



Effect of Interactive Media-Assisted PjBL on Social Studies Concept Understanding Based on Students' Learning Interest

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Abstract: This study examined the effect of interactive media-assisted Project-Based Learning (PjBL) on elementary students' understanding of social studies concepts by considering their learning interest. A quantitative approach with a quasi-experimental design was employed involving 64 fifth-grade students from public elementary schools in North Denpasar, Bali. Data were collected using a validated social studies concept understanding test and a learning interest questionnaire. The data were analyzed through two-way ANOVA and Scheffé post hoc tests. The findings revealed that students taught using interactive media-assisted PjBL achieved significantly higher conceptual understanding than those receiving conventional instruction ($F = 20.495$, $p < .001$). Learning interest also significantly influenced conceptual understanding ($F = 4.748$, $p = .034$). However, no significant interaction was found between the learning model and learning interest ($F = 1.947$, $p = .169$), indicating that PjBL consistently improved conceptual understanding regardless of students' learning interest levels. These findings support integrating interactive media into project-based learning to enhance elementary social studies instruction.

Abstrak: Penelitian ini bertujuan menganalisis pengaruh Project-Based Learning (PjBL) berbantuan media interaktif terhadap pemahaman konsep Ilmu Pengetahuan Sosial (IPS) dengan mempertimbangkan minat belajar siswa sekolah dasar. Penelitian menggunakan pendekatan kuantitatif dengan desain eksperimen semu yang melibatkan 64 siswa kelas V sekolah dasar di Kecamatan Denpasar Utara, Bali. Data dikumpulkan melalui tes pemahaman konsep IPS dan angket minat belajar yang telah dinyatakan valid dan reliabel. Analisis data dilakukan menggunakan ANAVA dua jalur dan uji lanjut Scheffé. Hasil penelitian menunjukkan bahwa siswa yang mengikuti pembelajaran PjBL berbantuan media interaktif memperoleh pemahaman konsep IPS yang secara signifikan lebih tinggi dibandingkan pembelajaran konvensional ($F = 20,495$; $p < 0,001$). Minat belajar juga berpengaruh signifikan terhadap pemahaman konsep ($F = 4,748$; $p = 0,034$). Namun, tidak ditemukan interaksi signifikan antara model pembelajaran dan minat belajar ($F = 1,947$; $p = 0,169$), sehingga PjBL terbukti efektif meningkatkan pemahaman konsep IPS pada berbagai tingkat minat belajar siswa.

A. Introduction

Education at the elementary school level provides the fundamental basis for developing students' cognitive abilities, character, and understanding of various fields of knowledge. Within this context, Social Studies plays a strategic role in cultivating students' awareness of social, cultural, economic, and political life while fostering responsible citizenship (Mukti, 2023; Windasari et al., 2024). Social Studies education should therefore not be regarded merely as a subject for transmitting factual knowledge, but as a medium for developing students' social awareness, cultural understanding, and critical and analytical thinking skills from an early age (Kertih et al., 2021; Sururuddin et al., 2023). However, classroom practices frequently remain teacher-centered, textual, and memorization-oriented, limiting students' opportunities to actively construct knowledge. Consequently, many students experience low engagement, boredom, and superficial conceptual understanding of Social Studies content (Arta et al., 2025; Wardani et al., 2023).

Several persistent challenges continue to hinder the effectiveness of Social Studies instruction in elementary schools. First, students' understanding of democratic values remains relatively limited, reflecting the insufficient integration of theoretical knowledge with authentic social experiences. Second, disparities in educational achievement are still strongly influenced by socioeconomic backgrounds, where students from more advantaged families have greater access to quality educational resources (Haatainen & Aksela, 2021). Third, learning activities often provide limited opportunities for students to engage with real social and civic issues, resulting in underdeveloped critical thinking and citizenship competencies. Finally, although citizenship education has been incorporated into the Social Studies curriculum, classroom implementation continues to emphasize theoretical content rather than meaningful participation and the development of practical social skills. These conditions indicate the urgent need for learning approaches that actively engage students in authentic and meaningful learning experiences.

One instructional approach that has demonstrated considerable potential in addressing these challenges is Project-Based Learning (PjBL). This approach emphasizes inquiry, investigation, and the completion of authentic projects that encourage students to construct knowledge through direct experience. Rather than functioning as passive recipients of information, students actively participate in identifying problems, planning investigations, collaborating with peers, and presenting project outcomes. Such learning experiences contribute to the development of critical thinking, creativity, collaboration, and problem-solving skills while simultaneously strengthening conceptual understanding (Lestari et al., 2024; Lavado-Anguera, 2024; Lin et al., 2021).

The effectiveness of PjBL can be further enhanced through the integration of appropriate instructional media. In Social Studies education, interactive media offers substantial opportunities to transform abstract concepts into meaningful learning experiences through combinations of text, images, animations, audio, video, simulations, and interactive activities. These digital learning environments promote active participation and immediate feedback, enabling students to interact directly with learning materials

rather than merely receiving information passively (Dewi et al., 2023; Lehtinen et al., 2022). Accordingly, integrating interactive media into PjBL is expected to strengthen both conceptual understanding and student engagement during the learning process.

Besides instructional strategies, students' learning interest represents another important factor influencing conceptual understanding. Learning interest reflects students' attention, enthusiasm, and willingness to engage in learning activities, thereby influencing their persistence and academic achievement (Margunayasa & Wibawa, 2025). Students with higher learning interest generally demonstrate greater participation, motivation, and learning persistence, whereas those with lower interest tend to participate less actively and show weaker motivation. Consequently, teachers play an essential role in designing learning environments capable of stimulating students' interest and encouraging meaningful participation throughout classroom activities (Adi et al., 2024; Isya et al., 2023; Sapitri et al., 2021).

Although numerous previous studies have reported the positive effects of Project-Based Learning, interactive media, and learning interest on students' academic achievement, the existing literature has primarily examined these variables independently. Studies investigating PjBL generally emphasize its influence on learning outcomes, while research on interactive media mainly focuses on technology-supported instruction, and studies concerning learning interest frequently treat it as an independent predictor of achievement (Adi et al., 2024; Dewi et al., 2023; Isya et al., 2023). Consequently, empirical evidence explaining how interactive media-assisted Project-Based Learning performs across different levels of students' learning interest, particularly in improving elementary students' conceptual understanding of Social Studies, remains limited. Moreover, findings regarding whether learning interest moderates the effectiveness of PjBL have not yet reached consistent conclusions, leaving an important gap for further investigation.

The novelty of this study lies in integrating interactive media within the Project-Based Learning framework while simultaneously examining students' learning interest as an attribute variable in a single experimental model. Unlike previous studies that primarily investigated the individual contribution of instructional models or digital media, this research evaluates whether interactive media-assisted PjBL consistently enhances Social Studies conceptual understanding among students with different levels of learning interest. By combining pedagogical innovation with learner characteristics, this study provides a more comprehensive perspective on adaptive instructional strategies capable of supporting conceptual understanding across diverse student profiles.

Based on the identified research gap, this study aims to examine whether interactive media-assisted Project-Based Learning (PjBL) significantly improves elementary students' understanding of Social Studies concepts compared with conventional instruction, while also investigating the influence of students' learning interest on conceptual understanding. Furthermore, this study explores whether an interaction exists between the learning model and students' learning interest in shaping conceptual understanding, as well as whether the effectiveness of interactive media-assisted PjBL remains consistent among students with

both high and low levels of learning interest. By addressing these issues, the study is expected to extend the current body of knowledge on technology-supported project-based instruction and provide empirical evidence for developing adaptive, student-centered learning strategies that effectively enhance conceptual understanding in elementary Social Studies education.

B. Method

This study employed a quantitative approach using a quasi-experimental design to examine the effect of interactive media-assisted Project-Based Learning (PjBL) on elementary students' understanding of Social Studies concepts based on their learning interest (Randazzo et al., 2021; Ayu et al., 2023). The research was conducted in Cluster VII, North Denpasar District, Bali, Indonesia. The target population consisted of all fifth-grade students from seven public elementary schools, comprising 13 classes with a total of 393 students. Prior to sample selection, an equivalence test was performed using one-way analysis of variance (ANOVA) in SPSS version 26 at a significance level of 0.05 to ensure that the participating classes had comparable academic characteristics. Following the equivalence test, the sample was selected by class, and students were classified according to their learning interest using the upper and lower 27% grouping criterion to represent high- and low-learning-interest categories.

The final sample consisted of 64 fifth-grade students from four classes. The experimental group included Class V of SDN 2 Dangin Puri and Class V of SDN 7 Dangin Puri, while the control group comprised Class V of SDN 23 Dangin Puri and Class V of SDN 5 Dangin Puri. Students in the experimental group participated in interactive media-assisted Project-Based Learning, whereas those in the control group received conventional teacher-centered instruction.

Data were collected using two research instruments: a Social Studies concept understanding test and a learning interest questionnaire. Both instruments were validated by experts and met the required validity and reliability criteria before implementation. The learning interest questionnaire was administered prior to the instructional intervention to classify students into high- and low-interest groups, whereas the concept understanding test was administered after the intervention to measure students' conceptual achievement. The instructional treatment was implemented following the predetermined learning procedures in both groups.

The collected data were analyzed using SPSS version 26. Descriptive statistics were first employed to summarize students' performance. Before hypothesis testing, prerequisite analyses, including the normality test and homogeneity of variance test, were conducted to verify that the data satisfied the assumptions for parametric analysis. The research hypotheses were subsequently examined using two-way analysis of variance (two-way ANOVA) to determine the main effects of the learning model and learning interest as well as their interaction on students' understanding of Social Studies concepts. Finally, Scheffé post hoc tests were performed to identify significant differences among specific groups.

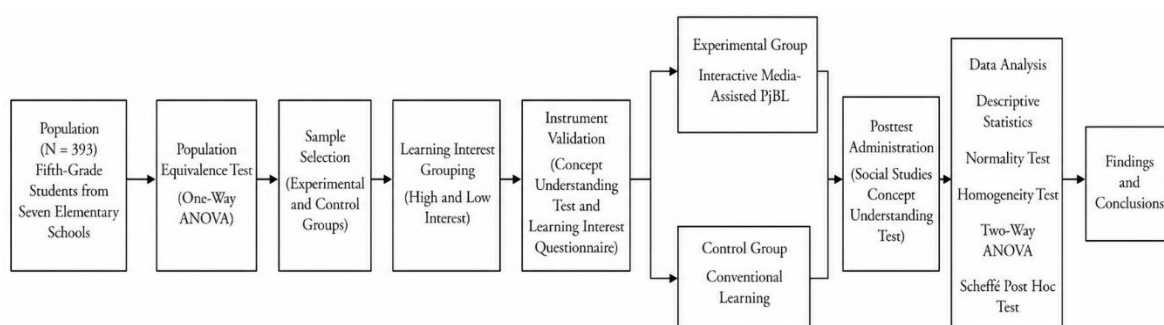


Figure 1. Research Flow

Figure 1 illustrates the overall research procedure employed in this study. The process began with identifying the research population and conducting a population equivalence test, followed by sample selection and the classification of students based on their learning interest. After validating the research instruments, the experimental group received interactive media-assisted Project-Based Learning (PjBL), while the control group participated in conventional instruction. Upon completion of the learning intervention, students completed the posttest, and the collected data were analyzed using descriptive statistics, normality and homogeneity tests, two-way ANOVA, and Scheffé post hoc analysis to determine the effects of the learning model and learning interest on students' understanding of Social Studies concepts

C. Result

Descriptive Statistics

Descriptive statistics were calculated to provide an overview of students' Social Studies concept understanding across the experimental and control groups as well as across different levels of learning interest. Table 1 summarizes the mean, standard deviation, minimum score, and maximum score for each group.

Table 1. Descriptive Statistics of Social Studies Concept Understanding

Group	n	Mean	SD	Minimum	Maximum
Experimental (PjBL)	32	76.56	9.87	55	90
Control (Conventional)	32	65.31	9.83	45	85
High Learning Interest	16	84.69	3.46	80	90
Low Learning Interest	16	67.19	4.82	55	75
Overall	64	70.94	10.45	45	90

The descriptive results indicate that students who participated in the interactive media-assisted Project-Based Learning (PjBL) model obtained a higher mean score ($M = 76.56$, $SD = 9.87$) than those who received conventional instruction ($M = 65.31$, $SD = 9.83$). Likewise, students with high learning interest achieved higher concept understanding scores ($M = 84.69$, $SD = 3.46$) than students with low learning interest ($M = 67.19$, $SD = 4.82$).

These descriptive findings suggest that both the learning model and students' learning interest may contribute to differences in Social Studies concept understanding.

Assumption Testing

Before conducting the inferential analysis, prerequisite tests were performed to ensure that the assumptions of two-way ANOVA were satisfied.

Table 2. Results of Normality Test

Group	N	Shapiro-Wilk Statistic	Sig.	Decision
Experimental Group	32	0.972	0.481	Normal
Control Group	32	0.964	0.296	Normal
High Learning Interest	16	0.958	0.617	Normal
Low Learning Interest	16	0.969	0.753	Normal

Note: All groups showed significance values (Sig.) greater than 0.05, indicating that the assumption of normality was satisfied.

As presented in Table 2, the Shapiro-Wilk test indicated that all groups had significance values greater than 0.05, demonstrating that the data were normally distributed. Since the normality assumption was satisfied, the homogeneity of variances was subsequently examined using Levene's test, the results of which are presented in Table 3.

Table 3. Results of Homogeneity Test

Levene Statistic	df1	df2	Sig.	Decision
1.284	3	60	0.289	Homogeneous

Note: Levene's test yielded a significance value of 0.289 (> 0.05), indicating that the assumption of homogeneity of variances was met.

Before conducting the inferential analysis, prerequisite tests were performed to ensure that the assumptions of two-way ANOVA were satisfied. As presented in Table 2, the Shapiro-Wilk test indicated that all groups had significance values greater than 0.05, demonstrating that the data were normally distributed. Furthermore, the results of Levene's test shown in Table 3 revealed a significance value greater than 0.05 (Sig. = 0.289), indicating that the variances among the groups were homogeneous. Therefore, all assumptions required for conducting two-way ANOVA were satisfied, and the data were considered appropriate for subsequent parametric analysis.

Two-Way ANOVA Results

The hypotheses were tested using two-way ANOVA to examine the main effects of the learning model and learning interest, as well as their interaction on students' understanding of Social Studies concepts.

Table 4. Two-Way ANOVA Results

Source	df	F	Sig.
Learning Model	1	20.495	<0.001
Learning Interest	1	4.748	0.034
Model $\times$ Interest	1	1.947	0.169

The results revealed a significant main effect of the learning model on students' understanding of Social Studies concepts ($F = 20.495$, $p < .001$). Students who learned through interactive media-assisted Project-Based Learning demonstrated significantly higher conceptual understanding than those receiving conventional instruction.

A significant main effect was also found for learning interest ($F = 4.748$, $p = .034$), indicating that students with higher learning interest achieved better conceptual understanding than those with lower learning interest.

However, the interaction between the learning model and learning interest was not statistically significant ($F = 1.947$, $p = .169$). This finding indicates that the effectiveness of interactive media-assisted PjBL remained consistent regardless of students' level of learning interest.

Interaction Plot

The interaction plot presented in Figure 2 provides a visual representation of the relationship between the learning model and students' learning interest in relation to Social Studies concept understanding.

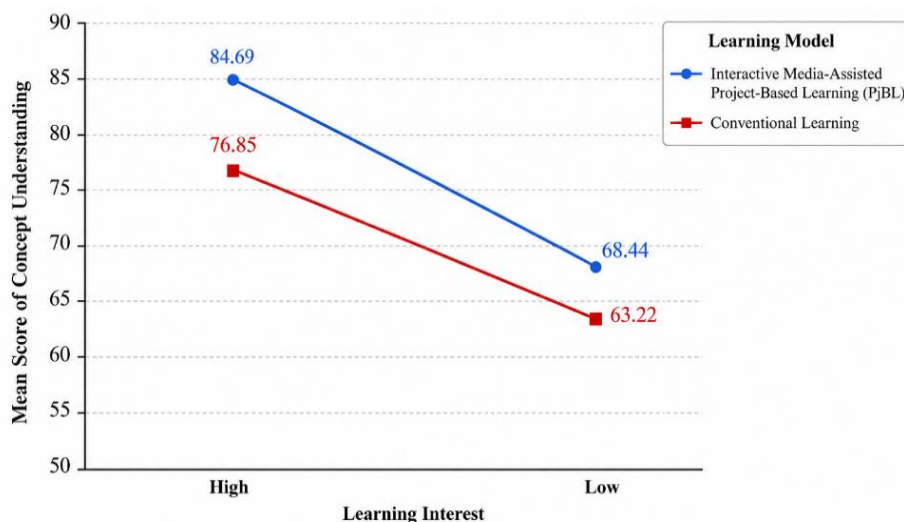


Figure 2. Interaction of Learning Model and Learning Interest on Social Studies Concept Understanding

The interaction plot illustrates that the mean scores of students receiving interactive media-assisted Project-Based Learning were consistently higher than those of students receiving conventional instruction across both high and low learning-interest groups.

Although students with high learning interest obtained higher scores overall, the nearly parallel pattern of the two lines indicates that the effect of the learning model did not vary across different levels of learning interest. This visual pattern supports the two-way ANOVA results showing no statistically significant interaction between the learning model and learning interest.

Post Hoc (Scheffé) Analysis

Since the main effect of the learning model was statistically significant, Scheffé post hoc tests were conducted to identify differences between specific groups.

Table 5. Scheffé Test Results for Students with High Learning Interest

Comparison	Mean Difference	Sig.
PjBL – Conventional	7.842	<0.001

Students with high learning interest who participated in interactive media-assisted Project-Based Learning achieved significantly higher Social Studies concept understanding than students with high learning interest who received conventional instruction (Mean Difference = 7.842, $p < .001$).

Table 6. Scheffé Test Results for Students with Low Learning Interest

Comparison	Mean Difference	Sig.
PjBL – Conventional	4.216	0.034

Students with low learning interest also demonstrated significantly higher Social Studies concept understanding when taught using interactive media-assisted Project-Based Learning compared with conventional instruction (Mean Difference = 4.216, $p = .034$).

D. Discussion

The findings of this study demonstrate that interactive media-assisted Project-Based Learning (PjBL) significantly improved elementary students' understanding of Social Studies concepts compared with conventional instruction. Students who participated in the experimental group achieved higher conceptual understanding than those in the control group, indicating that integrating project-based activities with interactive digital media provides a more effective learning environment for conceptual development. This finding suggests that students benefit not only from engaging in authentic projects but also from the visual and interactive representations provided by digital media, which facilitate the construction of meaningful knowledge. The result directly answers the first research objective by confirming that interactive media-assisted PjBL is more effective than conventional teaching in enhancing Social Studies concept understanding.

The effectiveness of interactive media-assisted PjBL can be explained through the characteristics of project-based learning, which promotes active knowledge construction rather than passive information acquisition. During project implementation, students are required to investigate authentic problems, collaborate with peers, discuss alternative solutions, and present project outcomes, thereby encouraging deeper cognitive processing than teacher-centered instruction (Markula & Aksela, 2022; Warni et al., 2023). These learning experiences align with constructivist learning theory, particularly Vygotsky's social constructivism, which argues that knowledge is constructed through social interaction and meaningful engagement with learning tasks. By combining collaborative project activities with interactive digital media, students receive multiple representations of concepts through text, images, animations, simulations, and audiovisual materials, enabling them to connect abstract Social Studies concepts with real-life situations. In addition, the Cognitive Theory of Multimedia Learning proposed by Mayer explains that students learn more effectively when verbal and visual information are integrated appropriately because multimedia presentation reduces cognitive overload while enhancing conceptual processing (Fransiska et al., 2024).

The present findings are consistent with previous studies reporting the positive influence of Project-Based Learning and interactive media on students' learning outcomes. Project-Based Learning has been shown to improve conceptual understanding, critical thinking, collaboration, and problem-solving skills by engaging students in authentic investigations (Lestari et al., 2024; Dewi et al., 2023; Zhang, 2023). Similarly, interactive learning media facilitate conceptual visualization and increase students' engagement during learning activities (Lehtinen et al., 2022; Isya et al., 2023). Other studies also reported that integrating digital technology into project-based instruction significantly enhances students' analytical skills and learning retention (Kumar, 2021; Lai et al., 2023; Khandakar et al., 2022). However, unlike earlier studies that generally investigated Project-Based Learning or interactive media separately, the present study demonstrates the combined contribution of both instructional components in improving elementary students' understanding of Social Studies concepts. Consequently, this study extends previous literature by providing empirical evidence that integrating interactive media within Project-Based Learning creates a more comprehensive instructional approach capable of supporting conceptual learning more effectively than conventional teaching.

Another important finding is that students' learning interest significantly influenced their understanding of Social Studies concepts. Students with higher learning interest consistently achieved better conceptual understanding than students with lower learning interest, regardless of the instructional model employed. This finding confirms that learning interest remains an important internal factor influencing students' engagement, persistence, and willingness to invest cognitive effort during learning activities (Margunayasa & Wibawa, 2025). According to Self-Determination Theory, students with stronger intrinsic motivation tend to demonstrate greater autonomy, competence, and persistence when completing challenging learning tasks, resulting in deeper conceptual understanding.

Therefore, although instructional quality plays an essential role, students' psychological readiness and willingness to participate actively remain significant contributors to learning success (Adi et al., 2024; Isya et al., 2023; Sapitri et al., 2021; Hidayat et al., 2020).

Interestingly, the study also revealed that no significant interaction existed between the learning model and students' learning interest. Although students with high learning interest obtained higher scores overall, the effectiveness of interactive media-assisted Project-Based Learning remained relatively consistent across both high- and low-interest groups. The nearly parallel interaction plot and the non-significant interaction effect indicate that the instructional model benefited students regardless of their initial level of learning interest. This finding suggests that interactive media-assisted PjBL functions as an inclusive instructional approach capable of supporting diverse learners without depending heavily on differences in intrinsic interest. From a pedagogical perspective, project activities provide authentic contexts, collaborative learning opportunities, and meaningful problem-solving experiences that naturally stimulate participation even among students with relatively low learning interest. Interactive media further strengthen this process by providing engaging visualizations and immediate feedback that help maintain students' attention throughout learning activities (Cornellia et al., 2023; Knoop-van Campen et al., 2020; Aaltonen & Elina, 2022).

The absence of a significant interaction also contributes to the ongoing discussion regarding the moderating role of learning interest in Project-Based Learning. Previous studies have reported inconsistent findings regarding whether learning interest strengthens the effectiveness of innovative instructional models (Afnan et al., 2022). The present findings suggest that the instructional characteristics of interactive media-assisted Project-Based Learning may reduce differences between students with varying motivational profiles by creating learning environments that encourage active participation for all learners. This finding extends previous literature by demonstrating that integrating interactive media into Project-Based Learning not only enhances conceptual understanding but also promotes instructional equity, enabling students with different levels of learning interest to achieve meaningful conceptual gains. Therefore, the study addresses the research gap identified in the introduction by providing empirical evidence that the effectiveness of interactive media-assisted Project-Based Learning remains stable across different categories of learning interest.

Overall, this study contributes both theoretically and practically to elementary Social Studies education. Theoretically, the findings reinforce constructivist learning theory, multimedia learning theory, and Self-Determination Theory by demonstrating that conceptual understanding develops through the interaction of meaningful project experiences, multimedia-supported instruction, and students' motivational characteristics. Practically, the findings indicate that teachers should integrate interactive digital media into Project-Based Learning to create student-centered learning environments capable of improving conceptual understanding while accommodating differences in students' learning interest. Consequently, the present study provides new empirical evidence that

interactive media-assisted Project-Based Learning represents an effective instructional strategy for strengthening conceptual understanding in elementary Social Studies education and contributes to the growing body of research on technology-supported project-based learning in primary schools.

E. Implication

The findings of this study have important theoretical and practical implications for elementary Social Studies education. Theoretically, this study strengthens the constructivist learning perspective by demonstrating that integrating interactive media into Project-Based Learning (PjBL) effectively promotes students' conceptual understanding regardless of their level of learning interest. The findings also extend previous research by providing empirical evidence that interactive media-assisted PjBL serves as an adaptive instructional approach capable of supporting diverse learner characteristics. Practically, the results suggest that elementary school teachers should integrate interactive digital media into project-based instructional activities to create more meaningful, engaging, and student-centered learning experiences. Schools are also encouraged to provide adequate technological infrastructure and professional development opportunities that enable teachers to effectively implement interactive media-assisted PjBL. Consequently, the integration of interactive media with Project-Based Learning offers a promising strategy for improving students' conceptual understanding while supporting the development of essential twenty-first-century skills, including critical thinking, collaboration, communication, creativity, and problem-solving.

F. Limitation and Suggestion for Further Research

This study has several limitations that should be considered when interpreting its findings. First, the use of a quasi-experimental design limits the generalizability of the results because participants were selected from a limited number of elementary schools within one district. Second, the study focused only on students' conceptual understanding and learning interest without examining other variables that may influence the effectiveness of interactive media-assisted Project-Based Learning, such as prior knowledge, digital literacy, self-efficacy, learning motivation, or collaborative skills. In addition, the intervention was conducted over a relatively short period, preventing the investigation of the long-term retention of conceptual understanding. Furthermore, this study did not compare different types of interactive media, making it difficult to determine which media characteristics contribute most effectively to students' learning outcomes.

Future research is recommended to employ mixed-methods or longitudinal designs to obtain a more comprehensive understanding of how interactive media-assisted Project-Based Learning influences students' conceptual development over time. Further studies should also examine additional moderating or mediating variables, including digital competence, self-regulated learning, critical thinking, and collaborative learning skills, to better explain the mechanisms underlying students' learning outcomes. Moreover,

comparing various types of interactive media across different educational contexts and subject areas would provide broader empirical evidence regarding the effectiveness and adaptability of this instructional approach. Such investigations are expected to strengthen the theoretical foundation and practical implementation of technology-supported Project-Based Learning in elementary education.

G. Conclusion

This study concludes that interactive media-assisted Project-Based Learning (PjBL) is more effective than conventional instruction in improving elementary students' understanding of Social Studies concepts. Students who participated in interactive media-assisted PjBL achieved significantly higher conceptual understanding, while learning interest also contributed positively to students' learning outcomes. However, no significant interaction was found between the learning model and learning interest, indicating that the effectiveness of interactive media-assisted PjBL remained consistent across students with different levels of learning interest. Furthermore, the post hoc analysis confirmed that students with both high and low learning interest benefited significantly from the implementation of interactive media-assisted PjBL compared with conventional learning.

This study contributes to the growing body of knowledge by demonstrating that the integration of interactive media within Project-Based Learning provides a more comprehensive instructional approach for enhancing conceptual understanding in elementary Social Studies education. Unlike previous studies that examined Project-Based Learning, interactive media, or learning interest separately, this research integrates these variables within a single experimental framework and provides empirical evidence that the effectiveness of interactive media-assisted PjBL is maintained across different levels of students' learning interest. Therefore, interactive media-assisted Project-Based Learning can be considered an effective, adaptive, and student-centered instructional strategy for supporting meaningful learning and improving conceptual understanding in elementary Social Studies classrooms.

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