reached 96.05, higher than the control class's score of 86.84. Meanwhile, at Pertiwi 1 Elementary School in Jambi City, the average posttest score for the experimental class was 89.12, while that of the control class was 86.76. These descriptive statistical results indicate that learning using flipbook-based e-textbooks tends to yield better learning outcomes than learning using conventional teaching materials.

Table 2. Descriptive Statistics on Students' 6C Skills

Aspect	Class	Mean	SD	Min	Max
Critical Thinking	Elementary school 19 experiment	74,56	8,55	62	83
	Elementary school 19 control	64,04	11,12	50	82
	Elementary school pertiwi 1 experiment	75,78	9,28	63	92
	Elementary school pertiwi 1 control	69,22	13,23	52	92
Creativity	Elementary school 19 experiment	75,00	8,56	60	83
	Elementary school 19 control	63,60	9,46	50	81
	Elementary school pertiwi 1 experiment	77,63	7,82	58	90
	Elementary school pertiwi 1 control	62,55	10,18	50	88
Collaboration	Elementary school 19 experiment	61,05	6,53	50	73
	Elementary school 19 control	54,30	6,46	43	68
	Elementary school pertiwi 1 experiment	74,22	7,91	63	87
	Elementary school pertiwi 1 control	61,27	8,93	50	82
Communication	Elementary school 19 experiment	77,63	8,36	64	92
	Elementary school 19 control	63,16	11,49	50	83
	Elementary school pertiwi 1 experiment	74,73	9,24	50	89
	Elementary school pertiwi 1 control	62,92	10,70	53	86
Character	Elementary school 19 experiment	77,30	8,97	61	91
	Elementary school 19 control	69,41	6,48	60	84
	Elementary school pertiwi 1 experiment	77,18	11,98	58	94
	Elementary school pertiwi 1 control	66,24	8,40	52	82
Citizenship	Elementary school 19 experiment	78,77	7,99	58	92
	Elementary school 19 control	72,81	4,45	65	80

Aspect	Class	Mean	SD	Min	Max
	Elementary school pertiwi 1 experiment	75,98	7,95	67	90
	Elementary school pertiwi 1 control	68,63	9,21	58	88

Based on Table 2, the experimental groups at both schools consistently achieved higher average scores than the control groups across all aspects of the 6C skills—namely, critical thinking, creativity, collaboration, communication, character, and citizenship. These findings indicate that the use of flipbook-based e-textbooks not only contributes to improved learning outcomes but also supports the development of students' 21st-century skills.

In terms of critical thinking, the average scores for the experimental group ranged from 74,56 to 75,78, while those for the control group ranged from 64.04 to 69.22. The creativity aspect also showed a fairly clear difference, with the experimental group's average ranging from 75,00 to 77,63 higher than the control group's range of 62.55–63.60. The same pattern was observed in the aspects of communication, character, and citizenship, where all experimental groups achieved higher average scores than the control group.

The most striking difference was observed in the aspect of collaboration, particularly at Pertiwi 1 Elementary School in Jambi City, where the experimental group scored an average of 74,22, while the control group scored only 61,27. Overall, the descriptive statistics show that students who learned using flipbook-based e-textbooks tended to achieve better 6C skills than students who participated in learning using conventional teaching materials. These findings were further confirmed through inferential statistical testing in the normality, homogeneity, and hypothesis testing stages.

After presenting the results of the descriptive statistical analysis for each of the 6C Skills indicators (Character, Citizenship, Critical Thinking, Creativity, Collaboration, and Communication), a comprehensive (simultaneous) descriptive statistical analysis was then conducted. This simultaneous analysis aims to provide a comprehensive overview of the profile of students' 6C Skills achievement in the Social Studies Phase B curriculum in elementary school, both in the experimental class using flipbook-based e-textbooks and in the control class using conventional textbooks. A summary of the simultaneous descriptive statistical results for the 6C Skills is presented in Table 3.

Table 3. Descriptive Statistics for the 6C Skills Simultaneously

Group	N	Mean	Std. Deviation	Minimum	Maximum
Experiment	36	74,93	7,489	61	87
Control	36	64,83	7,815	54	85

Based on Table 3, it can be seen that the number of students in each group was 36. The experimental class achieved a simultaneous mean score of 74,93 for 6C skills, while the control class achieved a mean score of 64,83. The difference of 10,10 points indicates that students in the experimental class demonstrated higher proficiency in 6C skills compared to students in the control class after completing the learning process.

Based on the data distribution, the experimental class had a standard deviation of 7.489, while the control class had a standard deviation of 7.815. These relatively close standard deviation values indicate that the variation in scores between the two groups is not significantly different. This suggests that the distribution of students' abilities in both classes is relatively homogeneous, although the experimental class showed a tendency toward higher learning outcomes.

The range of scores obtained also revealed differences in achievement between the groups. In the experimental class, the lowest score obtained by students was 61 and the highest was 87, while in the control class, the lowest score was 54 and the highest was 85. The higher minimum score in the experimental class indicates that nearly all students were able to achieve a higher level of 6C proficiency compared to students in the control class.

These overall results for the 6C skills, analyzed simultaneously, indicate that the use of flipbook-based e-textbooks tends to improve students' 6C skills compared to learning that uses conventional teaching materials. Although descriptive statistics cannot yet be used to conclude that there is a statistically significant difference, these results provide an initial indication that the experimental class performed better across all aspects of the 6C skills. Therefore, inferential testing through prerequisite tests and hypothesis testing is needed to determine whether these differences in means are statistically significant.

Instrument Validity and Reliability

Validity testing was conducted to determine whether each item adequately measured the intended construct. The validity test was performed on the pretest and posttest instruments, and the results were evaluated based on the correlation coefficient and significance value. A significant correlation indicates that an item has an adequate relationship with the overall measurement and can therefore be considered suitable for use in the instrument. The results of the validity testing for each item of the pretest and posttest instruments are presented in Table 4.

Table 4. Instrument Validity Test Results

No.	Pretest r (Sig.)	Interpretation	Posttest r (Sig.)	Interpretation
1	0.678 (0.003)	High	0.652 (0.005)	High
2	0.525 (0.030)	Moderate	0.692 (0.002)	High
3	0.656 (0.004)	High	0.686 (0.002)	High
4	0.514 (0.035)	Moderate	0.697 (0.002)	High
5	0.514 (0.035)	Moderate	0.660 (0.004)	High
6	0.648 (0.005)	High	0.678 (0.001)	High
7	0.626 (0.007)	High	0.688 (0.003)	High
8	0.820 (0.001)	Very High	0.827 (0.001)	Very High
9	0.734 (0.001)	High	0.643 (0.005)	High
10	0.678 (0.003)	High	0.631 (0.007)	High
11	0.525 (0.030)	Moderate	0.611 (0.009)	High
12	0.656 (0.004)	High	0.546 (0.024)	Moderate
13	0.575 (0.016)	Moderate	0.697 (0.002)	High
14	0.757 (0.001)	High	0.660 (0.004)	High
15	0.557 (0.020)	Moderate	0.768 (0.001)	High
16	0.787 (0.001)	High	0.668 (0.003)	High
17	0.677 (0.003)	High	0.697 (0.002)	High
18	0.575 (0.016)	Moderate	0.780 (0.001)	High
19	0.514 (0.035)	Moderate	0.592 (0.012)	Moderate
20	0.648 (0.005)	High	0.765 (0.001)	High

As presented in Table 4, all 20 items of both the pretest and posttest instruments obtained significance values below 0.05, indicating that all items met the statistical criterion for validity. For the pretest instrument, the correlation coefficients ranged from 0.514 to 0.787. Most items were categorized as having high validity, while items 2, 4, 5, 11, 13, 15, 18, and 19 were categorized as moderate. The highest pretest correlation coefficient was obtained by item 16 ($r = 0.787$; $p = 0.001$), whereas the lowest was obtained by item 4 ($r = 0.514$; $p = 0.035$).

The posttest instrument also demonstrated acceptable validity across all 20 items. The correlation coefficients ranged from 0.546 to 0.827, with most items categorized as high and two items, namely items 12 and 19, categorized as moderate. Item 8 produced the highest correlation coefficient ($r = 0.827$; $p = 0.001$), while item 12 had the lowest coefficient ($r = 0.546$; $p = 0.024$). Overall, the results indicate that all items in both instruments demonstrated statistically significant correlations and were therefore retained for data collection. The generally high correlation coefficients also indicate that the items had an adequate association with the constructs being measure

Table 5. Instrument Reliability Test Results

Instrument	Reliability Coefficient	Category
Pretest	0.913	Very High
Posttest	0.970	Very High

Table 5 shows that both instruments demonstrated very high reliability. The pretest instrument obtained a reliability coefficient of 0.913, while the posttest instrument obtained a higher coefficient of 0.970. These values indicate a high level of internal consistency among the items in both instruments. The higher reliability coefficient for the posttest instrument suggests that its items demonstrated particularly strong consistency in measuring the intended construct. Thus, in combination with the validity results presented in Table 4, the reliability findings support the use of both the pretest and posttest instruments in the subsequent analysis.

Normality Test

Before testing the hypotheses, the learning outcome data were first tested for normality to determine whether the data distribution met the assumptions of parametric statistics. The normality test was conducted using the Shapiro–Wilk test because the sample size in each group was less than 50 students. The data are considered normally distributed if the significance value (Sig.) is > 0.05 , whereas a Sig. value ≤ 0.05 indicates that the data are not normally distributed. The results of the normality test for both schools are presented in table 4.

Table 6. Results of the Normality Test for Learning Outcomes

School	Group	Pretest Sig.	Description	Posttest Sig.	Description
Elementary School 19 Jambi City	Experiment	0,144	Normal	0,001	Abnormal
	Control	0,556	Normal	0,049	Abnormal
Elementary School Pertiwi 1 Jambi City	Experiment	0,301	Normal	0,072	Normal
	Control	0,430	Normal	0,063	Normal

Based on table 6, all pretest data for both the experimental and control classes at both schools had significance values greater than 0.05, indicating a normal distribution. For the posttest data, different results were found at Elementary School 19 in Jambi City, where the experimental class had a significance value of 0.001 and the control class had a value of 0.049. Both values are less than 0.05, so the posttest data at Elementary School 19 in Jambi City do not meet the assumption of normality. In contrast, the posttest data at Elementary School Pertiwi 1 in Jambi City had significance values of 0.072 for the experimental class and 0.063 for the control class, indicating that all data are normally distributed.

The normality of the students' 6C skill data was also tested using the Shapiro–Wilk test. This test aimed to determine whether the data distribution for each aspect of the 6C skills in both the experimental and control groups met the assumption of normality. The data were considered normally distributed if the significance value (Sig.) was > 0.05 , whereas a Sig. value ≤ 0.05 indicated that the data were not normally distributed.

Table 7. Results of the Normality Test for Students' 6C Skills

Aspect	Group	Sig.	Description
Critical Thinking	Elementary School 19 Experiment	0,002	Abnormal
	Elementary School 19 Control	0,024	Abnormal
	Elementary School Pertiwi 1 Experiment	0,194	Normal
	Elementary School Pertiwi 1 Control	0,239	Normal
Creativity	Elementary School 19 Experiment	0,005	Abnormal
	Elementary School 19 Control	0,286	Normal
	Elementary School Pertiwi 1 Experiment	0,613	Normal
	Elementary School Pertiwi 1 Control	0,081	Normal
Collaboration	Elementary School 19 Experiment	0,164	Normal
	Elementary School 19 Control	0,412	Normal
	Elementary School Pertiwi 1 Experiment	0,100	Normal
	Elementary School Pertiwi 1 Control	0,062	Normal
Communication	Elementary School 19 Experiment	0,106	Normal
	Elementary School 19 Control	0,025	Abnormal
	Elementary School Pertiwi 1 Experiment	0,183	Normal
	Elementary School Pertiwi 1 Control	0,006	Abnormal
Character	Elementary School 19 Experiment	0,060	Normal
	Elementary School 19 Control	0,265	Normal
	Elementary School Pertiwi 1 Experiment	0,016	Abnormal
	Elementary School Pertiwi 1 Control	0,719	Normal
Citizenship	Elementary School 19 Experiment	0,199	Normal
	Elementary School 19 Control	0,139	Normal
	Elementary School Pertiwi 1 Experiment	0,093	Normal
	Elementary School Pertiwi 1 Control	0,079	Normal

Table 7 showing the results of the normality test, indicates that the data distributions for each aspect of the 6C skills exhibit different characteristics. In the Critical Thinking aspect, the data for the Elementary School 19 group both the experimental and control groups were not normally distributed (Sig. = 0.002 and 0.024), whereas both groups at Elementary School Pertiwi were normally distributed with significance values of 0.194 and 0.239, respectively. In the Creativity aspect, only the Elementary School 19 experimental group did not meet the normality assumption (Sig. = 0.005), while the other three groups showed a normal distribution.

Furthermore, all groups in the Collaboration aspect had significance values above 0.05, so they can be considered normally distributed. In the Communication aspect, the data for the Elementary School 19 experimental and Pertiwi experimental groups met the assumption of normality, whereas the Elementary School 19 control group (Sig. = 0.025) and the Pertiwi control group (Sig. = 0.006) were not normally distributed. For the Character aspect, only the Pertiwi experimental group did not follow a normal distribution (Sig. = 0.016), while the other groups met the assumption of normality. As for the Citizenship aspect, all groups obtained significance values greater than 0.05, so all data were deemed to follow a normal distribution.

Overall, the results of the normality tests indicate that some aspects of the 6C skills still exhibit non-normal data distributions, particularly in the areas of Critical Thinking,

Creativity, Communication, and Character across several research groups. In contrast, the Collaboration and Citizenship aspects showed normal distributions across all groups. These findings indicate that the assumption of normality is not consistently met for all variables; therefore, further analysis must consider the characteristics of the data distribution for each aspect before determining which statistical testing techniques to use.

The results of the normality test were used to determine the appropriate statistical analysis for comparing the learning outcomes between the experimental and control groups. The statistical test selection was based on the distribution of the posttest scores from both groups, because the posttest represented the students' learning outcomes after the implementation of the learning treatment and was the primary outcome used for between-group hypothesis testing. The pretest scores were used to describe the students' initial conditions and to examine baseline differences between the experimental and control groups, rather than as the primary basis for selecting the posttest hypothesis test. As presented in Table 4, the pretest data for both the experimental and control groups at Elementary School 19/IV were normally distributed, whereas the posttest data for both groups were not normally distributed. Therefore, the Mann-Whitney U test was selected for comparing the posttest scores at Elementary School 19/IV because the posttest data did not meet the normality assumption. In contrast, the posttest data for both the experimental and control groups at Pertiwi 1 Elementary School met the normality assumption; therefore, the independent samples t-test was used. Thus, the statistical test was determined consistently based on the distribution of the posttest scores in both groups, while the pretest data were considered as baseline information for evaluating the initial condition of the groups.

A normality test was also conducted simultaneously on the 6C skill data to determine whether the data from the experimental and control classes were normally distributed, as this is one of the prerequisites for parametric analysis. The normality test was performed using the Kolmogorov-Smirnov test with a significance level of 0.05.

Table 8. Results of the Simultaneous Normality Test for 6C Skills

Group	Kolmogorov-Smirnov Sig.	Description
Experiment	0,147	Normal
Control	0,053	Normal

Based on table 8, the significance values of the Kolmogorov-Smirnov test were 0.147 for the experimental group and 0.053 for the control group. Both values are greater than 0.05 (Sig. > 0.05), indicating that the 6C skill data for both groups are simultaneously normally distributed. Thus, the assumption of normality has been met, and the data are suitable for further analysis, namely the homogeneity test and hypothesis testing using the independent samples t-test.

Homogeneity Test

A homogeneity test was conducted to determine whether the variances of the learning outcome data between the experimental and control groups were homogeneous, as one of the prerequisites for using parametric statistical tests. The test was conducted using Levene's Test, with the criterion that the data are considered homogeneous if the significance value (Sig.) is > 0.05, whereas a Sig. value $\leq$ 0.05 indicates that the data variances are not homogeneous. The results of the homogeneity test for both schools are presented in table 8.

Table 8. Results of the Homogeneity Test for Learning Outcomes Data

School	Levene Statistic	Sig.	Description
Elementary School 19 Jambi City	11,713	0,002	Not Homogeneous
Elementary School Pertiwi 1 Jambi City	0,357	0,554	Homogeneous

On table 8 the results of the homogeneity test show that the learning outcome data from Elementary School 19 in Jambi City have a significance value of 0.002, which is less than 0.05. These results indicate that the data variances between the experimental and control classes are not homogeneous, thus failing to meet one of the assumptions of parametric analysis. In contrast, the learning outcome data from Pertiwi 1 Elementary School in Jambi City yielded a significance value of 0.554, which is greater than 0.05; thus, the data variances between the two groups are considered homogeneous and meet the prerequisites for parametric analysis.

The results of this homogeneity test were used as the basis for determining the appropriate hypothesis testing technique. At Elementary School 19 in Jambi City, the initial data did not meet the assumption of homogeneity, so the analysis had to be adjusted according to the data characteristics. Meanwhile, the data from Pertiwi 1 Elementary School in Jambi met the assumption of homogeneity and could therefore be analyzed using parametric tests. After data transformation at State Elementary School 19 in Jambi, the data variances became homogeneous, ensuring that all data used in the subsequent analysis met the assumption of homogeneity. Consequently, the hypothesis testing process was conducted using statistical methods appropriate to the results of the prerequisite tests, thereby ensuring a more accurate interpretation of the research findings.

Next, a homogeneity test was conducted on the 6C skill data between the experimental and control groups prior to hypothesis testing. The test used Levene's Test, with the criterion that the data are considered homogeneous if the significance value (Sig.) is > 0.05 , whereas a significance value ≤ 0.05 indicates that the data variances are not homogeneous, as shown in Table 8.

Table 9. Results of the 6C Skills Homogeneity Test

6C Skills Aspects	F	Sig.	Description
Critical Thinking	5,767	0,019	Not Homogeneous
Creativity	0,589	0,445	Homogeneous
Collaboration	0,958	0,331	Homogeneous
Communication	2,653	0,108	Homogeneous
Character	10,683	0,002	Not Homogeneous
Citizenship	0,710	0,402	Homogeneous

Table 9 shows that the variance of the data for each aspect of the 6C skills has different characteristics. For the Critical Thinking aspect, a significance value of 0.019 was obtained, which is less than 0.05; therefore, the variance of the data between the experimental and control groups is deemed non-homogeneous. Similarly, for the Character aspect, a significance value of 0.002 indicates that the variance of the two groups is also non-homogeneous.

In contrast, the aspects of Creativity (0.445), Collaboration (0.331), Communication (0.108), and Citizenship (0.402) had values greater than 0.05. These results indicate that the variance of the data for these four aspects is homogeneous, meaning that the distribution characteristics of the data between the experimental and control groups are relatively similar.

Overall, the results of the homogeneity test showed that four of the six 6C skill aspects met the assumption of homogeneity of variances, namely Creativity, Collaboration, Communication, and Citizenship. Meanwhile, the Critical Thinking and Character aspects did

not meet the assumption of homogeneity because they had significance values below 0.05. These findings indicate that the assumption of equal variances is not fully met across all 6C skill aspects; therefore, the selection of further statistical analyses must take into account the results of the homogeneity test for each aspect to ensure that the interpretation of the research results remains valid and accurate.

A homogeneity test was also conducted simultaneously on the 6C skill data to determine whether the variances of the data in the experimental and control classes were homogeneous, as one of the prerequisites for parametric analysis. The homogeneity test was performed using Levene's test with a significance level of 0.05.

Table 10. Results of the Simultaneous Homogeneity Test for 6C Skills

Variable	Levene Statistic	Sig.	Description
The 6C Skills Simultaneously	0,000	0,984	Homogeneous

On Table 10 a significance value (Sig.) of 0.984 was obtained. This value is greater than 0.05 (Sig. > 0.05), so the variances of the 6C skill data in both the experimental and control classes are deemed homogeneous. Thus, the assumption of homogeneity has been met, and the data are suitable for further analysis, namely a hypothesis test using the independent samples t-test.

Hypothesis Testing

A hypothesis test was conducted to determine whether there was a difference in learning outcomes between students in the experimental class, who used flipbook-based e-textbooks, and students in the control class, who used conventional teaching materials. Before conducting the hypothesis test, the learning outcome data met the prerequisites for analysis according to the characteristics of each school. At Elementary School 19 in Jambi City, the data were not normally distributed, so the hypothesis test was conducted using the Mann–Whitney U test as a nonparametric test. Meanwhile, at Elementary School Pertiwi 1 in Jambi City, the data met the assumptions of normality and homogeneity, so the test was conducted using an independent samples t-test. The use of these two types of tests aimed to obtain statistical decisions appropriate to the characteristics of the data distribution, thereby ensuring that the test results were more accurate and reliable.

The results of the hypothesis tests for both schools are presented in the following table. Decision-making is based on the significance value (Sig., 2-tailed) with a significance level of 0.05. If the significance value is less than 0.05 (Sig. < 0.05), the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted, indicating a significant difference in learning outcomes between the experimental and control classes. A summary of the results of the hypothesis tests on student learning outcomes at both schools is presented in the following table.

Table 11. Results of the Hypothesis Test on Student Learning Outcomes

School	Test Types	Test Statistics	Sig. (2-tailed)	95% CI		Hypothesis
				Lower	Upper	
Elementary school 19 Jambi City	Mann–Whitney U	U = 59,500; Z = -3,642 r = 0,590	0,000	-15.0	-5.0	Accepted
Elementary school Pertiwi 1 Jambi City	Independent Sample t-Test	t = -0,816; df = 32 Cohen's d = 0,280	0,420	-0,398	-0,954	Rejected

Based on the hypothesis testing results presented in Table 11, differences in student learning outcomes were observed across the two research schools. At Elementary School 19 Jambi City, the Mann–Whitney U test produced a U value of 59.500, Z value of -3.642 , and a two-tailed significance value of 0.000, which is lower than the significance level of 0.05 ($0.000 < 0.05$). Therefore, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted, indicating a statistically significant difference in learning outcomes between the experimental and control classes. The effect size was $r = 0.590$, indicating a relatively substantial effect and suggesting that the observed difference was not only statistically significant but also meaningful in magnitude.

In contrast, at Pertiwi 1 Elementary School Jambi City, the independent samples t-test resulted in a t value of -0.816 , with $df = 32$ and a two-tailed significance value of 0.420. Since the significance value was greater than 0.05 ($0.420 > 0.05$), H_0 is accepted and H_1 is rejected. This result indicates that there was no statistically significant difference in learning outcomes between the experimental and control classes at this school. The Cohen's d value of 0.280 indicates a small effect size, suggesting that the difference between the two groups was relatively limited in practical magnitude.

Overall, the hypothesis testing results indicate that the relationship between the use of flipbook-based e-textbooks and student learning outcomes was not consistent across the two schools. A statistically significant difference with a relatively substantial effect size was found at Elementary School 19 Jambi City, whereas no statistically significant difference and only a small effect size were observed at Pertiwi 1 Elementary School Jambi City. These findings suggest that the observed differences in learning outcomes may be associated with the implementation and context of the learning intervention, rather than being attributed solely to the use of flipbook-based e-textbooks. Differences in student characteristics, classroom implementation, teacher practices, and school learning environments may contribute to the variation in outcomes across research sites. Given the quasi-experimental design and the use of intact classes, these findings should therefore be interpreted as evidence of differences associated with the intervention rather than as definitive causal effects.

After identifying differences in learning outcomes through hypothesis testing, the analysis continued by calculating the N-Gain to determine the improvement in students' learning outcomes after participating in the instruction. The N-Gain test was used to measure the effectiveness of instruction by comparing the increase in pretest and posttest scores for each group. The higher the N-Gain value obtained, the greater the improvement in students' abilities after receiving the instructional treatment. In addition, this analysis also provides an overview of the effectiveness of using flipbook-based e-textbooks compared to instruction in the control classes at each school. A summary of the N-Gain test results at Elementary School 19 in Jambi City and Elementary School Pertiwi 1 in Jambi City is presented in table 12.

Table 12. Results of N-Gain Test for Student Learning Outcomes

School	Group	N	N-Gain (%)	Min	Max	Category
Elementary School 19 Jambi City	Control Class	19	60,43	33	100	Effective
	Experimental Class	19	89,04	67	100	Very Effective
	Difference in Mean N-Gain	-	28,61	-	-	Higher Experimental Class
Elementary School Pertiwi 1 Jambi City	Control Class	17	67,25	43	100	Effective
	Experimental Class	17	73,35	50	100	Effective
	Difference in Mean N-Gain	-	6,10	-	-	Higher Experimental Class

Table 12 shows the results of the N-Gain test, indicating that at Elementary School 19 in Jambi City, the experimental class achieved an average N-Gain of 89.04%, classified as "highly effective," while the control class achieved an average of 60.43%, classified as "effective." The difference in average N-Gain of 28.61% indicates that the improvement in student learning outcomes in the experimental class was significantly higher than that in the control class. In addition, the minimum score in the experimental class reached 67%, higher than the control class's 33%, while the maximum score in both groups was 100%. These findings indicate that the use of flipbook-based e-textbooks is capable of providing a more optimal improvement in learning outcomes compared to learning that uses conventional teaching materials at Elementary School 19 Kota Jambi.

Although the average N-Gain for the experimental class (73.35%) was higher than that of the control class (67.25%), the difference of 6.10% was still relatively small. This indicates that the improvement in learning outcomes between the two groups is not strikingly different. This is consistent with the results of the Independent Sample t-Test, which showed that there was no significant difference between the learning outcomes of the experimental class and the control class at Pertiwi I Elementary School in Jambi City. Thus, although the use of flipbook-based e-textbooks was able to improve students' learning outcomes, the improvement was not large enough to produce a statistically significant difference compared to learning in the control class.

Overall, the N-Gain test results show that the use of flipbook-based e-textbooks led to a greater improvement in learning outcomes compared to the control classes at both schools. However, the levels of effectiveness achieved differed. At Elementary School 19 in Jambi City, the learning medium demonstrated very high effectiveness with a significantly greater improvement in learning outcomes, whereas at Elementary School Pertiwi I in Jambi City, the improvement achieved remained in the "effective" category with a relatively small difference compared to the control class. These findings reinforce the results of the previous hypothesis test, namely that the implementation of flipbook-based e-textbooks had a more significant impact on improving learning outcomes at Elementary School 19 in Jambi City compared to Elementary School Pertiwi 1 in Jambi City.

After obtaining data on students' 6C skills in each aspect, the analysis continued with hypothesis testing to determine whether there were significant differences between the experimental class, which used flipbook-based e-textbooks, and the control class. Hypothesis testing was conducted using the Mann-Whitney U Test for aspects that did not meet the assumption of normality namely, Critical Thinking, Creativity, Communication, and Character while the Independent Samples t-Test was used for aspects that met the assumptions of normality and homogeneity, namely Collaboration and Citizenship. Testing decisions were based on a significance level of 0.05. If the Sig. (2-tailed) value is < 0.05 , then H_0 is rejected and H_1 is accepted, indicating a significant difference in 6C skills between the experimental and control classes.

Table 13. Results for all aspects of the 6C skills

6C Aspects	Test Types	Test Statistics	Sig. (2-tailed)	Hypothesis Decision
Critical Thinking	Mann-Whitney U	U = 362,00; Z = -3,229	0,001	Accepted
Creativity	Mann-Whitney U	U = 204,50; Z = -5,002	0,000	Accepted
Collaboration	Independent Samples t-Test	t = 4,515; df = 70	0,000	Accepted
Communication	Mann-Whitney U	U = 240,50;	0,000	Accepted

6C Aspects	Test Types	Test Statistics	Sig. (2-tailed)	Hypothesis Decision
		Z = -4,606		
Character	Mann–Whitney U	U = 325,00; Z = -3,644	0,000	Accepted
Citizenship	Independent Samples t-Test	t = 3,670; df = 70	0,000	Accepted

Table 12 shows that for all aspects of the 6C skills, the significance values are less than 0.05; therefore, H_0 is rejected and H_1 is accepted for each aspect. For the Critical Thinking aspect, the Mann–Whitney U test yielded a Sig. (2-tailed) value of 0.001, indicating a significant difference in critical thinking ability between students in the experimental class and the control class. These results indicate that the use of flipbook-based e-textbooks has a positive effect on students' ability to analyze information, evaluate various problem-solving alternatives, and make logical decisions.

In the Creativity category, a significance value (two-tailed) of 0.000 was obtained, indicating a significant difference in creativity between the two groups. These results show that students who learned using flipbook-based e-textbooks demonstrated greater ability to generate new ideas, develop varied solutions, and express their ideas creatively during the learning process.

The Collaboration aspect, which was analyzed using an Independent Samples t-Test, also yielded a Sig. (2-tailed) value of 0.000, indicating a significant difference in collaboration skills between the experimental and control classes. These findings suggest that the use of flipbook-based e-textbooks encourages students to collaborate more effectively, share responsibilities, and actively participate in completing group assignments.

Next, regarding the Communication aspect, the Mann–Whitney U test yielded a Sig. (2-tailed) value of 0.000, indicating a significant difference in communication skills between the two groups. These results suggest that learning with flipbook-based e-textbooks provides students with the opportunity to communicate ideas, express opinions, and interact with peers and teachers more effectively.

Regarding the Character aspect, a Sig. (2-tailed) value of 0.000 was obtained, indicating a significant difference in student character between the experimental and control classes. This finding suggests that the use of flipbook-based e-textbooks not only contributes to improved academic performance but also supports the development of positive character traits, such as responsibility, discipline, honesty, and independence in the learning process.

Meanwhile, regarding the Citizenship aspect, the results of the Independent Samples t-Test showed a Sig. (2-tailed) value of 0.000, so H_0 was rejected and H_1 was accepted. These results indicate a significant difference in citizenship skills between the experimental and control classes. Thus, the use of flipbook-based e-textbooks is also effective in increasing students' concern for their social environment, their appreciation of diversity, and their sense of responsibility as members of society.

The overall results of the hypothesis testing show that all six aspects of the 6C skills have significance values below 0.05; therefore, all alternative hypotheses (H_1) are accepted. These findings indicate that the use of flipbook-based e-textbooks has a significant effect on improving students' Critical Thinking, Creativity, Collaboration, Communication, Character, and Citizenship skills compared to learning in the control class. Thus, the developed learning medium has proven effective in facilitating the comprehensive development of 21st-century skills, enhancing not only students' cognitive aspects but also their social, character, and citizenship aspects.

After testing the hypotheses for each aspect of the 6C skills, the analysis continued by testing the 6C skills simultaneously. This test aimed to determine whether there was a significant difference in overall 6C skills between students learning with flipbook-based e-textbooks and those learning with conventional instructional materials. Since the data on the 6C skills, when analyzed simultaneously, met the assumptions of normality and homogeneity, the hypothesis testing was conducted using an Independent Samples t-Test. The test decision was based on a significance level of 0.05; that is, if the Sig. (2-tailed) value is < 0.05 , then H_0 is rejected and H_1 is accepted, meaning there is a difference in the simultaneous 6C skills between the experimental and control classes.

Table 14. Results of the Simultaneous Hypothesis Test for 6C Skills

Variable	Types of Tests	t	df	Sig. (2-tailed)	Difference	Hypothesis Decision
The 6C Skills Simultaneously	Independent Samples t-Test	5,602	70	0,000	10,106	Accepted

Table 13 shows that the 6C skills simultaneously yielded a Sig. (2-tailed) value of 0.000, which is less than the significance level of 0.05 ($0.000 < 0.05$). Thus, H_0 is rejected and H_1 is accepted, leading to the conclusion that there is a significant difference in overall 6C skills between students in the experimental class and those in the control class. The Mean Difference value of 10.106 indicates that the average 6C skills of students in the experimental class were higher than those in the control class after participating in the instruction.

These findings reinforce the results of hypothesis testing for each aspect of Critical Thinking, Creativity, Collaboration, Communication, Character, and Citizenship, all of which showed p-values below 0.05. Thus, the use of flipbook-based e-textbooks not only influences each aspect of the 6C skills individually but also enhances the 6C skills as a whole. These results indicate that integrating flipbook-based e-textbooks into learning facilitates the development of 21st-century skills more comprehensively, so that students experience improvement not only in a single skill aspect but also across all dimensions of the 6C skills simultaneously.

Discussion

The research findings indicate that the use of flipbook-based e-textbooks is linked to greater improvements in Social Studies learning outcomes and 6C skills among Phase B elementary school students. These results indicate that digital learning media that integrate text, images, videos, animations, interactive exercises, and easy navigation can create a more meaningful learning experience compared to learning using conventional teaching materials. Theoretically, these findings reinforce the constructivist perspective, which states that students construct knowledge through active engagement in the learning process. Flipbooks serve not only as a medium for conveying information but also as a learning environment that allows students to explore concepts, connect new knowledge with prior experiences, and build understanding independently. This aligns with the implementation of the Merdeka Curriculum, which places students at the center of learning and encourages the use of digital technology to create active, contextual, and differentiated learning experiences.

The improvements observed across all dimensions of critical thinking, creativity, communication, collaboration, character, and citizenship indicate that flipbook-based e-textbooks not only impact cognitive aspects but also comprehensively support the development of 21st-century competencies. The interactive presentation of material

provides students with opportunities to analyze information, solve problems, convey ideas, collaborate in groups, and foster a sense of responsibility and concern for their social environment. These findings are consistent with the research by [Nurhayati et al., \(2024\)](#) which states that the integration of 21st-century skills into learning can enhance students' critical thinking, creativity, communication, and collaboration skills. The results of this study also reinforce the findings of [Arifin, \(2024\)](#) that the use of digital learning media not only improves academic achievement but also contributes to the development of students' character and citizenship through more active and reflective learning activities. Thus, flipbooks can be viewed as a medium capable of developing the 6C competencies holistically, rather than merely improving learning outcomes.

The improvement in social studies learning outcomes achieved by the experimental class also supports various previous studies on the effectiveness of flipbook-based digital learning media. The findings of this study are consistent with [Utami et al., \(2025\)](#) which shows that flipbook-based e-modules can improve learning outcomes by presenting material in a way that is engaging, systematic, and easy for students to understand. Similar results were also reported by [Shaltina et al., \(2026\)](#) that flipbook media increases learning motivation, making students more active during the learning process. In addition, research by [Aprilia, \(2021\)](#) explains that context-based flipbooks are effective in improving critical thinking skills because they provide a more interactive learning experience and encourage students to explore the learning material. The alignment of these findings with various previous studies indicates that the integration of digital technology in the form of flipbooks is an effective strategy for improving the quality of social studies instruction in elementary schools.

Nevertheless, this study also shows that the extent of improvement in learning outcomes is not entirely consistent across all school contexts. The differences in effectiveness found indicate that the success of implementing flipbook-based e-textbooks is influenced by various contextual factors, such as student readiness, teachers' ability to manage digital-based learning, the availability of supporting resources, and the characteristics of the learning environment. Therefore, the effectiveness of instructional media is determined not only by the quality of the media itself but also by the quality of instructional implementation. These findings demonstrate that the use of educational technology requires adequate support from the school ecosystem so that the full potential of digital media can be optimally harnessed.

The scientific contribution of this study lies in providing empirical evidence that flipbook-based e-textbooks are not only effective in improving social studies learning outcomes but are also capable of simultaneously developing the 6C skills in elementary school students. Most previous studies have focused only on improving learning outcomes or one to two 21st-century competencies, whereas this study demonstrates that all dimensions of the 6C framework can be developed in an integrated manner through the use of systematically designed digital media. Therefore, this study expands the body of research on digital learning at the elementary school level while providing practical implications that flipbook-based e-textbooks can serve as an innovative teaching resource to support the implementation of the Merdeka Curriculum and the sustainable development of students' 21st-century competencies.

The findings of this study can be further interpreted from the perspective of how digital instructional materials transform the learning activities experienced by elementary students. The effectiveness of flipbook-based e-textbooks should not be understood merely as a consequence of replacing printed textbooks with digital versions. Rather, the pedagogical value of the flipbook lies in its capacity to organize information through multiple representations and provide students with opportunities to interact with learning content. According to the Cognitive Theory of Multimedia Learning, meaningful learning occurs when

learners select relevant verbal and visual information, organize the information into coherent mental representations, and integrate it with prior knowledge. The combination of text, illustrations, animation, video, and interactive activities in a digital textbook can therefore provide multiple entry points for processing Social Studies concepts that may otherwise be presented in an abstract or predominantly verbal form (Mayer, 2024). Systematic evidence also indicates that multimedia learning is most beneficial when multimedia features are organized according to sound instructional principles rather than simply accumulated within a digital environment (Çeken & Taşkın, 2022). Thus, the present findings suggest that the pedagogical structure of the flipbook may be more important than its digital format alone.

This interpretation is particularly relevant to the improvement in Social Studies learning outcomes observed in the present study. At Elementary School 19 Jambi City, students in the experimental group improved from a pretest mean of 69.74 to a posttest mean of 96.05, whereas the control group increased from 69.47 to 86.84. The corresponding N-Gain values were 89.04% for the experimental group and 60.43% for the control group. This relatively large difference is consistent with international evidence indicating that digital instructional materials can produce positive effects on academic outcomes when they provide meaningful cognitive and instructional support. A meta-analysis of digital technology and deep learning reported a positive overall effect and further showed that technology was particularly beneficial when integrated with appropriate instructional guidance and when combined with collaborative rather than purely individual learning (Wu, 2024). Likewise, a meta-analysis of digital textbook use found that e-books can produce substantial improvements in academic achievement, while research using primary-school samples has demonstrated that the quality and selection of an e-textbook can significantly influence student performance (Shalgimbekova et al., 2024; Wijaya et al., 2022). These findings provide a plausible explanation for why the experimental class in the present study achieved a larger improvement than the control class.

The pattern at Pertiwi 1 Elementary School, however, provides an important qualification to the interpretation of digital learning effectiveness. Although the experimental group obtained a higher posttest mean than the control group (89.12 versus 86.76) and a higher N-Gain value (73.35% versus 67.25%), the difference was comparatively small and did not reach statistical significance. This result indicates that the introduction of a digital textbook does not automatically generate a strong additional learning advantage in every classroom. Such contextual variability is consistent with the broader educational technology literature, which repeatedly shows that the effects of technology are heterogeneous and depend on the function assigned to technology, the duration and organization of the intervention, the pedagogical strategy accompanying the technology, and the characteristics of learners and teachers (Ran et al., 2022a; Wu, 2024). A large systematic analysis of school-based online, blended, computer-assisted, game-based, and collaborative technology interventions likewise found that digital technology was generally more effective than regular instruction, but the magnitude and direction of effects differed across educational settings and learner groups (Topping et al., 2022). Therefore, the weaker between-group difference at Pertiwi 1 should not necessarily be interpreted as evidence that the flipbook was ineffective; rather, it suggests that the added value of the technology may have been constrained by contextual and implementation-related factors.

The difference between the two schools also strengthens the interpretation that instructional technology operates through an interaction between medium and pedagogy. Research on technology-enhanced learning increasingly emphasizes that the important question is not simply whether technology is present, but what type of learning activity the technology enables. Technology is more likely to generate meaningful cognitive gains when

it facilitates active processing, problem solving, interaction, collaboration, and feedback rather than merely delivering information in a digital format (Topping et al., 2022). In a similar vein, a meta-analysis of technology-supported collaboration found a positive overall effect on student learning outcomes, with a particularly strong relationship with academic achievement; the effects were also moderated by factors such as group size, intervention duration, and subject area (E. Xu et al., 2025). Consequently, the variation observed between Elementary School 19 and Pertiwi 1 may reflect differences in how the flipbook was enacted within classroom activities rather than differences in the technological resource itself.

The findings related to critical thinking provide further support for this interpretation. Students who used the flipbook achieved higher critical-thinking scores than those in the control classes, and the difference was statistically significant. The result is compatible with international meta-analytic evidence demonstrating that technology-supported collaborative learning can produce a substantial improvement in critical thinking. Tedla & Chen, (2025), for example, reported an overall effect size of 0.859 for computer-supported collaborative learning, while Xu et al., (2023) found that collaborative problem solving produced a significant positive effect on critical thinking, particularly when learning activities incorporated appropriate scaffolding. In the context of elementary education, Falloon, (2024) similarly demonstrated that technology-supported critical-thinking curricula were most successful when pedagogical, technological, and school-level factors were deliberately aligned. These studies suggest that the critical-thinking advantage observed in the experimental group may have emerged because the flipbook provided a richer stimulus for questioning, comparing information, interpreting social phenomena, and evaluating possible explanations, particularly when those resources were embedded in teacher-guided activities.

The creativity findings can also be understood through the affordances of multimodal and interactive digital learning. The experimental students demonstrated higher creativity scores than the control students, indicating that the flipbook-based learning environment may have given them more opportunities to generate and express ideas. This interpretation is supported by a meta-analysis of educational technology interventions showing a moderate overall influence on creative thinking, with interactive learning environments producing some of the strongest effects (Zaremohzzabieh et al., 2025). Another meta-analysis found that technology-mediated learning can improve creativity, particularly when technology is coupled with inquiry, task-driven activities, and active learning rather than passive observation (Wang et al., 2024). Therefore, the higher creativity scores in the present study may be attributable not to the visual attractiveness of the flipbook alone, but to the extent to which its multimedia features enabled students to manipulate information, explore alternative responses, and construct their own interpretations of Social Studies content.

The communication and collaboration findings are equally important because they indicate that the influence of digital instructional materials extends beyond individual cognitive performance. In the present study, the experimental group significantly outperformed the control group in both communication and collaboration. These findings are consistent with evidence that digital textbooks can support social and affective competencies among elementary students. In a longitudinal study involving 1,418 elementary students, Im, (2024) found that sustained use of digital textbooks was associated with higher communication, collaboration, sociability, motivation, and learning attitudes. Similarly, research in Social Studies has shown that students using digital learning materials demonstrated better social skills than students using printed textbooks (Sariyatun et al., 2021). The present findings therefore extend this literature by demonstrating that

the communication and collaboration advantage of digital learning can be observed alongside gains in other dimensions of the 6C framework.

One possible mechanism is that a well-designed flipbook can provide a common informational object around which students communicate and coordinate their activities. Students may refer to the same images, explanations, videos, questions, or learning tasks while discussing interpretations with peers. In this sense, the digital material functions not simply as a repository of information but as a shared cognitive and social resource. Meta-analytic evidence indicates that collaborative learning and technology-supported collaboration are particularly effective when digital tools are intentionally used to create opportunities for interaction rather than simply to distribute content (Jeong et al., 2019; Ran et al., 2022b; E. Xu et al., 2025). This perspective is important because it supports the argument that the 6C outcomes observed in the present study are likely to be related to the instructional activities enabled by the flipbook.

The significant difference in character is particularly noteworthy because character development is less frequently examined in studies of digital learning than cognitive achievement. The finding suggests that digital instructional materials may contribute to character development when the content and learning activities explicitly require responsibility, independence, discipline, honesty, mutual respect, and reflection. However, technology should not be assumed to develop character automatically. Research on digital literacy and character education indicates that technology becomes supportive of character formation when digital learning is accompanied by intentional value integration, teacher guidance, and opportunities for ethical decision making (Utaminingsih & Purwati, 2024). Thus, the present finding should be interpreted as evidence that the flipbook-supported learning environment was associated with more favorable character-related behaviors under the observed instructional conditions, rather than as evidence that digital media independently produces character development.

The citizenship result also deserves specific attention because citizenship is often absent from conventional formulations of 21st-century competencies, which frequently emphasize only the four Cs. Social Studies provides a particularly appropriate disciplinary context for citizenship because its content is closely connected to social interaction, community life, diversity, social responsibility, and the interpretation of social issues. Research on primary Social Studies curriculum has shown that communication, collaboration, technology use, and broader 21st-century competencies are relevant components of Social Studies learning, although the extent to which curricula successfully develop these competencies varies considerably (Taş, 2022). The present study contributes to this discussion by demonstrating that the citizenship dimension can be incorporated into a digitally mediated Social Studies learning environment. Nevertheless, digital citizenship research also warns that the mere presence of technology does not guarantee critical, ethical, or responsible citizenship. Effective digital citizenship education requires explicit opportunities for students to practice responsible participation, critical evaluation, respect for others, and ethical decision making (Li et al., 2025; Tadlaoui-Brahmi et al., 2022). Therefore, the citizenship gains observed in the experimental classes may reflect the interaction between the Social Studies content, the instructional tasks, and the opportunities provided by the flipbook rather than the technological format itself.

Another important implication concerns the simultaneous improvement of all six dimensions of the 6C framework. The experimental group obtained a mean score of 74.93 compared with 64.83 in the control group, producing a mean difference of 10.106 points and a statistically significant between-group result. This finding is theoretically important because it suggests that the six competencies can develop in an interconnected learning environment rather than necessarily requiring six independent instructional interventions.

Contemporary research increasingly views 21st-century competencies as interrelated cognitive, social, and affective capabilities rather than isolated skills (Silber-Varod et al., 2019). The present result is also comparable with the findings of Zainil et al., (2024), who reported that STEM-based digital learning improved the six 6C dimensions among elementary school students. However, the present study extends that evidence to Social Studies and to a flipbook-based e-textbook intervention. Consequently, the contribution of this study is not merely that it includes six outcome dimensions; it demonstrates that a single digital learning resource embedded in Social Studies instruction can be associated with simultaneous differences across cognitive, interpersonal, character, and citizenship domains.

The simultaneous improvement should nevertheless be interpreted carefully because the six dimensions were assessed through classroom observation rather than solely through standardized performance tests. Observational assessment is valuable because 6C competencies are often expressed through behavior, interaction, participation, and decision making that may not be captured by conventional written tests. However, the quality of conclusions depends on the reliability and objectivity of the observation process. A systematic review of digital competence assessment in primary education similarly found that studies frequently emphasize observable skills while providing insufficient reporting of psychometric quality and responsible-use dimensions (Godaert et al., 2022). Thus, the present findings support the feasibility of assessing multiple 6C dimensions in real classroom settings, but future work should strengthen triangulation through multiple observers, self-assessment, peer assessment, performance tasks, and portfolio evidence.

The findings also have implications for the implementation of the Merdeka Curriculum. Social Studies is well positioned to function as a context for integrating knowledge with transferable competencies because students encounter authentic social phenomena that require interpretation, discussion, cooperation, judgment, and responsibility. The use of digital learning resources can expand the range of representations through which social issues are presented, while also supporting flexible access and learner autonomy. Evidence from digital learning research indicates that technology-assisted learning is more effective when it supports active cognitive engagement and when teachers provide explicit instructional guidance (Wu, 2024). Likewise, meta-analytic evidence on self-regulated learning in online and blended environments indicates that structured self-regulation interventions can produce moderate improvements in academic achievement (Z. Xu et al., 2023). These findings suggest that the flipbook should be conceptualized not as a replacement for the teacher, but as a structured learning resource within a teacher-mediated learning process.

This distinction is particularly important for interpreting the different outcomes obtained across the two schools. The findings indicate that the presence of the same type of instructional medium did not produce identical learning effects in different contexts. International research consistently shows that teacher competence, pedagogical alignment, technological infrastructure, student readiness, and institutional support shape the success of digital learning implementation (Osorio Vanegas et al., 2025; Z. Xu et al., 2023). A systematic review of technology integration in elementary education similarly emphasizes that infrastructure limitations and uneven teacher readiness remain important barriers to the effective use of digital learning (Hanifah et al., 2025). Therefore, the stronger effect observed at Elementary School 19 should be interpreted cautiously as contextual evidence rather than as proof that the flipbook is inherently more effective in one school than another.

Overall, the present findings support a more nuanced understanding of digital instructional media in elementary education. The main contribution of the flipbook-based e-textbook appears to arise from its combination of multimedia representation, learner

accessibility, structured learning activities, and opportunities for interaction. The evidence from the current study, together with international literature, suggests that digital materials are most educationally valuable when they are integrated with active, collaborative, problem-oriented, and reflective learning activities rather than used simply as electronic versions of printed textbooks (Mayer, 2024; Tedla & Chen, 2025; Wu, 2024). Accordingly, the findings support positioning flipbook-based e-textbooks as a pedagogical resource that can facilitate the development of integrated 6C competencies, while recognizing that their effectiveness remains dependent on classroom implementation and contextual conditions.

LIMITATIONS

This study has several limitations that should be considered when interpreting its findings. First, the study employed purposive sampling and used intact classes from only two elementary schools in Jambi City. Because students were not randomly assigned individually to the experimental and control groups, pre-existing differences between classes may have influenced the observed outcomes beyond the effect associated with the use of flipbook-based e-textbooks. Although the groups were selected from the same grade level and implemented the same learning objectives and assessment procedures, baseline equivalence cannot be completely guaranteed. Therefore, the findings should be interpreted as differences between groups associated with the instructional intervention rather than as definitive causal effects.

Second, the sample size was relatively small, consisting of 72 fourth-grade students distributed across four intact classes. The limited number of participating classes also creates a clustered data structure in which students are nested within classes and schools. The statistical analyses in this study primarily treated students as the units of analysis; consequently, class-level variation could not be fully separated from the observed differences between the experimental and control groups. This limitation may affect the precision and generalizability of the statistical findings.

Third, the assessment of 6C skills relied on classroom observation using a structured observation instrument. Although the instrument was developed based on operational indicators and subjected to validity and reliability procedures, the observation was conducted by a single researcher. Consequently, potential observer bias and subjectivity in scoring cannot be completely excluded, particularly because the observer was aware of the instructional group assignment. Future studies should involve multiple trained observers and report inter-rater reliability to strengthen the objectivity of observational assessment.

Fourth, the effectiveness of the flipbook-based e-textbooks may also have been influenced by contextual factors, including teacher characteristics, instructional implementation, student readiness, availability of digital facilities, and the learning environment at each school. The present study did not experimentally control these contextual factors. The differences in learning outcomes observed between the two schools, particularly the stronger effect at Elementary School 19 compared with Pertiwi 1 Elementary School, suggest that the effectiveness of digital instructional media may depend partly on the conditions under which the intervention is implemented.

Finally, the intervention was conducted within a relatively limited instructional period and focused on Social Studies learning in Phase B. Therefore, the findings do not establish whether the observed improvements in 6C skills can be sustained over a longer period or generalized to other subjects, educational levels, or school contexts. Future research should involve larger and more diverse samples, multiple classes and schools, longer intervention periods, and more comprehensive assessment approaches, including multiple observers, self-assessment, peer assessment, portfolios, and interviews. Such approaches would

provide stronger evidence regarding the consistency, sustainability, and broader applicability of flipbook-based e-textbooks in developing students' 6C competencies.

CONCLUSION

This study demonstrates that the use of flipbook-based e-textbooks is effective in improving social studies learning outcomes while developing 21st-century skills (6C) namely, critical thinking, creativity, communication, collaboration, character, and citizenship among Phase B elementary school students. All aspects of the 6C skills showed a significant improvement in the experimental class compared to the control class, accompanied by higher learning outcomes based on N-Gain analysis. These findings indicate that the integration of flipbook-based e-textbooks can create learning that is more interactive, contextual, and student-centered, thereby supporting the integrated achievement of both cognitive and non-cognitive competencies.

Theoretically, the results of this study reinforce the constructivist perspective, which emphasizes that the use of digital learning media can facilitate active and meaningful learning processes while supporting the development of 21st-century competencies. In practical terms, this study provides empirical evidence that flipbook-based e-textbooks can serve as an innovative teaching material alternative to support the implementation of the Merdeka Curriculum in social studies instruction at the elementary school level, as they not only enhance students' mastery of the subject matter but also foster their critical thinking, creativity, communication, collaboration, character, and citizenship skills.

The scientific contribution of this study lies in providing empirical evidence regarding the effectiveness of flipbook-based e-textbooks in simultaneously developing the 6C skills in Phase B social studies instruction in elementary school. These findings expand the body of research on the use of digital learning media by demonstrating that flipbooks not only contribute to improved learning outcomes but also support the holistic development of 21st-century competencies.

Future research is recommended to include a broader sample from various regions and educational levels so that the research findings have a higher degree of generalizability. In addition, future research could test the effectiveness of flipbook-based e-textbooks in other subjects, examine their long-term impact on the development of 6C skills, and utilize a wider variety of assessment techniques such as portfolios, self-assessment, peer assessment, and interviews so that students' competency development can be measured more comprehensively.

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AUTHOR CONTRIBUTIONS

Conceptualization, N.H., M.S., and A.S.; Methodology, N.H., M.S., and A.S.; Software, N.H.; Validation, N.H., M.S., and A.S.; Formal Analysis, N.H.; Investigation, N.H.; Resources, M.S. and A.S.; Data Curation, N.H.; Writing – Original Draft Preparation, N.H.; Writing-Review & Editing, M.S. and A.S.; Visualization, N.H.; Supervision, M.S. and A.S.; Project Administration, N.H.; Funding Acquisition, N.H.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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