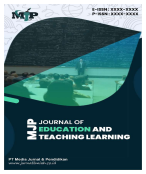
MJP Journal of Education and Teaching Learning
Vol.4, No.1 (2026): 986 – 996
https://jurnalilmiah.co.id/index.php/MJPJETL



The Effect of Using Digital Interactive Boards (DIB) on Fifth-Grade Elementary School Students' Literacy Comprehension of Intrinsic Elements

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Article Info

Keywords:

Digital Interactive Board (DIB); reading literacy; intrinsic elements; elementary school; interactive learning;

ABSTRACT

This study aims to analyze the effect of using Digital Interactive Boards (DIB) on fifth-grade elementary school students' literacy comprehension of intrinsic elements. The main problem in this study is the low ability of students to understand the intrinsic elements of texts due to the use of less interactive learning methods. This study employed a quantitative approach with a quasi-experimental design using a pretest-posttest control group design. The research sample consisted of two classes, namely the control class and the experimental class, selected using a cluster random sampling technique. The instrument used was a test of comprehension of the intrinsic elements of texts. The results showed that the average score of the experimental class increased significantly from 55.15 to 92.08, while the control class increased from 54.47 to 68.13. The paired sample t-test results indicated a significant improvement in both groups, but the improvement was higher in the experimental class. In addition, the independent sample t-test results showed a significant difference between the two groups (Sig. < 0.05). Based on these findings, it can be concluded that the use of Digital Interactive Boards (DIB) has a significant effect on improving students' literacy comprehension of intrinsic elements. This study implies that the integration of technology in learning can improve the effectiveness and equity of students' learning outcomes. Therefore, DIB can be used as an innovative alternative learning medium to improve the quality of Indonesian language learning in elementary schools.

Informasi Artikel

Kata Kunci:

Papan Interaktif Digital (PID); Literasi Membaca; Unsur Intrinsik; Sekolah Dasar; Pembelajaran Interaktif;

ABSTRAK

Penelitian ini bertujuan untuk menganalisis pengaruh penggunaan Papan Interaktif Digital (PID) terhadap pemahaman literasi unsur intrinsik siswa kelas V sekolah dasar. Permasalahan utama dalam penelitian ini adalah rendahnya kemampuan siswa dalam memahami unsur intrinsik teks akibat penggunaan metode pembelajaran yang kurang interaktif. Penelitian ini menggunakan pendekatan kuantitatif dengan desain quasi-eksperimental tipe *pretest-posttest control group design*. Sampel penelitian terdiri dari dua kelas, yaitu kelas kontrol dan kelas eksperimen, dengan teknik *cluster random sampling*. Instrumen yang digunakan berupa tes pemahaman unsur intrinsik teks. Hasil penelitian menunjukkan bahwa rata-rata nilai kelas eksperimen meningkat secara signifikan dari 55,15 menjadi 92,08, sedangkan kelas kontrol meningkat dari 54,47 menjadi 68,13. Hasil uji *paired sample t-test* menunjukkan peningkatan signifikan pada kedua kelompok, namun lebih tinggi pada kelas eksperimen. Selain itu, hasil uji *independent sample t-test* menunjukkan adanya perbedaan signifikan antara kedua kelompok (Sig. < 0,05). Berdasarkan temuan tersebut, dapat disimpulkan bahwa penggunaan Papan Interaktif Digital (PID) berpengaruh signifikan dalam meningkatkan pemahaman literasi unsur intrinsik siswa. Penelitian ini memberikan implikasi bahwa integrasi teknologi dalam pembelajaran dapat meningkatkan efektivitas dan pemerataan hasil belajar siswa. Dengan demikian, PID dapat dijadikan alternatif media pembelajaran inovatif dalam meningkatkan kualitas pembelajaran bahasa Indonesia di sekolah dasar.

Article History

Received : 19/06/2026
Revised : 28/06/2026
Accepted : 21/07/2026

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MJP Journal of Education and Teaching Learning
Vol.4, No.1 (2026): 986 – 996
https://jurnalilmiah.co.id/index.php/MJPJETL

1. Introduction

Reading literacy is a fundamental competence that strongly determines students' learning success at the elementary school level. Reading literacy is not only related to the ability to pronounce words or identify explicit information in a text, but also includes the ability to understand, interpret, connect, and evaluate the meaning of reading materials. In Indonesian language learning, one important form of reading literacy that needs to be developed is the comprehension of intrinsic elements of texts, such as theme, characters, characterization, plot, setting, point of view, and moral message. This ability serves as a foundation for students to understand narrative texts more deeply and to develop critical thinking skills from the elementary education level.

Globally, students' reading literacy achievement remains a serious concern. The results of the Progress in International Reading Literacy Study (PIRLS) 2021 show that the reading literacy of fourth-grade elementary school students is an important indicator for monitoring the quality of education systems across countries, especially after the disruption of learning caused by the COVID-19 pandemic. PIRLS 2021 is also an international assessment specifically designed to measure elementary school students' reading achievement in a global context. This condition indicates that reading comprehension skills need to be continuously strengthened through learning strategies that are more active, contextual, and aligned with the learning characteristics of 21st-century students.

In the Indonesian context, reading literacy is also a strategic issue. PISA 2022 data show that only about 25% of Indonesian students reached Level 2 or higher in reading literacy, while the OECD average reached 74%. At this level, students are at least able to identify the main idea in a text, find information based on certain criteria, and reflect on the purpose and form of a text with guidance. In addition, OECD Education GPS data recorded that the average reading score of Indonesian students in PISA 2022 was 359, lower than the OECD average of 476. These data indicate that Indonesian students' reading comprehension skills still require special attention, including at the elementary school level as the initial foundation for literacy development.

Literacy problems are also reflected in national data. The 2023 Indonesian Education Report showed that students' literacy skills were still in the medium category, namely 61.53% at the elementary school/Islamic elementary school/equivalent level, 59.00% at the junior high school/Islamic junior high school/equivalent level, and 49.26% at the senior high school/vocational high school/Islamic senior high school/equivalent level. This condition indicates that strengthening literacy cannot be achieved merely through routine reading activities, but must be integrated into the learning process that encourages deeper understanding of text content. In Indonesian language learning at elementary schools, students' difficulties in understanding intrinsic elements of texts often arise because learning is still teacher-centered, verbal, and lacks the use of visual and interactive media.

One of the causes of students' low comprehension of intrinsic elements of texts is the use of conventional learning methods that provide limited opportunities for students to interact directly with reading materials. In learning narrative texts, students do not only need to know the definitions of theme, characters, plot, and moral message, but also need to understand the relationships among these elements within the structure of a story. When learning is conducted only through lectures or passive textbook reading, students tend to experience difficulties in identifying,

classifying, and concluding intrinsic elements systematically. Therefore, learning media are needed that can visualize text content, facilitate discussion, and increase students' participation in the reading process.

The development of educational technology provides opportunities to overcome these problems through the use of interactive digital media. One relevant medium is the Digital Interactive Board (DIB), a digital screen-based learning device that allows teachers and students to interact directly with learning materials through touch, annotation, images, videos, audio, and visual displays. In literacy learning, DIB can be used to highlight keywords, map story plots, connect characters with events, organize intrinsic-element charts, and provide direct feedback to students. Thus, DIB has the potential to make reading instruction more multimodal, active, and meaningful.

Previous research findings show that the use of interactive boards or similar digital media can help improve students' reading skills. Wahid, Irawan, and Tidore (2021) found that the use of electronic whiteboards in reading instruction improved students' reading ability; the experimental class increased its average score from 74.90 to 81.90, while the control class increased from 65.30 to 70.25. Karthigesu and Mohamad (2020) also showed that the use of Interactive Whiteboards (IWB) in reading instruction was perceived positively by teachers because it could improve students' concentration, engagement, and reading motivation. These findings strengthen the assumption that interactive media can create a more engaging learning atmosphere and help students understand texts more effectively.

Other studies have also shown that the integration of digital technology in reading instruction has a positive impact on students' comprehension and reading attitudes. Prados Sánchez, Cózar-Gutiérrez, del Olmo-Muñoz, and González-Calero (2023), through a quasi-experimental study involving 85 fourth-grade students, found that a gamification platform produced significant differences in reading comprehension and reading attitudes compared to traditional approaches. Zahran (2025) also found that the use of Nearpod combined with a guided reading strategy could improve elementary school students' reading comprehension skills and motivation. In addition, the study by Acuña-Torres, Alvarado Trujillo, and Medina Hermosilla (2025) concluded that digital whiteboards contributed to improving elementary school students' reading comprehension by increasing interaction among teachers, students, and the learning environment.

Although various studies have demonstrated the benefits of interactive digital media in reading instruction, there is still a research gap that needs to be addressed. Most previous studies have focused more on general reading ability, reading motivation, or teachers' and students' perceptions of the use of digital media. Studies that specifically examine the effect of Digital Interactive Boards on the literacy comprehension of intrinsic text elements among fifth-grade elementary school students remain relatively limited. In fact, comprehension of intrinsic elements is an important competence in Indonesian language learning because it is directly related to students' ability to analyze the structure of narrative texts. Moreover, quantitative empirical evidence using a quasi-experimental design is still needed to compare the effectiveness of learning using DIB with conventional learning methods.

Based on these problems and research gaps, this study is important to conduct in order to analyze the effect of using Digital Interactive Boards on the literacy comprehension of intrinsic elements among fifth-grade elementary school students. This study

contributes empirical evidence regarding the effectiveness of digital technology integration in Indonesian language learning, particularly in the material of intrinsic text elements. Theoretically, this study is relevant to the Cognitive Theory of Multimedia Learning, which emphasizes that learning becomes more effective when information is presented through a combination of verbal and visual elements. Practically, the results of this study are expected to serve as an alternative for teachers in selecting innovative learning media that can improve students' engagement and learning outcomes.

Therefore, the main objective of this study is to analyze the effect of using Digital Interactive Boards on the literacy comprehension of intrinsic elements among fifth-grade elementary school students. The hypothesis proposed in this study is that there is a significant effect of using Digital Interactive Boards on the improvement of students' literacy comprehension of intrinsic elements. The research questions that guide this study are: (1) what is the level of students' literacy comprehension of intrinsic elements before and after the use of Digital Interactive Boards? and (2) is there a significant difference between the literacy comprehension of intrinsic elements of students who learn using Digital Interactive Boards and those who learn using conventional methods?

2. Method

The type of data collected in this study was primary data, obtained directly from the research subjects through test and observation instruments. The main data consisted of students' literacy comprehension scores on intrinsic elements, obtained through tests administered before (pretest) and after (posttest) the treatment. In addition, supporting data in the form of students' activities and engagement during the learning process could also be collected to strengthen the interpretation of the research findings. The use of primary data in experimental research allows for more accurate measurement of changes in students' abilities as a result of the treatment given [Istiq'faroh et al., 2025].

The data collection method in this study used a written test as the main instrument to measure students' comprehension of intrinsic elements of texts. The test was designed in the form of multiple-choice and/or essay questions covering indicators such as the ability to identify theme, characters, plot, setting, and moral message. In addition to the test, the researcher could also use an observation sheet to observe students' activities during the learning process, particularly in the use of DIB. This combination of methods aimed to obtain comprehensive data related to both learning outcomes and learning processes [Suada & Padmadewi, 2025].

The population in this study consisted of all fifth-grade elementary school students at one of the schools selected as the research site. The selection of this population was based on the consideration that fifth-grade students are at the stage of cognitive development from concrete operational to formal operational thinking, so they are already able to understand the structure of narrative texts in a more complex way. In addition, at this level, learning intrinsic elements of texts is already part of the Indonesian language curriculum [Astuti et al., 2026].

The research sample was determined using a cluster random sampling technique, namely sample selection based on existing class groups, which were then randomly selected to serve as the experimental group and the control group. This technique is commonly used in educational research because it takes into account limitations in individual randomization while maintaining the integrity of existing classes. For example, from several available fifth-grade classes, two classes were randomly selected, with one assigned as the experimental group and the other as the control group [Nurrahmah & Afnita,

2025].

The number of samples in this study was adjusted to field conditions, generally ranging from 20 to 35 students per class. Thus, the total sample could range from approximately 40 to 70 students. This number is considered adequate for quantitative experimental research at the elementary school level and allows for valid inferential statistical analysis. The determination of sample size also considered the homogeneity of students' initial abilities, which could be seen from the pretest results [Karaarslan & Polat, 2025].

The main research instrument was a literacy comprehension test on intrinsic elements, developed based on reading competency indicators in the curriculum. The instrument development process involved several stages, namely preparing the test blueprint, constructing test items, conducting an instrument tryout, and revising the instrument based on the tryout results. The blueprint included indicators such as identifying theme, characters, plot, setting, and moral message in narrative texts [Istiq'faroh et al., 2025].

Instrument validity testing was conducted through content validity by involving experts, such as lecturers in Indonesian language education or experienced teachers. This validity test aimed to ensure that the test items were aligned with the indicators being measured and relevant to the learning objectives. In addition, empirical validity could be tested by correlating each item score with the total score, so that only valid items would be used in the study [Wati et al., 2025].

Instrument reliability testing was conducted to ensure the consistency of measurement results. Reliability could be calculated using the Cronbach's Alpha coefficient, with a value of ≥ 0.70 indicating good reliability. In educational research, instrument reliability is very important to ensure that test results truly reflect students' abilities consistently and are not influenced by chance factors [Istiqomah & Umar, 2025].

The data analysis techniques in this study included descriptive and inferential statistical analysis. Descriptive analysis was used to describe the data, such as mean scores, standard deviation, minimum and maximum scores, and the percentage of improvement in learning outcomes. This analysis aimed to provide a general overview of students' abilities before and after the treatment [Liu et al., 2024].

Inferential analysis was used to test the research hypothesis. The tests used were the independent sample t-test to determine differences in learning outcomes between the experimental and control groups, and the paired sample t-test to determine improvement within each group. Before hypothesis testing was conducted, prerequisite tests were first carried out, including normality and homogeneity tests. If the data were normally distributed and homogeneous, the t-test could be used parametrically [Sulaimon et al., 2025].

Hypothesis testing was conducted using a significance level of $\alpha = 0.05$. The decision-making criterion was that if the significance value (Sig.) was < 0.05, the alternative hypothesis (H_1) was accepted and the null hypothesis (H_0) was rejected. This indicated that there was a significant effect of using Digital Interactive Boards on students' literacy comprehension of intrinsic elements. Conversely, if Sig. > 0.05, then there was no significant effect [Karaarslan & Polat, 2025].

Data processing in this study was carried out with the assistance of statistical software such as the latest version of SPSS (Statistical Package for the Social Sciences). The use of this software facilitated accurate and efficient data analysis, ranging from descriptive tests and prerequisite tests to hypothesis testing. With this systematic and standardized methodological procedure, the

study is expected to be replicable by other researchers in different contexts to test the consistency of the research findings [Cheng et al., 2025].

3. Result and Discussion

a. Descriptive Statistical Analysis

Descriptive statistical analysis was conducted to provide an initial overview of students' literacy comprehension of intrinsic elements before and after the treatment. Based on the results of data processing, the mean scores and standard deviations of each group, namely the control class and the experimental class, were obtained. This analysis aimed to examine the general tendency of the data as well as the level of variation in students' learning outcomes in both groups.

In the control class, the mean pretest score was 54.47, while the mean posttest score was 68.13. This indicates an improvement in students' ability after the learning process using the conventional method, with an increase of 13.66 points. Although there was an improvement, the score remained in the moderate category, indicating that the learning method used had not yet provided an optimal impact on students' comprehension of intrinsic elements.

Meanwhile, in the experimental class, the mean pretest score was 55.15 and the mean posttest score was 92.08. The increase in this class reached 36.92 points, showing a highly significant improvement compared to the control class. This indicates that the use of Digital Interactive Boards (DIB) was able to improve students' ability to understand the intrinsic elements of texts more effectively.

In terms of data distribution, the standard deviation in the experimental class after the treatment (SD = 8.73) was smaller than that of the control class (SD = 14.31). This shows that students' learning outcomes in the experimental class were more homogeneous or evenly distributed, while the control class showed greater variation in students' abilities. In other words, the use of DIB not only increased the average learning outcomes but also reduced the gap in ability among students.

Overall, the results of the descriptive analysis show that both groups experienced an improvement in learning outcomes; however, the improvement in the experimental class was much higher than that in the control class. This finding indicates that the use of Digital Interactive Boards (DIB) had a more significant impact on students' literacy comprehension of intrinsic elements, both in terms of increasing mean scores and equalizing learning outcomes.

b. Hypothesis Testing

Hypothesis testing in this study was conducted to determine the effect of using Digital Interactive Boards (DIB) on students' literacy comprehension of intrinsic elements. The analysis was carried out using the paired sample t-test to examine improvement within each group and the independent sample t-test to compare the results between the control group and the experimental group. This testing aimed to determine whether the differences found were statistically significant.

The results of the paired sample t-test in the control class showed a significance value of 0.00047, which was lower than 0.05 (Sig. < 0.05). This indicates that there was a significant improvement between the pretest and posttest scores in the control class. Therefore, learning using the conventional method still contributed to improving students' literacy comprehension of intrinsic elements, although the improvement was relatively limited.

Meanwhile, the results of the paired sample t-test in the experimental class showed a significance value of 0.00000047, which was also lower than 0.05 (Sig. < 0.05). This value was even much lower than that of the control class, indicating that the improvement in the experimental class was highly significant. This suggests that the use of Digital Interactive Boards (DIB) had a stronger effect on

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Vol.4, No.1 (2026): 986 – 996
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improving students' abilities.

Overall, the within-group test results show that both conventional learning and the use of DIB were able to improve students' learning outcomes. However, the improvement in the experimental class was much higher than that in the control class, indicating that the use of DIB was more effective in supporting students' comprehension of intrinsic elements of texts.

Furthermore, the results of the independent sample t-test showed a significance value of 0.000015, which was lower than 0.05 (Sig. < 0.05). This indicates that there was a significant difference between the posttest results of the control class and the experimental class. Thus, it can be concluded that the use of Digital Interactive Boards (DIB) had a significant effect compared to conventional methods in improving students' literacy comprehension of intrinsic elements.

c. Hypothesis Decision

Based on the results of the statistical tests conducted, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted. This indicates that there was a significant effect of using Digital Interactive Boards (DIB) on the literacy comprehension of intrinsic elements among fifth-grade elementary school students. Therefore, it can be concluded that the implementation of interactive technology-based learning media such as DIB was able to improve students' ability to understand the intrinsic elements of texts more effectively than conventional learning methods. This finding also reinforces the idea that the integration of technology in learning plays an important role in improving the quality of students' learning outcomes at the elementary school level.

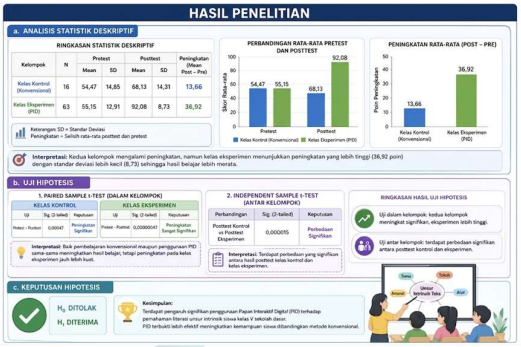

Figure 1. Research Results

The visualization of the research results shows a clear comparison between the control class and the experimental class in terms of improving students' literacy comprehension of intrinsic elements. In the descriptive statistical analysis section, it can be seen that both groups experienced an increase in scores from the pretest to the posttest. However, the increase in the experimental class was much higher than that in the control class, confirming the difference in the effectiveness of the learning methods used.

In the mean score comparison graph, the control class showed an increase from 54.47 to 68.13, while the experimental class increased from 55.15 to 92.08. This difference indicates that the use of Digital Interactive Boards (DIB) had a greater impact on students' learning outcomes. In addition, the mean score improvement graph also shows a significant difference between the two groups, namely 13.66 in the control class and 36.92 in the experimental class.

In terms of data distribution, the smaller standard deviation in the experimental class (8.73) compared to the control class (14.31) indicates that students' learning outcomes in the experimental class were more evenly distributed. This suggests that the use of DIB not only increased the average score but also reduced the gap in ability among students, making learning more inclusive.

In the hypothesis testing section, the visualization presents the results of the paired sample t-test and the independent sample t-test. Both groups showed significant improvement, but the experimental class had a higher level of significance. In addition, the between-group test showed a significant difference between the posttest results of the control and experimental classes, strengthening the evidence that the treatment given had a real effect.

Overall, the visualization of the research results confirms that the use of Digital Interactive Boards (DIB) was proven to be more effective than conventional methods in improving students' literacy comprehension of intrinsic elements. These results also clearly show that the integration of technology in learning can improve the quality of learning outcomes while creating more equitable and effective learning.

4. Conclusion

The results of the study show that the use of Digital Interactive Boards (DIB) significantly improved students' literacy comprehension of intrinsic elements compared to conventional methods. The higher improvement in the experimental class indicates that interactive technology-based learning media can strengthen students' comprehension process of narrative text structures.

This finding is in line with the Cognitive Theory of Multimedia Learning, which states that learning becomes more effective when information is presented through a combination of visual and verbal elements. In the context of this study, DIB enabled students to understand intrinsic elements through story plot visualization, character marking, and interactive information organization, thereby facilitating students' cognitive processes in understanding texts.

In addition, the results of this study also support constructivist theory, in which students actively construct their own understanding through interaction with learning media. The use of DIB allowed students not only to receive information passively but also to be directly involved in the process of text analysis.

Compared with previous studies, these results are consistent with the findings of Prados Sánchez et al. (2023), which showed that interactive digital media can improve students' reading comprehension. Similarly, Zahran's (2025) study found that the use of digital platforms such as Nearpod significantly improved students' reading ability and motivation.

However, the results of this study show a higher improvement than several previous studies, such as Aktaş (2023), which found that improvement was not always evenly distributed across all aspects of literacy. This difference may be caused by several factors: the type of media, as DIB is more interactive than passive digital media; the learning focus, as this study specifically examined intrinsic elements; and student engagement, as direct activities on the board increased participation.

Practically, these findings have important implications for elementary education. Teachers are encouraged to use interactive digital media such as DIB. Literacy learning also needs to integrate text visualization, and schools need to support the provision of learning technology. The contribution of this study is that it provides empirical evidence that the use of DIB is effective in improving a specific ability, namely the comprehension of intrinsic elements, which has rarely been examined quantitatively in previous studies.

Based on the results of the study, it can be concluded that the use of Digital Interactive Boards (DIB) has a significant effect on improving the literacy comprehension of intrinsic elements among fifth-grade elementary school students. This is evidenced by the results of descriptive statistical analysis, which showed a higher increase in the mean score of the experimental class compared to the

control class, as well as the results of hypothesis testing, which showed that the significance value was lower than 0.05. Thus, the alternative hypothesis (H_1) was accepted, meaning that the use of DIB was effective in improving students' ability to understand intrinsic elements of texts.

The findings of this study also show that interactive technology-based learning not only improves learning outcomes quantitatively but also helps create more equitable student achievement, as indicated by the smaller standard deviation in the experimental class. This indicates that the use of DIB can help reduce gaps in ability among students and support more inclusive and effective learning.

The practical implication of this study is the importance of integrating interactive digital learning media into the Indonesian language learning process in elementary schools. Teachers are encouraged to utilize technology such as Digital Interactive Boards as an alternative learning strategy that can increase students' engagement and comprehension. In addition, schools and education policymakers are expected to support the provision of technological facilities and infrastructure to optimize the implementation of digital-based learning.

Nevertheless, this study has several limitations, including the limited sample size involving only two schools and the relatively short duration of the treatment. These limitations may affect the generalizability of the research findings to a broader population. Therefore, the results of this study should be interpreted carefully in a wider context.

Based on these limitations, future research is recommended to involve a larger and more diverse sample and to extend the duration of the treatment in order to obtain more comprehensive results. In addition, further studies may also examine other variables, such as learning motivation, reading interest, or student engagement, to provide a deeper understanding of the effectiveness of technology use in literacy learning.

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