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The Effect of Educaplay Based on Game-Based Learning on Learning Interest and Participation in IPAS of Fourth-Grade Madrasah Ibtidaiyah Students

Aura Della Rahmawati[1], Risalul Ummah[2]
[123]Universitas Nahdlatul Ulama Sidoarjo; Indonesia
Correspondence Email; auradela6@gmail.com

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Abstract

This study aimed to examine the effect of Educaplay based on Game-Based Learning (GBL) on fourth-grade Madrasah Ibtidaiyah students' learning interest and participation in IPAS. The research employed a quantitative approach with a quasi-experimental pretest–posttest control group design conducted from January to February 2026 at MI Darussalam, involving 50 students (25 experimental; 25 control). Data were collected through a learning interest questionnaire (α = 0.89), participation observation sheets (reliability = 0.87), and documentation. Data analysis included the Kolmogorov–Smirnov normality test, Levene's homogeneity test, independent t-test, Mann–Whitney U test, N-Gain analysis, and effect size (Cohen's d). The experimental group achieved significantly higher results than the control group. The mean learning interest score was 93.00 (SD = 4.330) in the experimental class and 76.80 (SD = 6.103) in the control class, with a significant difference, t(47) = 10.607; p = 0.000; d = 3.09 (very large effect). The N-Gain was 54.20% (moderate category according to Richard R. Hake, 1999) in the experimental group and 20.53% (low category) in the control group. Learning participation also differed significantly (U = 121.00; p = 0.000), with higher scores in the experimental class (M = 20.28) than in the control class (M = 16.24). Educaplay based on Game-Based Learning significantly improves learning interest and participation in IPAS. The findings imply that interactive digital game-based media can enhance affective engagement and active classroom involvement in elementary education.

Keywords Educaplay, Game-Based Learning, Learning Interests, Student Participation.

INTRODUCTION

Basic education plays a crucial role in developing students' cognitive, affective, and psychomotor competencies (Slameto, 2015). At the Madrasah Ibtidaiyah (MI) level, Integrated Science and Social Studies (IPAS) learning is expected not only to promote conceptual understanding but also to foster students' curiosity, scientific attitudes, and active engagement in exploring real-life phenomena. In line with this, the implementation of the Merdeka Curriculum emphasizes student-centered and contextual learning, supported by the integration of digital technology to create meaningful learning experiences (Sugih et al., 2023). Recent studies have also highlighted that interactive and technology-supported learning environments significantly contribute to students' learning interest and participation at the elementary level (Widiana, 2022).

However, classroom practices often do not fully reflect these expectations. Based on preliminary observations conducted at MI Darussalam, IPAS learning is still predominantly teacher-centered, relying heavily on lectures and textbooks with minimal use of interactive media or digital technology. Students tend to show low engagement during lessons, as indicated by passive behavior such as limited participation in discussions and a lack of attention to instructional activities. These findings represent actual classroom conditions and indicate that students' learning interest and participation remain suboptimal.

Low levels of learning interest and participation have been widely recognized as critical issues in elementary education. Recent research shows that students' active involvement in learning is closely related to their motivation, attention, and overall learning outcomes (Yu et al., 2021; Ginting, 2021). Students who are actively engaged tend to demonstrate higher enthusiasm, better interaction, and deeper learning experiences. Conversely, passive learning environments often result in boredom, low motivation, and limited participation (Putri & Setiyawati, 2023). Therefore, improving students' affective engagement becomes an essential focus in designing effective instructional strategies (Partovi, 2019).

One promising approach to address this issue is the use of Game-Based Learning (GBL), which integrates game elements into the learning process to create an interactive and enjoyable environment. Previous studies in the last five years have consistently shown that GBL can enhance students' motivation, engagement, and participation by providing challenges, immediate feedback, and meaningful interaction (Alotaibi, 2024; Febrianti et al., 2025; Wafiqni & Adelia, 2025). In addition, digital platforms such as Educaplay offer various interactive features, including quizzes,

puzzles, and educational games, which support active learning and student-centered instruction (Alfinarum et al., 2023; Retta et al., 2025). These findings indicate that integrating digital game-based media has strong potential to improve students' affective learning outcomes.

Nevertheless, several limitations can be identified in previous studies. Most research has focused primarily on cognitive outcomes or examined only a single affective variable, such as motivation or interest. In addition, many studies have employed classroom action research designs, which limit the ability to compare the effectiveness of different instructional approaches. Quantitative studies using quasi-experimental designs that simultaneously examine learning interest and participation, particularly in IPAS learning at the MI level, remain limited (Hii, 2023). This indicates a research gap that requires further investigation using a more rigorous and comparative approach.

Based on this gap, this study aims to analyze the effect of Educaplay's digital media, based on Game-Based Learning, on students' learning interest and participation in IPAS learning at MI Darussalam. This research is expected to provide empirical evidence on the effectiveness of integrating digital game-based media in enhancing students' affective engagement. The novelty of this study lies in examining two affective variables simultaneously—learning interest and participation—within a quasi-experimental design in the context of elementary IPAS learning. Specifically, this study aims to examine differences in learning interest and participation between students who use Educaplay-based Game-Based Learning and those who receive conventional instruction, and to analyze the effectiveness of this approach in improving both variables.

METHOD

This study employed a quantitative approach using a quasi-experimental research design of the Pretest–Posttest Control Group Design type (Sugiyono, 2019). This design was selected because the researcher was unable to fully randomly assign subjects; however, it still allowed for comparison of treatment effects by measuring conditions before and after the intervention in both the experimental and control groups (Creswell & Creswell, 2018).

The research was conducted from January to February 2026 at MI Darussalam during the 2025/2026 academic year. The population consisted of all fourth-grade students, comprising two parallel classes. The total number of respondents was 50 students, with 25 students in the experimental class (IV D) and 25 students in the control class (IV C).

The sampling technique used was purposive sampling, based on equivalent academic characteristics, similar number of students, and instruction by the same subject teacher to minimize bias. Class IV D was designated as the experimental group, receiving IPAS instruction using Educaplay digital media based on Game-Based Learning (GBL), while Class IV C served as the control group and received conventional instruction without interactive digital media.

Experimental Design

The study used the following Pretest–Posttest Control Group Design:

Table 1. Research Framework

Group	Pretest	Treatment	Posttest
Experimental	O1	X (Educaplay-GBL)	O2
Control	O1	– (Conventional Learning)	O2

Source : Sugiyono (2017)

Based on Table 1, the research design employed in this study was the Pretest–Posttest Control Group Design. In this design, there were two research groups, namely the experimental group and the control group. Both groups were initially administered a pretest (O1) to determine the students' initial conditions or prior abilities before the treatment was implemented. Furthermore, the experimental group received the treatment (X) in the form of learning activities using Educaplay based on Game-Based Learning (GBL), while the control group was taught through conventional learning without the use of interactive digital media. After the learning process was completed, both groups were administered a posttest (O2) to examine changes in students' learning interest and participation following the treatment. This research design was applied to compare the effect of using Educaplay based on Game-Based Learning on students' learning interest and participation in comparison with conventional learning methods.

Research Instruments

The instruments used in this study consisted of a learning interest questionnaire, a learning participation observation sheet, and documentation. The learning interest questionnaire was employed to collect data on students' affective responses toward IPAS learning. This instrument was developed based on the theory of learning interest, which includes dimensions such as attention, enjoyment, engagement, and satisfaction in learning activities (Ormrod, 2020; Slameto, 2015; Slavin, 2018). The questionnaire was constructed using a five-point Likert scale ranging from strongly disagree to strongly agree. The instrument was declared valid based on expert judgment involving specialists in elementary education and educational evaluation, as well as empirical

validity testing using item-total correlation analysis. The reliability test yielded a Cronbach's Alpha coefficient of 0.89, indicating high internal consistency.

In addition, a learning participation observation sheet was used to measure students' active involvement during the learning process. This instrument included indicators such as activeness, participation in discussions, responsiveness to tasks, and interaction with peers and teachers. The observation sheet was developed based on student engagement theory, which emphasizes behavioral participation as a key component of effective learning (Fredricks et al., 2004; updated perspectives in Rahmawati & Widodo, 2021). The instrument demonstrated strong inter-rater reliability, with a coefficient of 0.87, indicating consistent observations between observers. Documentation techniques were also used to support the data, including classroom photos, lesson plans, and learning records, which served as supplementary evidence of the implementation process.

Research Procedure

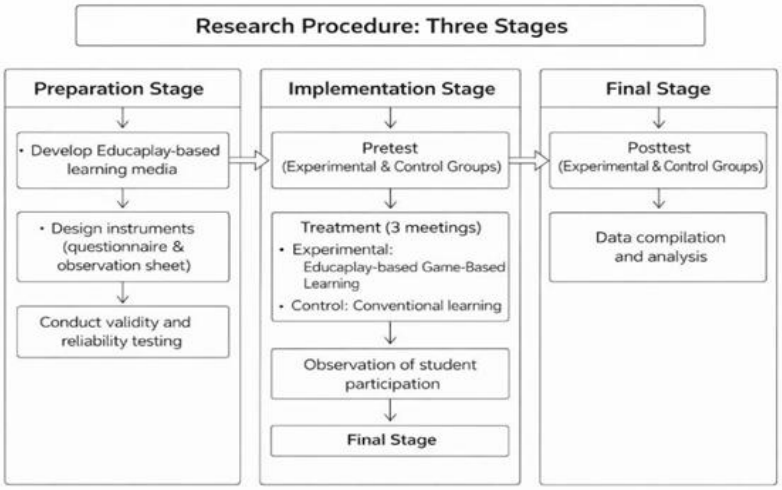

Figure 1. Flowchart of Research Procedure

The figure above illustrates the flowchart of the research procedure carried out systematically, starting from the preparation stage to data analysis. The study began with problem identification and preliminary observation at the school, followed by the development of research instruments in the form of a learning interest questionnaire and student participation observation sheets. After the instruments were declared valid and reliable, the researcher determined the experimental class and the control class. Both classes were administered a pretest to determine the students' initial abilities. Furthermore, the experimental class received instruction using Educaplay based on Game-Based Learning, while the control class was taught using conventional learning methods. After the treatment was completed, both classes were given a posttest to identify the

changes that occurred. The collected data were then analyzed using statistical tests to draw the research conclusions.

Data Analysis

Data analysis in this study was conducted systematically to ensure the validity and reliability of the findings. First, prerequisite tests were carried out to examine the assumptions of the data. The normality test was conducted using the Kolmogorov–Smirnov test to determine whether the data were normally distributed. The homogeneity of variance was tested using Levene's Test to ensure that the variances between groups were equal. These prerequisite tests are essential before conducting parametric statistical analysis a (Creswell & Creswell, 2018).

Descriptive statistical analysis was then performed to summarize the characteristics of the data, including the mean, standard deviation, and percentage of improvement. In addition, the normalized gain (N-Gain) was calculated to measure the effectiveness of the treatment in improving students' learning outcomes. The N-Gain score was interpreted using the following criteria: high ($g \geq 0.70$), moderate ($0.30 \leq g < 0.70$), and low ($g < 0.30$), based on the classification proposed by Hake (1998). This analysis provides a clearer picture of the magnitude of learning improvement beyond raw score differences.

Hypothesis testing was conducted using both parametric and non-parametric statistical techniques. A paired-sample t-test was used to examine within-group differences between pretest and posttest scores, while an independent samples t-test was applied to compare differences between the experimental and control groups. For data that did not meet parametric assumptions, particularly participation data, the Mann–Whitney U test was employed as a non-parametric alternative. Furthermore, effect size was calculated using Cohen's d to determine the magnitude of the treatment effect. The interpretation of effect size followed Cohen's, (1988) criteria: small ($d = 0.2$), medium ($d = 0.5$), and large ($d \geq 0.8$). This analysis complements significance testing by providing information about the practical significance of the results.

Scope and Limitations

This study was limited to fourth-grade students at MI Darussalam studying the IPAS topic of characteristics of living things. Therefore, the findings cannot be generalized directly to other grade levels, subjects, or school contexts. Furthermore, the variables analyzed focused only on affective (learning interest) and behavioral (participation) aspects, without measuring cognitive achievement outcomes or external factors such as parental support and home digital access.

FINDINGS AND DISCUSSION

Findings

Implementation of Learning Activities

The learning activities in this study were carried out in three meetings for both the experimental and control groups. In the experimental class, learning was conducted using Educaplay digital media based on Game-Based Learning, where students actively participated in interactive quizzes, puzzles, and game-based exercises. Students worked individually and in groups to complete tasks, received immediate feedback, and engaged in discussions. In contrast, the control class received conventional instruction using textbooks and teacher explanations without interactive media.

Figure 2. Learning Activities Using Educaplay in the Experimental Class

The figure illustrates the implementation of learning activities using Educaplay based on Game-Based Learning in the experimental class. In this activity, the students appeared actively engaged in the learning process through interactive quizzes, educational games, and group discussions. The use of interactive digital media created a more engaging learning atmosphere and encouraged students to participate actively throughout the learning process.

Descriptive Statistics Results

a. Descriptive Statistics of Learning Interest

Descriptive statistics of learning interest are presented in Table 2.

Table 2. Descriptive Statistics of Learning Interest

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre-test Ekspermen	25	20	75	95	85.60	5.831
Post-test Eksperimen	25	15	85	100	93.00	4.330
Pere-test Kontrol	25	25	60	85	71.00	6.292
Post-test Kontrol	25	25	65	90	76.80	6.103
Valid N (listwise)	25					

Source: SPSS 16

Based on Table 2, the experimental group had a mean pretest score of 85.60, which increased to 93.00 in the posttest, indicating an improvement of 7.40 points. Meanwhile, the control group had a mean pretest score of 71.00 and a posttest score of 76.80, showing an improvement of 5.80 points. The standard deviation in the experimental group decreased from 5.831 to 4.330, indicating that the scores became more consistent after the treatment, whereas the control group showed relatively stable variation, from 6.292 to 6.103. These data indicate that both groups experienced improvement; however, the increase and the posttest scores in the experimental group were higher than those in the control group.

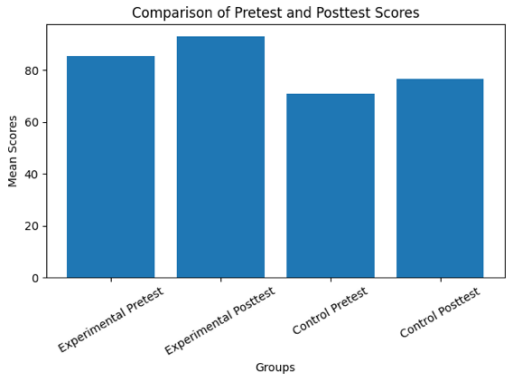

Figure 3. Comparison of Pretest and Posttest Learning Interest Scores

The graph illustrates the comparison of students' learning interest pretest and posttest scores between the experimental class and the control class. The graph shows an increase in scores in both groups after the learning process was conducted; however, the improvement in the experimental class was higher than that of the control class. These results indicate that the use of Educaplay based on Game-Based Learning was more effective in improving students' learning interest.

b. Description Statistics of Learning Participation

Descriptive statistics of learning participation are presented in Table 3.

Table 3. Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Kelas Kontrol	25	14	8	22	16.24	3.551
Kelas Eksperimen	25	10	14	24	20.28	2.951
Valid N (listwise)	25					

Source: SPSS 16

Based on Table 3, the mean participation score in the experimental group was 20.28 with a standard deviation of 2.951, while the control group had a mean of 16.24 with a standard deviation of 3.551. The higher mean score in the experimental group indicates a higher level of observed

participation compared to the control group. These results indicate that learning using Educaplay based on Game-Based Learning was able to enhance students' engagement in the learning process, such as actively asking questions, answering questions, participating in discussions, and completing assignments.

Assumption Testing

a. Normality Test (Kolmogorov–Smirnov)

Normality tests were performed using the Kolmogorov-Smirnov test to determine whether the data were normally distributed before proceeding to further statistical analysis.

The normality test results are presented in Table 4.

Table 4. Tests of Normality

	Kelas	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Result	Pre-test Kontrol	.203	25	.009	.941	25	.154
	Post-test Kontrol	.184	25	.029	.940	25	.148
	Pre-test Eksperimen	.175	25	.047	.923	25	.059
	Post-tes Eksperimen	.278	25	.000	.867	25	.004
a. LillieforsSignificance Correction							

Source: SPSS 16

Based on Table 4, the Shapiro–Wilk significance values for the control group were 0.154 (pretest) and 0.148 (posttest), indicating normal distribution ($p > .05$). In the experimental group, the pretest value was 0.059 (normal), while the posttest value was 0.004 (not normal). These results indicate that not all data were normally distributed.

b. Homogeneity Test (Levene's Test)

The homogeneity test was conducted using Levene's test to determine whether the variances of the two groups were equal. The homogeneity test results are shown in Table 5.

Table 5. Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Result	Based on Mean	2.016	1	48	.162
	Based on Median	1.589	1	48	.214
	Based on Median and with adjusted df	1.589	1	46.057	.214
	Based on trimmed mean	2.031	1	48	.161

Source: SPSS 16

As shown in Table 5, the significance value based on the mean was 0.162 ($p > 0.05$), indicating that the variances of the two groups were homogeneous and met the requirements for conducting parametric statistical tests.

Hypothesis Testing

a. Independent Sample t-Test (Learning Interest)

As the data were normally distributed and homogeneous, the analysis was continued using an independent samples t-test to determine whether there was a significant difference between the experimental and control groups.

The results of the independent samples t-test are presented in Table 6.

Table 6. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Result	Equal variances assumed	1.797	.187	-10.607	47	.000	-15.917	1.501	-18.935	-12.898
	Equal variances not assumed			-10.536	41.498	.000	-15.917	1.511	-18.967	-12.867

Source: SPSS 16

The analysis showed a significance value (Sig. 2-tailed) of 0.000 ($p < .05$), indicating a statistically significant difference between the experimental and control groups. The t-test result was $t(47) = 10.607$ with a mean difference of 15.917.

The independent samples t-test was used because the data met the homogeneity assumption and most distributions were approximately normal, making parametric testing appropriate for comparing mean differences between two groups (Creswell & Creswell, 2018). The effect size (Cohen's d = 3.09) indicates a very large effect of the treatment.

b. Mann–Whitney U Test (Learning Participation)

The results of the Mann–Whitney U test are presented in Table 7 and Table 8.

Table 7. Ranks

	Class	N	Mean Rank	Sum of Ranks
Scor	Class Control	25	17.84	446.00
	Class Eksperimen	25	33.16	829.00
	Total	50		

Source: SPSS 16

The table presents the ranking results of students' learning participation in the experimental class and the control class based on the Mann–Whitney U test. The mean rank value of the experimental class was higher than that of the control class. This indicates that the level of student participation in the experimental class was better than that of the students in the control class.

Table 8. Test Statistics[a]

	Skor
Mann-Whitney U	121.000
Wilcoxon W	446.000
Z	-3.730
Asymp. Sig. (2-tailed)	.000

Source: SPSS 16

Based on Table 8, the significance value was 0.000 ($p < .05$), indicating a significant difference in learning participation between the experimental and control groups. The Mann–Whitney U test was used because participation data did not meet parametric assumptions.).

N-Gain Analysis

N-Gain was calculated to determine practical effectiveness.

The N-Gain analysis results are presented in Table 9.

Table 9. N-Gain Analysis

	Class			Statistic	Std. Error
N_GainPersen	**Kontrol**	**Mean**		**20.53**	**1.635**
		95%Confidence Interval for Mean	Lower Bound	17.16	
			Upper Bound	23.91	
		5% Trimmed Mean		20.82	
		Median		20.00	
		Variance		66.794	
		Std. Deviation		8.173	
		Minimum		0	
		Maximum		33	
		Range		33	
		Interquartile Range		11	
		Skewness		-.089	.464
		Kurtosis		.291	.902
	Eksperimen	Mean		54.20	4.533
		95%Confidence Interval for Mean	Lower Bound	44.84	
			Upper Bound	63.56	
		5% Trimmed Mean		54.39	
		Median		50.00	
		Variance		513.685	
		Std. Deviation		22.665	
		Minimum		0	
		Maximum		100	
		Range		100	
		Interquartile Range		22	
		Skewness		.346	.464
		Kurtosis		1.279	.902

Source: SPSS 16

Based on Table 9, the experimental group achieved an average N-Gain of 54.20%, while the control group achieved 20.53%. According to the N-Gain classification criteria, the experimental group falls into the moderate category, whereas the control group is categorized as low. This indicates a higher level of improvement in the experimental group compared to the control group.

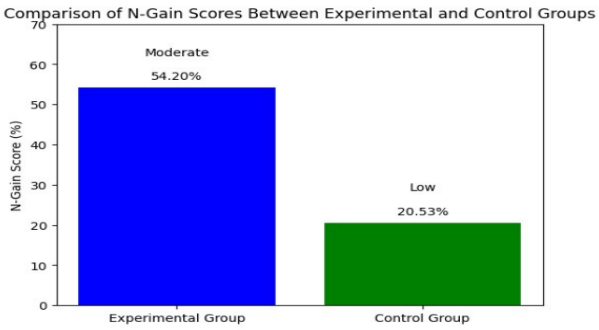

Figure 4. N-Gain Comparison Between Experimental and Control Groups

The graph illustrates the comparison of N-Gain scores between the experimental class and the control class. The graph shows that the N-Gain score in the experimental class was higher than that in the control class. This indicates that the use of Educaplay based on Game-Based Learning was more effective in improving students' learning interest compared to conventional learning methods.

Discussion

The findings of this study indicate that the use of Educaplay-based Game-Based Learning (GBL) significantly enhances students' learning interest and participation in IPAS learning. This improvement can be explained both practically and theoretically through the mechanisms embedded in interactive digital learning environments. From a practical perspective, Educaplay creates an engaging learning atmosphere by integrating quizzes, challenges, and immediate feedback into classroom activities. These features encourage students to actively respond, compete, and interact during the learning process, thereby increasing their attention, enjoyment, and willingness to participate. The structured game elements, such as scoring systems and time-based challenges, also provide clear goals and reinforcement, which sustain students' engagement throughout the lesson (Hamari et al., 2014; Zabala-Vargas & Martínez, 2021).

From a theoretical perspective, the effectiveness of Educaplay-based GBL can be explained through Self-Determination Theory, which emphasizes that learning motivation increases when students experience autonomy, competence, and relatedness (Deci & Ryan, 2000). In this study, autonomy was reflected in students' opportunities to complete tasks independently within the digital platform, competence was supported through immediate feedback that helped students recognize their progress, and relatedness emerged through interaction with peers during game-based activities. These elements collectively foster intrinsic motivation, which subsequently manifests as increased learning interest and active participation. This finding is consistent with

recent studies showing that interactive digital learning environments significantly improve student engagement and motivation (Nugroho & Darmawan, 2024; Sari & Sumarni, 2022; Widiana, 2022).

The increase in learning interest observed in this study can also be understood through the affective components of learning, particularly attention, enjoyment, and satisfaction. Compared to conventional instruction, game-based learning provides more dynamic and emotionally engaging experiences, which stimulate students' curiosity and sustain their focus. The use of interactive media transforms passive learning into active exploration, where students are directly involved in responding to tasks and receiving instant results. This supports previous findings that game-based digital media enhances students' affective engagement more effectively than traditional methods (Febrianti et al., 2025; Wafiqni & Adelia, 2025). Thus, the improvement in learning interest is not merely a result of novelty but is driven by meaningful interaction and continuous feedback.

In terms of learning participation, the results can be explained through constructivist learning theory, which posits that knowledge is actively constructed through interaction and experience (Gee, 2003; Plass et al., 2015). Educaplay-based activities require students to engage cognitively and behaviorally by answering questions, solving problems, and participating in discussions. This shifts the learning process from teacher-centered to student-centered, where students play an active role in constructing their understanding. The interactive nature of the platform reduces passive behavior and encourages collaboration, thereby increasing observable participation in classroom activities. This is in line with recent research indicating that digital game-based learning environments promote active engagement and reduce classroom passivity (Yu et al., 2021; Rohmah et al., 2023).

Furthermore, the significant improvement supported by a large effect size and moderate N-Gain indicates that the impact of the intervention is not only statistically significant but also educationally meaningful. The moderate level of N-Gain suggests that students experienced substantial improvement in their engagement within a relatively short period of time. This reinforces the idea that integrating game-based digital media into classroom instruction can effectively enhance both affective and behavioral aspects of learning when implemented systematically.

Compared to previous studies, this research extends existing findings by simultaneously examining learning interest and participation within a quasi-experimental design. While earlier studies have primarily focused on cognitive outcomes or single affective variables, this study

provides a more comprehensive understanding of student engagement by integrating both affective and behavioral dimensions (Abeysekera & Dawson, 2015; Hii, 2023). Therefore, the contribution of this study lies in strengthening the theoretical and empirical linkage between game-based learning, motivation, and active participation in elementary education contexts.

Overall, the findings suggest that Educaplay-based Game-Based Learning is effective because it combines motivational, interactive, and constructivist learning principles into a single instructional approach. Practically, it provides teachers with an accessible and engaging tool to enhance classroom interaction, while theoretically, it supports the integration of motivational and constructivist frameworks in explaining student engagement.

CONCLUSION

This study shows that the use of Educaplay digital media based on Game-Based Learning (GBL) is more effective than conventional instruction in improving students' learning interest and participation in IPAS learning. The average learning interest score of the experimental class increased from 85.60 to 93.00 ($\Delta = 7.40$), while the control class increased from 71.00 to 76.80 ($\Delta = 5.80$). The independent samples t-test indicated a significant difference, $t(47) = 10.607$; $p = 0.000$, with a very large effect size (Cohen's $d = 3.09$). Learning participation was also higher in the experimental class ($M = 20.28$) compared to the control class ($M = 16.24$), with a significant difference based on the Mann–Whitney U test ($U = 121.00$; $p = 0.000$). In addition, the N-Gain of the experimental class was 54.20%, whereas the control class achieved 20.53% (low category). These findings confirm that students who learned using Educaplay-based GBL demonstrated higher behavioral engagement during the learning process.

Students who learned through the game-based approach exhibited greater enthusiasm and active involvement, reflected in improved focus, increased enjoyment, more frequent questioning, participation in discussions, and active task completion. These findings indicate that interactive digital media should not merely function as a supplementary classroom tool but can serve as a pedagogically grounded instructional strategy that meaningfully enhances affective engagement and participatory behavior in elementary education.

Theoretically, the results reinforce motivational and constructivist perspectives, suggesting that structured digital game integration fulfills students' intrinsic motivational needs and promotes active knowledge construction. Practically, this study provides empirical evidence supporting the

integration of Game-Based Learning in IPAS instruction to foster student-centered learning aligned with 21st-century educational demands.

However, this study has several limitations that need to be acknowledged. First, the research focused only on affective and behavioral variables, namely learning interest and participation, without incorporating cognitive achievement measures that could provide a more comprehensive understanding of learning outcomes. Second, the study was conducted within a single institutional context, which may limit the generalizability of the findings to other schools or educational settings. Third, the duration of the intervention was relatively short, so it does not fully capture the long-term sustainability of the observed improvements in student engagement.

Based on these limitations, future research is recommended to adopt longitudinal designs in order to examine whether the motivational and participatory effects of Educaplay-based Game-Based Learning can be sustained over time. In addition, further studies should incorporate cognitive variables to explore multidimensional learning outcomes, including conceptual understanding and academic achievement. Expanding the research across multiple schools and educational levels is also important to enhance the generalizability of the findings. Moreover, comparative studies involving other digital learning platforms, such as Kahoot or Wordwall, are suggested to determine the relative effectiveness of different game-based tools. Finally, future research should consider examining moderating variables, such as students' digital literacy, gender differences, and prior academic achievement, to better understand the conditions under which this instructional approach is most effective.

In conclusion, Educaplay-based Game-Based Learning represents an empirically supported instructional innovation capable of significantly enhancing students' learning interest and participation in elementary IPAS learning. Its integration into classroom practice has strong potential to improve overall learning quality in primary education contexts.

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