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The Effectiveness of Digital-Based Interactive Learning Videos in Increasing Interest and Basic Ball Movement Skills in Elementary Schools

Septiani Nirmalasari[1], Tatang Muhtar[2]✉, Muhammad Nur Alif[3], Anggi Setia Lengkana[3]

Physical Education Elementary School Teacher Education Study Program, Universitas Pendidikan Indonesia, Indonesia[123]

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Abstract

Low learning interest and sub optimal mastery of basic volleyball movement skills remain a recurring problem in Physical Education learning at elementary schools. In response to this challenge, this study aims to analyze the impact of digital interactive learning video presentations on increasing both learning interest and basic volleyball movement skills. More specifically, this skill evaluation includes the forearm pass, overhead pass, underhand serve, overhand serve, and spike techniques among grade five students at Rancakalong Elementary School. To achieve that goal, this quantitative study applied a preexperimental design through a one group pretest and posttest approach involving 20 students. Furthermore, the data collection process relied on a Likert scale learning interest questionnaire with a reliability value of 0.87 and a five-component performance test with a reliability value of 0.92 which was converted into a scale of zero to one hundred. After all data were collected, a comprehensive statistical analysis was conducted which included the Shapiro Wilk normality test, paired sample t test, Cohen d effect size calculation, and normalized N Gain analysis. As a result, the test proved a highly convincing increase in the learning interest domain with a t value of 53.18, an effect size of 11.89, and an N Gain score of 0.63. Not only that, but a similar positive impact was also recorded on the mastery of physical movement skills with a t value of 22.93, an effect size of 5.13, and an N Gain score of 0.38. Overall, both of these improvement achievements simultaneously occupied the moderate category. Ultimately, this series of findings further reinforces the importance of integrating interactive visual tools as an effective breakthrough in optimizing the quality of sports education at the elementary school age.

How to Cite

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✉ Correspondence Author:
E-mail: tatangmuhtar@upi.edu

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INTRODUCTION

Physical, Sports, and Health Education (PE) is an integral part of the educational process that aims to develop the physical, psychological, motor, and social aspects of students as a whole (Langkana & Sofa, 2017). As the only subject that directly focuses on the psychomotor development and mental health of students, PE has a great influence on the formation of movement routines and active life habits from an early age (Syarif et al., 2025). Within the framework of Gallahue and Ozmun's holistic developmental theory, the mastery of basic movement skills at elementary school age becomes the foundation that determines a child's involvement in physical activity throughout life (Gallahue & Ozmun, 2012).

Volleyball is one of the team sports taught in the elementary school PE curriculum. This sport requires mastering five basic movement techniques, namely bottom passing, top passing, bottom serve, top serve, and smash, as a comprehensive foundation of play (Ahmadi, 2007; Viera & Ferguson, 2000). On the field, the learning of basic volleyball techniques in elementary school is often hampered by the dominance of single lecture and demonstration methods without adequate visual media, so that students have difficulty building accurate cognitive representations of movements (Aryanata et al., 2020; Supriatna & Suhairi, 2021). Nurshafa, Lengkana, and Saptani in a classroom action study at Gunung Sari Elementary School Sumedang found that the main obstacles to volleyball learning in elementary school include incompatibility of tools and media with student characteristics, monotonous methods, and inadequate facilities (Nurshafa et al., 2024). The results of initial observations at Rancakalong Elementary School, Rancakalong District, Sumedang Regency showed a similar condition, namely the majority of grade V students had low involvement in practice sessions, especially in upper serve and smash techniques that required more complex coordination.

This problem has a direct impact on students' interest in learning. Ryan and Deci's theory of self-determination asserts that an individual's intrinsic interest in an activity is determined by the fulfillment of basic psychological needs including competence, autonomy, and connectedness (Ryan & Deci, 2018). Syarif, Muhtar, Alif, and Lengkana found that 80% of elementary school students in Cimanggung District have a high interest in volleyball, with intrinsic factors as the more dominant determinant (Syarif et al., 2025). Mulya and Lengkana prove that confidence and learning motivation have a significant effect on the learning achievement of elementary school students (a combined contribution of 60%), reinforcing the argument that the affective aspect cannot be ignored in movement learning (Mulya & Lengkana, 2020).

Mayer's multimedia cognitive theory provides a strong theoretical foundation for the use of interactive learning videos, that the simultaneous presentation of information through visual and auditory channels results in the construction of richer mental models (Mayer, 2009). Munandar, Herlambang, and Muhtar emphasized that the integration of technology in the Futuristic Pedagogic paradigm makes the learning system more flexible, personalized, and adaptive (Munandar et al., 2025). In line with that, Bandura's theory of cognitive social learning asserts that the mastery of motor skills includes the five basic techniques of volleyball, which is facilitated by observation of precise and repetitive visual models (Bandura, 1986).

A number of empirical studies support the potential of interactive videos. Awaluddin, Bachtiar, and Hudain reported an increase in their average passing skills from 64.5 to 83.1 through interactive multimedia (Awaluddin et al., 2025). Arridho et al., found that interactive multimedia-based motion models significantly outperformed conventional learning (Arridho et al., 2023). Afifah, Muhtar, Alif, and Lengkana revealed that the physical components of volleyball, especially arm muscle strength, are the dominant predictors of smash quality (adjusted $R^2 = 0.972$), indicating that technical training must be supported by a proper understanding of movement from an early age (Afifah et al., 2026). Hidayat et al., added that a structured physical activity-based coordination model significantly improved the self-efficacy of elementary school students ($p = 0.002$) (Hidayat et al., 2023).

The research gap identified is the lack of studies that test the influence of interactive videos on the five components of basic volleyball movement skills comprehensively accompanied by reliable instruments, in elementary school students in rural areas. This research is here to fill this gap. Two hypotheses were formulated: (H_1) digital-based interactive learning videos have a significant effect on learning interest; and (H_2) digital-based interactive learning videos have a significant effect on the basic movement skills of volleyball (five components) of grade V students of Rancakalong Elementary School.

The novelty of this study lies in its simultaneous and comprehensive assessment of all five volleyball technique components using a dual validated-instrument approach that combines a Likert-scale learning interest questionnaire with an ICC-verified five-component performance test. This distinguishes it from prior studies that typically examined partial skills or relied on single-instrument evaluations, particularly in urban school contexts. The purpose of this study is therefore to examine the effectiveness of digital interactive video learning in simultaneously improving students' learning interest and their mastery of all five basic volleyball movement skills within an authentic rural elementary school setting.

METHOD

This study uses a quantitative approach with a pre-experimental design of one group of pretest and post-test or commonly known as one group pretest post-test design. This design contains stage O1 as the initial measurement followed by stage X as an interactive video learning intervention and ended by stage O2 as the final measurement (Maksum, 2018; Sugiyono, 2019). The design was chosen deliberately because this research is still an initial exploration of an educational unit that has limitations in the formation of a control group.

The subjects involved in this study were 20 grade V students of Rancakalong Elementary School in Sumedang Regency. This group consists of 12 male students and 8 female students with an age range between 10 to 11 years. All participants were selected through purposive sampling technique based on the results of problem identification during initial observation. Furthermore, to maintain identity confidentiality, each subject was assigned a code S01 to S20 that was used consistently across the data presentation.

The series of interventions lasted for eight meetings with a time allocation of 90 minutes for each session spread over four weeks. Each face-to-face session follows a structured learning flow. The first stage is perception and motivation for 10 minutes. The second stage was filled with a 20-minute H5P and PowerPoint-based interactive video showing that contained technique demonstrations, motion animations, and adaptive quizzes with automatic feedback. Next, the third stage is a reflective discussion of the video content for 10 minutes. The fourth stage is focused on guided field practice exercises for 45 minutes. Finally, the fifth stage was closed with cooling and a brief evaluation for 5 minutes.

The instrument to measure learning interest uses a four-point Likert scale questionnaire that stretches from one to four values. The questionnaire consists of 20 statements that specifically include four main indicators, namely feelings of pleasure, interest, attention, and active involvement (Setiawan et al., 2022). Meanwhile, basic movement skills are evaluated through a practical test that includes five main components, namely:Passing bottom, Passing top, bottom serve, top serve, and smash. The assessment for each movement component uses standard guidelines with a maximum score accumulation of 60 which is then converted into an assessment scale of 0 to 100. The practice assessment process was carried out objectively by two independent assessors to maintain the purity of the data. The validity of each questionnaire item was tested using the Pearson correlation between the item score and the total score (r_table = 0.444; df = 18; $\alpha = 0.05$). The reliability of the learning interest questionnaire was then tested using the Cronbach Alpha method while the level of agreement between the two practice assessors was calculated using the Intra class Correlation Coefficient(ICC) (Winarno, 2013). Before the main research stage is carried out in the field, all of these instruments have been verified for reliability through testing of the IBM SPSS Statistics 26 software with the following results details.

Based on the results of the validity test, all 20 items of the learning interest questionnaire statement were declared valid because they had a calculated r value that exceeded the table r value. The highest score was obtained in item P12 with the number 0.829 while the lowest value was found in item P11 with the number 0.472.

Table 1. Results of the Reliability Test of Learning Interest Questionnaire (Source: processed by the researcher, 2026).

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.874	.871	20

Note. Cronbach Alpha values that reach or exceed the limit of 0.80 are categorized as good instruments based on Field (2018) guidelines.

Table 2. Results of the Mobility Skill Test Reliability Test (Source: processed by the researcher, 2026).

	ICCb	95% CI Lower	95% CI Upper	F	df1	Sig.
Single Measures	.892	.780	.948	17.634	19	.000
Average Measures	.916	.876	.974	17.634	19	.000

Note. This calculation uses a two-way mixed effect model with absolute agreement where the value of the size that touches the number 0.90 and above is in the category of very satisfactory according to the reference of Koo and Mae (2016).

Referring to **Table 2**, the test results showed a Cronbach Alpha value of 0.874. This figure is convincingly included in the good category so that this learning interest measurement tool is considered very feasible to use in the field (Field, 2018). In the next test, Table 3 shows that the mean value of the size for the intra class correlation coefficient is 0.916. The achievement of the score that touched the very satisfactory category indicates that the level of agreement between the two practice assessors is very aligned and objective (Koo & Mae, 2016). Based on the series of proven results, all instruments are officially declared reliable and fully ready to be applied at the main research stage.

The final stage in the form of data analysis is carried out through several consecutive test steps. The first step begins with the presentation of descriptive statistics to see an overview of the data. The second step involves normality testing using the Shapiro Wilk method given that the number of samples tested is less than 50 people. Next, the third step focuses on testing the main hypothesis through a paired sample t-test with a significance level of 0.05. The fourth step includes calculating the size of the Cohen d effect to see how massive the impact of the treatment has been given (Cohen, 1988). Finally, this stage is closed with the calculation of normalized N Gain values to measure the amount of improvement in student learning outcomes more carefully (Hake, 1998).

RESULTS AND DISCUSSION

The reality on the field often shows that volleyball learning in elementary schools is hampered by the limited demonstration of teachers and the lack of visual facilities in schools. Early childhood learners generally have difficulty digesting complex movement mechanics if they only rely on direct observation that takes place very quickly. The use of interactive displays in this study is applied purely as a bridge so that the details of basic techniques can be slowly unraveled and learned repeatedly by students. To prove whether the approach has actually brought about meaningful change, this section presents the results of testing the field data sequentially.

Continuing the explanation above, the details of the distribution of assessment categories for the learning interest variable are described in full in Table 3. Along with the presentation, Table 4 presents the details of the category distribution for the basic five-component movement skills which are then visualized simultaneously in Figure 1 to provide ease in reading the direction of change. As a technical reading guideline, the grouping of movement skills is based on a standard conversion scale that assigns a low category for scores below 40, low for a score range of 40 to 54.99, medium for a range of 55 to 69.99, high for a range of 70 to 84.99, and very high for a score range of 85 and above.

Furthermore, the presentation of the data in Table 3 reveals a very comprehensive shift in the distribution of learning interests as illustrated on the left side of Figure 1. At the time of the initial measurements, none of the subjects were in the very high category. However, after the intervention was given, as many as 60 percent of the students shot up to the very high category and the remaining 40 percent were steady in the high category. In line with this, Table 4 and the right side of Figure 1 show drastic changes in movement skills. The group that was initially dominated by the poor category as much as 75 percent and the low category as much as 25 percent managed to transition to the medium category as much as 80 percent and high as much as 20 percent so that all the lower categories were no longer left. This shift shows the impact of overarching learning, especially on the top serve and spike as the two techniques with the least initial score.

Table 3. Frequency Distribution of Learning Interest Categories (Source: processed by researchers, 2026).

Categories	Interval	f Pre	f Post	% Pre	% Post	Δ f
Very High	3,00–4,00	0	12	0%	60%	+12
Height	2,50–2,99	11	8	55%	40%	−3
Medium	2,00–2,49	0	0	0%	0%	—
Low	1,50–1,99	7	0	35%	0%	−7
Very Low	1,00–1,49	2	0	10%	0%	−2
Total		20	20	100%	100%	

Table 4. Frequency Distribution of Basic Movement Skills Category (Source: processed by researchers, 2026).

Categories	Interval	f Pre	f Post	% Pre	% Post	Δ f
Very High	≥ 85	0	0	0%	0%	—
Height	70–84,99	0	4	0%	20%	+4
Medium	55–69,99	0	16	0%	80%	+16
Low	40–54,99	5	0	25%	0%	−5
Less	< 40	15	0	75%	0%	−15
Total		20	20	100%	100%	

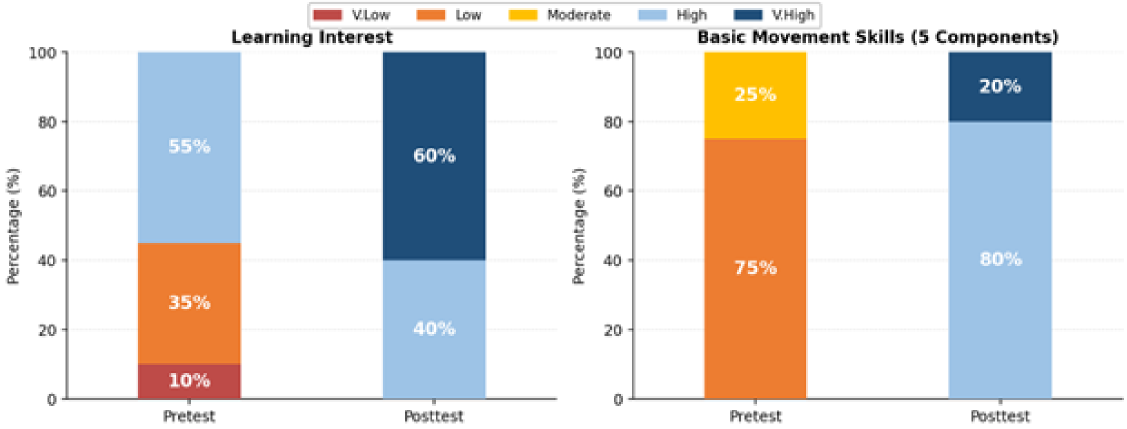

Figure 1. Comparison of Percentage of Interest and Skill Categories (Source: processed by researchers, 2026).

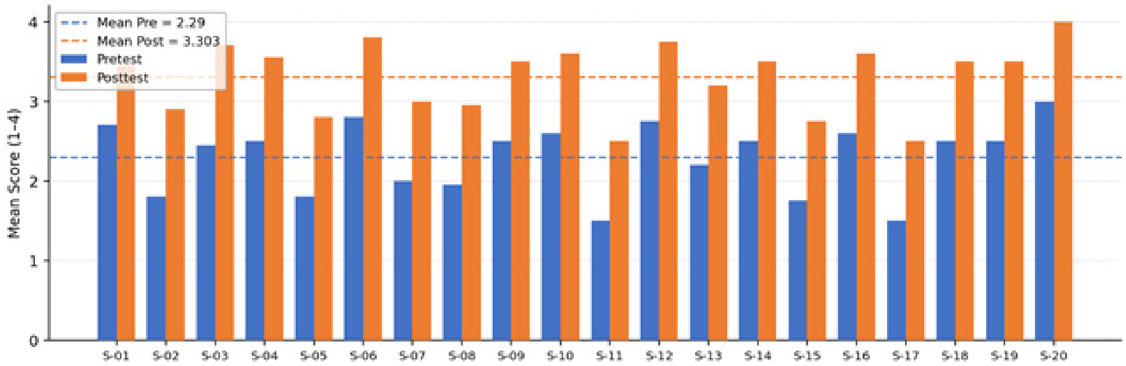

Figure 2. Comparison of Learning Interest Scores per Subject (Source: processed by researchers, 2026).

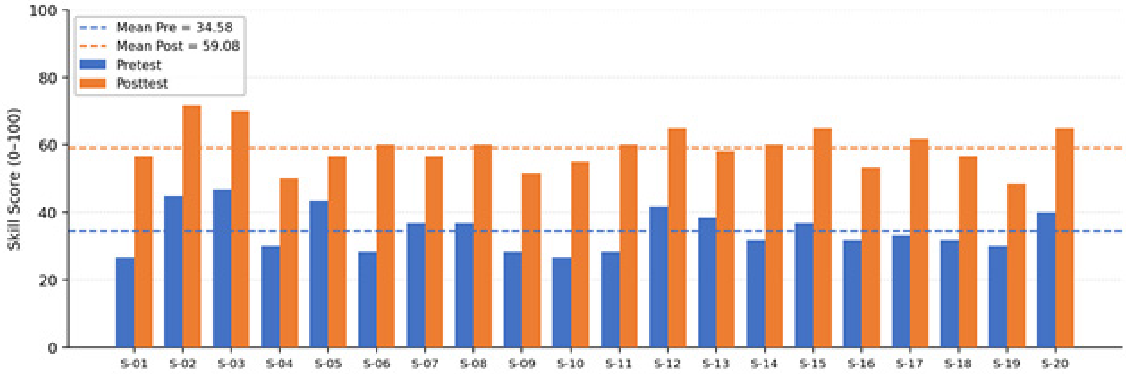

Figure 3. Comparison of Movement Skill Scores per Subject (Source: processed by researchers, 2026).

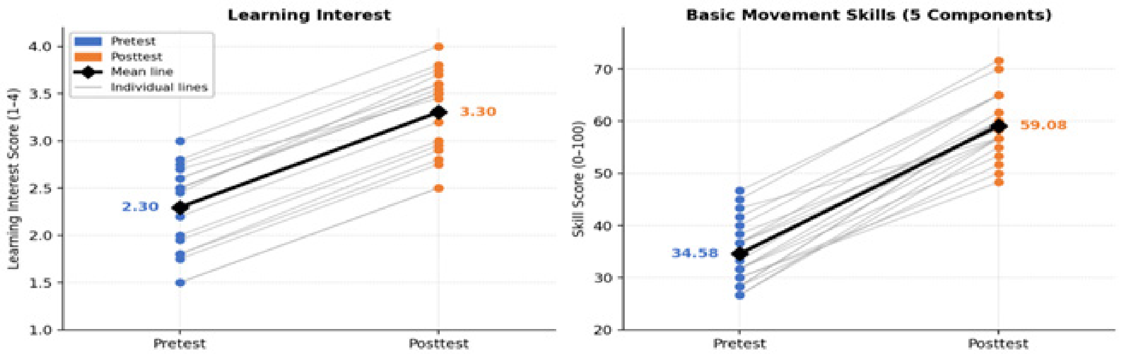

Figure 4. Score Change Path Chart per Subject (Source: processed by researchers, 2026).

Furthermore, to complete the understanding of the group's achievements, the picture of each individual's score is also displayed visually. **Figure 2** shows the details of the learning interest score per subject, followed by **Figure 3** which shows the five-component skill score per subject, and **Figure 4** which shows the direction of change of each individual from pretest to post-test.

Based on these visual presentations, **Figure 2** and **Figure 3** ensure an even improvement in all 20 research subjects. This fact is reinforced by **Figure 4** which shows the entire individual trajectory line of compact points upwards. On the left panel representing interest, the slope of the line appears fairly uniform as evidence that the effects of the intervention are felt evenly. Meanwhile, on the right panel representing skills, the slope level looks more diverse. Subjects S02 and S03 recorded the largest jump in value while S04 and S05 recorded a more sloping increase. This difference is a natural reflection of each student's variation in initial ability and level of grasp of complex techniques such as top serve and smash.

Before moving on to hypothesis testing, the researcher first ensures that the data normality conditions are met empirically using the Shapiro Wilk test method. The details of the output of the statistical program for the test are summarized in **Table 5**.

Table 5. Results of the Data Normality Test (Source: processed by the researcher, 2026).

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Learning Interest Pretest	.113	20	.200*	.915	20	.081
Posttest of Learning Interest	.099	20	.200*	.920	20	.100
Skill Pretest	.161	20	.197	.925	20	.124
Posttest Skills	.130	20	.200*	.970	20	.754

Note. An asterisk signifies the lower bound of the actual significance value while the letter a indicates the use of the Lilliefors significance correction method.

Referring to the exposure of **Table 5**, the significance value of Shapiro Wilk for the entire data distribution was proven to exceed the limit of 0.05. In detail, the score includes an interest pretest with a result of 0.081 then an interest posttest with a result of 0.100 and a skills pretest with a result of 0.124 and a skills post-test with a result of 0.754. This condition conclusively ensures that the assumption of normality has been met.

After the validity of the data distribution is confirmed, the hypothesis testing stage through a paired sample t-test is immediately carried out. The statistical outputs for these tests are presented in **Table 6**, **Table 7, Table 8** respectively.

Table 6. Descriptive Statistics of Paired Samples (Source: processed by researchers, 2026).

		Red	N	Std. Deviation	Std. Error Mean
Pair 1	Learning Interest Pretest	2.2950	20	.44777	.10012
	Post-test of Learning Interest	3.3025	20	.44381	.09924
Pair 2	Pretest of Basic Movement Skills	34.5833	20	6.27990	1.40423
	Post-test of Basic Movement Skills	59.0833	20	6.15290	1.37583

Table 7. Correlation of Paired Samples (Source: processed by researchers, 2026).

		N	Correlation	Sig. (2-tailed)
Pair 1	Pretest-Posttest Learning Interest	20	.982	.000
Pair 2	Pretest-Posttest Skills	20	.705	.000

Table 8. Results of the Paired Sample t-test (Source: processed by the researcher, 2026).

	Paired Differences					t	df	Sig. (2-tailed)
	Red	Std. Dev.	Std. Error Mean	95% CI Lower	95% CI Upper			
Pair 1	1.00750	.08472	.01894	.96785	1.04715	53.183	19	.000
Pair 2	24.50000	4.77873	1.06856	22.26349	26.73651	22.928	19	.000

Note. The first pair represents the difference in the score of post-stroke and prates for learning interest while the second pair represents the difference in score for the five-component basic movement skills.

Breaking down the results in **Table 6**, the average interest in learning was proven to have soared from 2,295 to 3,303 which is equivalent to an increase of 43.9 percent. At the same time, the average skill also increased from 34.58 to 59.08 or equivalent to an advance of 70.84 percent. This remarkable achievement was mainly driven by the rapid progress in the upper serve technique and the spike departing from the starting position most behind. In addition, **Table 7** shows a very strong correlation in the variables of learning interest as well as a fairly strong correlation in skills. The culmination of this test is in **Table 8** which confirms that both hypotheses are fully accepted. The first pair produced a t-value of 53.183 with a significance level of 0.000 while the second pair produced a t-value of 22.928 with a significance level of 0.000. The range of confidence that stayed away from zero in both tests was an absolute guarantee that the improvement was real.

As a complement to the success of the above statistical proof, the analysis of the size of the Cohen d effect and the calculation of the normalized N Gain value per subject are also described in detail in **Table 9** using the green color guidelines for the high category and red for the low category.

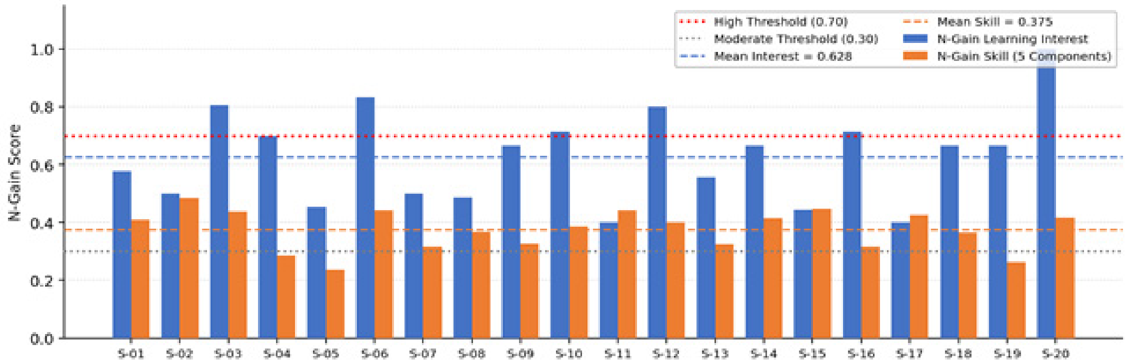

Figure 5. N Gain score per Subject (Source: processed by researchers, 2026).

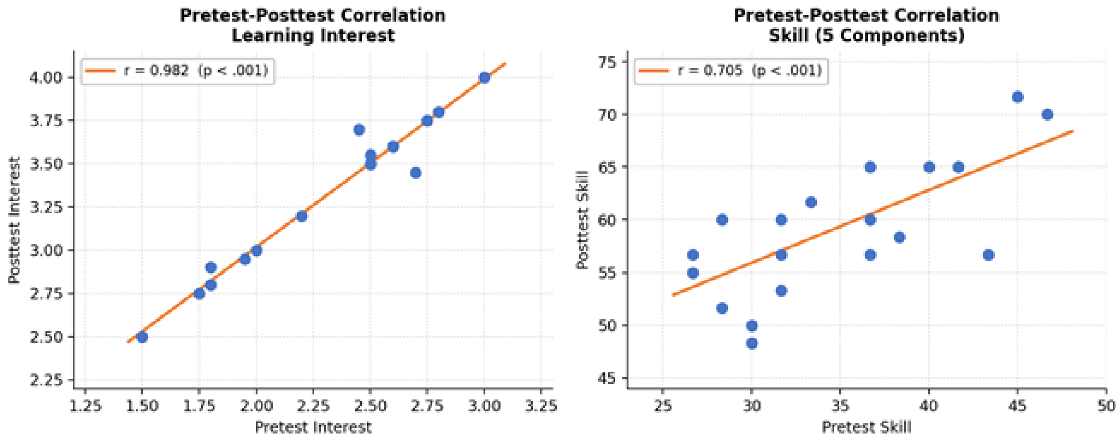

Figure 6. Interest and Skill Correlation Distribution Graph (Source: processed by the researcher, 2026).

Table 9. Effect Size and N Gain per Variable (Source: processed by researchers, 2026)

Variable	Cohen's d	Categories Effects	N-Gain (ġ)	Category Gain
Interest in Learning	11,89	Very Large	0,628	Medium
Skills (5 Components)	5,13	Very Large	0,375	Medium

Note. The criterion for measuring the Cohen effect d is stated to be very large if it is more than 2.0 based on the reference of Ellis (2010) while the criterion of N Gain is stated to be moderate if it is in the range of 0.30 to 0.70 based on the guidelines of Hake (1998).

Based on **Table 9** and **Figure 5**, it can be seen that there is a diversity of meaningful personal achievements. In the area of learning interest, six children managed to achieve a high category of N Gain scores, namely subjects S03, S06, S10, S12, S16, and S20. Inversely proportional to this, in the area of physical skills, there were three students who recorded a low category of N Gain score, namely S04, S05, and S19. This difficulty is rooted in the high complexity of upper serve techniques and spike which do require much longer muscle mastery time. Collectively, the average N Gain for the five-component skill in the moderate category is a reasonable reflection of the dual learning load given to students in a single period of time.

In addition to the elaboration of the initial and final comparative values, linear regression correlation analysis is also visualized through a distribution graph to see the pattern of group tendencies in more depth as presented in **Figure 7**.

Looking at **Figure 6** on the left side, a very strong correlation dominates the area of learning interest so that the coordinate points appear to move up in parallel as if reflecting the same level of interest of students. On the other hand, **Figure 6** on the right side shows a looser distribution of skill points. This moderate distribution pattern indicates a sharp dynamic of position changes among the students as a result of varying levels of innate physical ability in conquering top serve and smash shots.

As the final stage to comprehensively read students' technical abilities, the mastery profile of the five basic motion components is specially dissected through the mesh diagram in **Figure 7**.

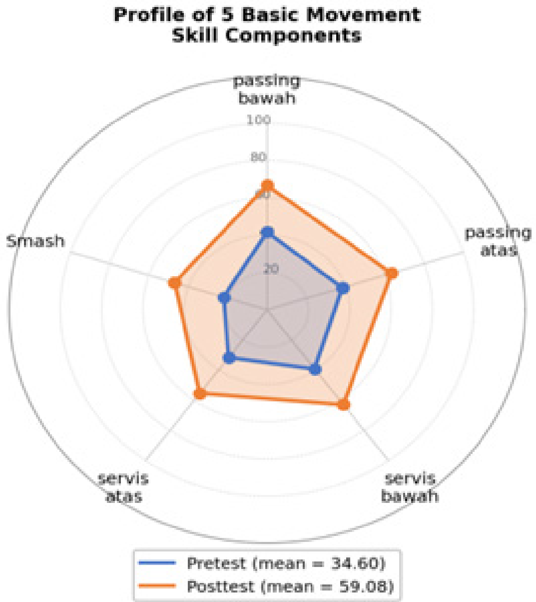

Figure 7. Five-Component Mastery Profile of Movement Skills (Source: processed by the researcher, 2026).

The graphical presentation in **Figure 7** proves that the orange field representing the posttest results consistently exceeds the blue field belonging to the pretest results in all areas of the engineering component. In particular, the SME component, which initially recorded the most worrying value at 22.1 percent, actually showed the most striking expansion of the field at the end point at 47.1 percent. Nevertheless, the movement still has the lowest mastery because it requires the most excellent body alignment. In contrast to other techniques, upper serve skills jumped up from 31.7 percent to 55.4 percent while lower passing, top passing, and lower serve variations respectively recorded much neater and more uniform progress.

The universally upward shift in learning interest documented across all students, as reflected in the category distribution of **Table 3** and the individual trajectories of **Figure 4**, points to a deeper mechanism than mere novelty effect. The homogeneity of affective response, where no student remained in the lower categories after the intervention suggests that the interactive video format succeeded in simultaneously addressing the three basic psychological needs posited by self-determination theory, namely competence, autonomy, and relatedness. When students could pause, replay, and observe technique demonstrations at their own pace, they experienced a sense of growing competence over movements they previously found opaque. This perception of mastery, once triggered, catalyzes the transition from externally regulated motivation to genuinely intrinsic engagement.

Positive achievement in the affective realm is closely related to pure motivation from within the student. The near-perfect pretest-to-posttest correlation in **Table 7** for the interest variable is theoretically interpretable through Ryan and Deci's self-determination framework: the intervention did not arbitrarily redistribute affective states but rather amplified each student's existing motivational disposition in a consistent direction, confirming that internal factors remain the primary engine of engagement in PE contexts (Syarif et al., 2025). This convergence between the affective findings of the present study and the broader literature on volleyball interest in elementary contexts is theoretically significant: it implies that what interactive video actually does is not create interest from scratch, but rather unlock and sustain the latent motivational capital that students bring to the classroom.

The confidence-achievement relationship documented in previous PE research is the operative bridge here once students begin to feel competent through visual observation of technique, the affective and psychomotor domains begin to reinforce each other rather than compete (Mulya & Lengkana, 2020). From a cognitive-design perspective, the dual-channel architecture inherent in the H5P and PowerPoint-based video is precisely the condition that multimedia cognitive theory identifies as optimal for the construction of rich and durable mental models of motor acts (Mayer, 2009). When students can internalize a coherent mental image of how a forearm pass or overhead serve should look and feel before stepping onto the court, the perceived distance between their current ability and the target skill narrows and it is precisely this narrowed gap that satisfies the competence need identified as the seedbed of intrinsic motivation (Ryan & Deci, 2018). Situating this mechanism within the broader pedagogical transformation underway in Indonesian elementary schools, the integration of interactive technology into PE aligns with the futuristic pedagogic paradigm that repositions the teacher as a learning architect rather than a sole knowledge transmitter, making the classroom environment inherently more responsive to individual learning rhythms (Munandar et al., 2025).

What this study adds to that argument is an empirical grounding in a rural school context, demonstrating that the affective dividends of such integration are not confined to urban or well-resourced settings. From the perspective of interest development theory, the eight-session trajectory appears sufficient to carry students through the triggered and maintained situational interest phases, with the near-uniform post-test distribution in **Table 3** suggesting that for many students the experience has laid the cognitive and affective groundwork for individual interest to crystallize over time (Hidi & Renninger, 2006). Reinforcing this interpretation, elevated self-efficacy beliefs forged through repeated successful observation are independently established as durable predictors of continued academic engagement well beyond the immediate instructional episode (Schunk & DiBenedetto, 2020).

The pattern of skill improvement observed across all students, most visibly in the complete elimination of the poor and low categories documented in **Table 4** and the five-component radar expansion in **Figure 7**, is interpretable as a direct psychomotor consequence of the observational learning mechanism described by social cognitive theory. When a learner repeatedly watches a skilled model execute a forearm pass or underhand serve in slow motion with animated cues, they encode a motor program or a cognitive blueprint of the required movement sequence, before they attempt physical execution. This pre-execution mental modeling reduces the trial-and-error burden that typically causes frustration and disengagement in early volleyball learners, which is precisely the condition that prior classroom-based studies have identified as the root of stagnation in elementary PE settings (Nurshafa et al., 2024). The alignment between the present findings and those of prior interactive multimedia studies extends beyond the simple fact of improvement, it points to a consistent pattern in which the superiority of multimedia-based approaches over lecture-only methods is most pronounced precisely for the type of complex, multi-component motor skills that characterize volleyball at the elementary level (Arridho et al., 2023; Awaluddin et al., 2025).

The theoretical explanation for this advantage lies in the observational learning principle: the opportunity to watch a skilled model execute the five techniques repeatedly, at adjustable speed, and with visual cues creates a symbolic mental representation of the motor act that the learner can rehearse cognitively before physical practice begins (Bandura, 1986). This cognitive scaffolding is what makes the subsequent guided field practice in the forty-five-minute exercise segment particularly productive: students arrive at the court already holding an internalized reference model against which they can calibrate their own body positions. The structured physical activity then reinforces self-efficacy as each successful attempt confirms the adequacy of the internally rehearsed movement template (Hidayat et al., 2023). Crucially, the video medium also promotes an external attentional focus or directing the learner's attention toward the intended movement effect rather than internal body mechanics, which motor learning research identifies as a condition that significantly accelerates automaticity and reduces performance variability (Wulf et al., 2010). This attentional mechanism helps explain the particularly strong gains in the forearm pass and underhand serve because the two techniques with the clearest visual end-point in the video demonstrations while also illuminating why the overhand serve and spike, which demand more complex whole-body coordination and lack a similarly clear visual anchor, produced the widest inter-individual variation in progress as visible in the **Figure 7** radar profile.pike punches.

A theoretically important nuance emerges when the individual variation in skill trajectories visible in **Figure 4** and the component-level profile in **Figure 7** are read together. The uneven expansion of the radar field is narrower for the overhand serve and spike relative to the three passing and underhand serve components, and is not simply a measurement artifact; it reflects a fundamental asymmetry in the biomechanical demands of the five techniques. Forearm passing, overhead passing, and underhand serving share a relatively stable base of support and a predictable ball trajectory, which makes the cognitive-to-associative transition described by Fitts and Posner's stage model achievable within eight sessions of combined video observation and guided practice. The overhand serve and spike, by contrast, require dynamic weight transfer, sequential arm-shoulder-trunk coordination, and precise timing that must be neurologically consolidated through many more repetitions than an eight-session protocol can realistically provide.

The fact that these components nevertheless improved, indicates that the video scaffolding successfully initiated the cognitive phase of learning for all five techniques; it simply could not complete the associative phase for the two most demanding ones within the available instructional time (Fitts & Posner, 1967). The practical implication is not to question the adequacy of the video medium but rather to argue for extending the instructional cycle and supplementing video observation with individualized repetitionintensive drill sessions, which have independently demonstrated effectiveness in consolidating specific volleyball technique components at the elementary level (Susanto et al., 2021). Beyond the design implications, the broader distribution shift in Table 4, where every student migrated out of the deficient skill bands entirely establishes a structurally important baseline finding: the floor-level barrier to volleyball learning at this school has been removed. What the present study therefore demonstrates is not that interactive video alone produces elite skill, but that it functions as a powerful leveling instrument capable of bringing every learner to the threshold of functional technique mastery, after which technique-specific drilling becomes productive rather than frustrating. The long-term sustainability of this kind of technology-enriched physical education ultimately rests on the pedagogical preparedness of the teacher, making continuous investment in digital facilitation competencies for PE educators an indispensable structural complement to any media-based learning reform (Septiani et al., 2025).

CONCLUSION

This study demonstrates that digital interactive video learning effectively improves both learning interest and basic volleyball movement skills simultaneously. Grade V students at Rancakalong Elementary School who initially showed minimal mastery of the five volleyball techniques, namely forearm pass, overhead pass, underhand serve, overhand serve, and spike, achieved consistent and meaningful growth across both dimensions following eight sessions of intervention.

These results directly answer the purpose of this study by confirming that the integration of digital interactive video into elementary physical education is capable of simultaneously nurturing students' affective engagement and advancing their psychomotor competence. Both research hypotheses are fully accepted, affirming that digital interactive video learning constitutes a practical and effective instructional breakthrough, particularly for rural elementary schools with historically limited access to specialized physical education resources and visual learning media.

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