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Effect of teacher encouragement during deep learning on attention and volleyball techniques among students at high school physical education

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ABSTRACT

Background: Teacher Encouragement during Deep Learning (TEDL) based on literature has a positive impact, but it is not yet clear how it affects attention and volleyball technique among students. **Objectives**: Therefore, the current study aims to analyze the effects of TEDL on improving attention and volleyball techniques among students in physical education (PE) classes. **Methods**: An experimental method with a pretest-posttest design was adopted in this study. Forty participants were involved, representing students from several high schools in Sukabumi (Indonesia). They were recruited using inclusion criteria and randomly assigned to the TEDL group (n = 20) and the control group (CG) (n = 20). Assessment of attention and basic volleyball techniques was measured at the pretest and posttest stages. **Finding/Results**: The results of our study show that there are significant main effects of teaching ($p < 0.05$), time ($p < 0.05$) and interaction ($p < 0.05$) on attention and volleyball techniques. **Conclusion**: We firmly conclude that TEDL can be an alternative teaching model to replace traditional learning in improving attention and volleyball techniques among students. Future research is expected to design TEDL programs for other teaching materials such as basketball, soccer, futsal, swimming, hockey, or badminton.

Keywords: Combined teaching; attention students; volleyball techniques; physical education

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INTRODUCTION

In the current era, physical education (PE) is trying to innovate in the teaching system so that achievement is much more optimal (Valle-muñoz et al., 2025). Data based on literature shows that most teachers often use traditional teaching models or what is known as direct instruction (Guzmán & Payá, 2020), where this model has the characteristic of teaching knowledge and skills orally and through direct

demonstrations and repeated practice to students (Sierra-Ríos et al., 2020). Basically, the direct instruction teaching model has been proven to have a positive effect on improving several student abilities, but some teachers claim that this model has not shown satisfactory results (Longakit et al., 2024; Liang & Liang, 2025). Due to these differences, there needs to be a major innovation by implementing a new teaching model which is estimated to be much more effective in PE classes, for example combining teacher encouragement into deep learning.

Teacher encouragement is basically feedback from teachers to students (Shima & Suzuki, 2024), this feedback can be verbal, for example the teacher can give praise such as "you are great," "steady movements," "don't give up" or "show your skills as best as possible" (Nurudin et al., 2025). With positive encouragement from the teacher, this can be a stimulus and ultimately trigger positive feelings during the teaching session (Sahli et al., 2024). Several previous studies have shown that involving the use of encouragement during teaching sessions can improve playing skills (Akdag et al., 2025; Hammami et al., 2023; Ridwan et al., 2025) and physical enjoyment to a higher level (Selmi et al., 2023). In addition, the presence of a teacher who provides encouragement to students during teaching sessions is a positive thing and makes students feel cared for and loved (Hidayat et al., 2025). Thus, there is a need for further exploration regarding the application of teacher encouragement during deep learning (TEDL), this can potentially produce new and more effective teaching.

Basically, deep learning is a relatively new teaching model and is currently experiencing an increasing trend (Kovač et al., 2025; Lobo, 2025). This model is characterized by a learning approach that aims to create a deeper learning experience with a focus on holistic understanding (Liang & Liang, 2025). In the context of PE teaching in schools, this model can be applied to improve skills, attitudes and encourage a deeper understanding of sport and health (Li, 2025). The main pillars of deep learning in PE teaching are: (i) Mindful learning, where learning is expected to raise students' awareness to be involved in learning activities, (ii) Meaningful learning, where learning is expected to be meaningful for students and (iii) Joyful learning, where the learning presented must be fun and interesting for students (Amalia et al., 2025). By utilizing deep learning, students will be more optimal in learning a skill in a particular sport (Omarov et al., 2024). In addition, a previous study has reported that the use of long-term deep learning is very necessary in physical education classes, because this will help students to learn all the material in depth (Zhen & Wang, 2024). Thus, it is important to conduct further exploration regarding the effectiveness of TEDL on students' abilities including attention and basic volleyball techniques.

Conceptually, attention can be interpreted as the ability to pay attention better than other students (Páez-Maldonado et al., 2020). Recent literature shows that the aspect of attention is very important and is the main focus among researchers today (Mero Piedra et al., 2024). A high level of attention is believed to make it easier and quicker for students to learn movement assignments from teachers (Kurtoğlu et al., 2025). Meanwhile, low attention can lead to students having difficulty performing each movement in a particular sport (Páez-Maldonado et al., 2020). In addition, the aspect of attention has been reported by several previous studies to be very beneficial for students' attention to learning at school (Polevoy, 2022).

In PE learning there are several lesson materials that must be studied by students, including volleyball. Literature shows that to be able to play volleyball well, students

are required to learn several volleyball techniques such as serve, passing and spike (Mielniczek et al., 2025; Saharullah et al., 2023). Basically, volleyball techniques are very important and support the players' competitive performance (Lin et al., 2022). Furthermore, it has been reported that the higher a student's volleyball technique, the greater their chances of winning a match (Hidayat et al., 2025). By studying volleyball techniques effectively, students have the opportunity to pass volleyball courses.

Based on the explanation above, attention and volleyball technique play a crucial role in student success in PE learning at school. However, there is still a dearth of empirical research examining the effects of TEDL on improving attention and volleyball technique. In addition, the number of studies on TEDL is still inadequate and no one has reported how it affects students at the high school level. The evidence obtained from this study will contribute to the literature and provide an opportunity to evaluate the effects of TEDL implementation on attention and volleyball techniques. Thus, our current study aims to examine the use of TEDL and its possible effects on volleyball attention and technique. In this context, our research hypothesis is as follows: the application of TEDL can improve students' attention and volleyball techniques more than CG.

METHOD

Design

Our current research involved an experimental pretest-posttest design to measure the effects of TEDL on attention and volleyball technique. The study was conducted over 10-weeks, with three sessions per week, scheduled on Mondays, Wednesdays, and Saturdays.

Participants

We used G-Power analysis (version 3.1.9.7, IBM, Düsseldorf) to determine the minimum sample requirement. The analysis used a Type I error (α) of 0.05, a power (1-β) of 0.80, and an effect size of 0.25. The results indicate that at least 30 participants should participate in this study (Kurtoğlu et al., 2025). Based on the results of the G-Power analysis, 40 students (20 males and 20 females) were recruited to participate in this experimental study. Inclusion criteria: aged between 15 until 18 years, no chronic illnesses, and parental consent to participate. Students who met the inclusion criteria. Ethical approval for this study was obtained from the Research Ethics Committee of the Univeristas Muhammadiyah Sukabumi (Approval Number: 345-UMMI) on October 1, 2025. In addition, 40 participants were randomly assigned to the TEDL (n = 20) and CG (n = 20) groups (see **Figure 1**). All activities in this study were in accordance with the Declaration of Helsinki criteria.

Experimental Procedure

In the first week, we collected information about age, height, weight, and body mass index (BMI) from the demographic characteristics of the participants and continued with participants doing a 5-minute warm-up to stretch the muscles throughout the body and after that, all participants carried out a pretest which was a measurement of attention and volleyball techniques for 60 minutes and the activity ended with a 5-minute cool-down. In the second to ninth weeks, the TEDL and CG programs each lasted for 60 minutes carried out separately or TEDL on field A and CG on field B. Then in the tenth week, all participants carried out a posttest which was a re-measurement of aspects of attention and volleyball techniques with the same rules and duration as the pretest stage.

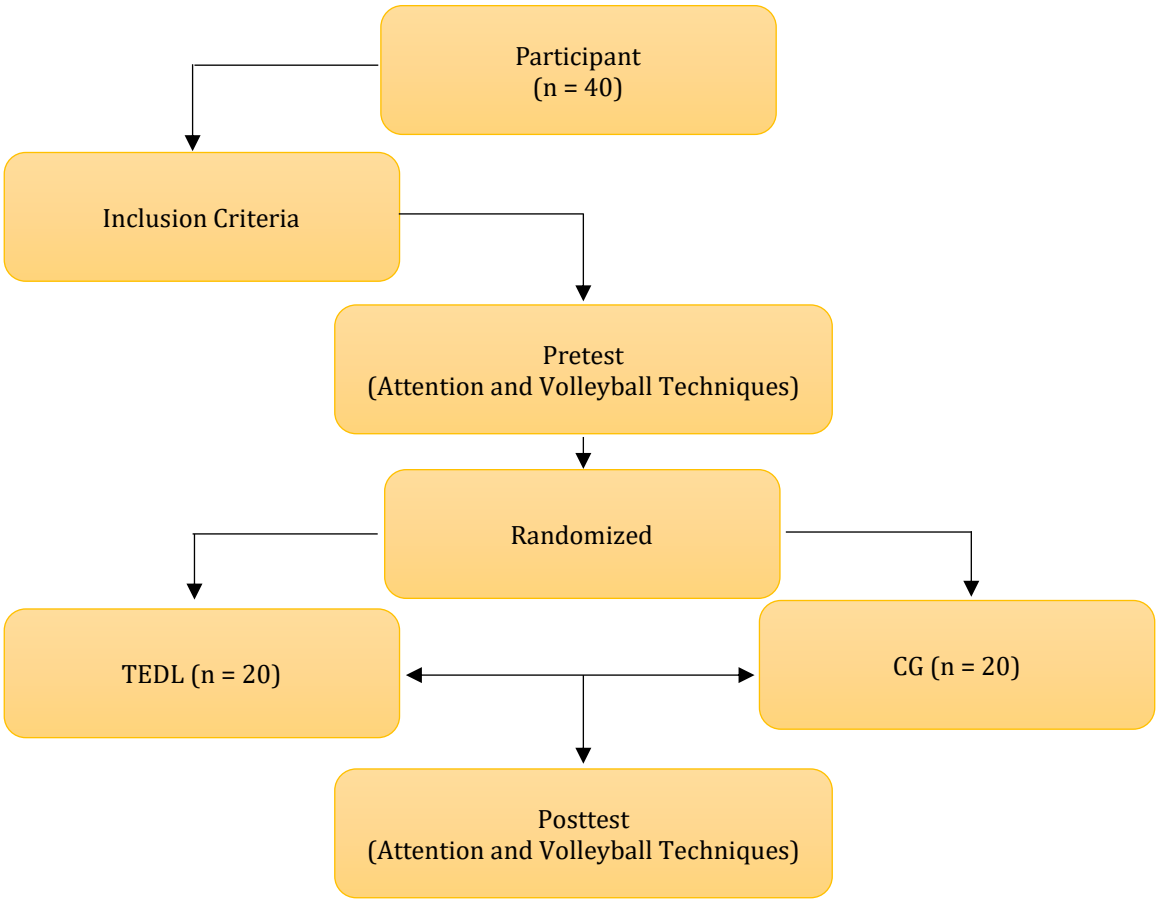

Figure 1. Experimental Process of Study. Note. TEDL: Teacher Encouragement Deep Learning; CG: Control Group

Measures

Attention

Previous research has used this test to measure attention levels among students (Kurtoğlu et al., 2025; Páez-Maldonado et al., 2020). This test involves finding and marking certain letters among mixed letters. These letters are arranged in a certain order on the page and each page contains 660 letters. On the prepared page there are 31 letters "a," 29 letters "g," 30 letters "b" and 29 letters "d." Participants were instructed to draw with a pencil under the letters a, b, d, and g on the front page. In the test, participants were given 3 minutes to complete the task. After the test was completed, it was evaluated by counting the lines. In the test evaluation, the participants' correct answers were taken into account, and each correct answer was recorded as a final score. In this study, tests were conducted on the validity and reliability values of the attention instrument (see **Table 3**).

Volleyball Techniques

Based on a previous study to measure the level of basic volleyball techniques of students, including: (i) a serve test, where participants were instructed to serve into the zone 1 box to get 5 points, the ball falling into zone 2 to get 3 points, then the ball falling in zone 3 to get 2 points and if the ball does not enter any zone to get 0 points (Lin et al., 2022), and the test was carried out 3 times, (ii) passing test, where participants make an overhand or underhand pass directed to a zone on the field, the ball landing in the target area gets 4 points (Apidogo et al., 2021), 2 points are awarded for balls that fall on the area line and the test is conducted 3 times, (iii) spike test, participants are instructed to

spike the ball aimed at a target measuring 6 m x 3 m (Doma et al., 2020). Participants perform this test for 1 minute and the final score is calculated by adding up the spikes that enter the target. In this study, tests were conducted on the validity and reliability values of the attention instrument (see **Table 3**). The field for the volleyball technique test is presented in **Figure 2**.

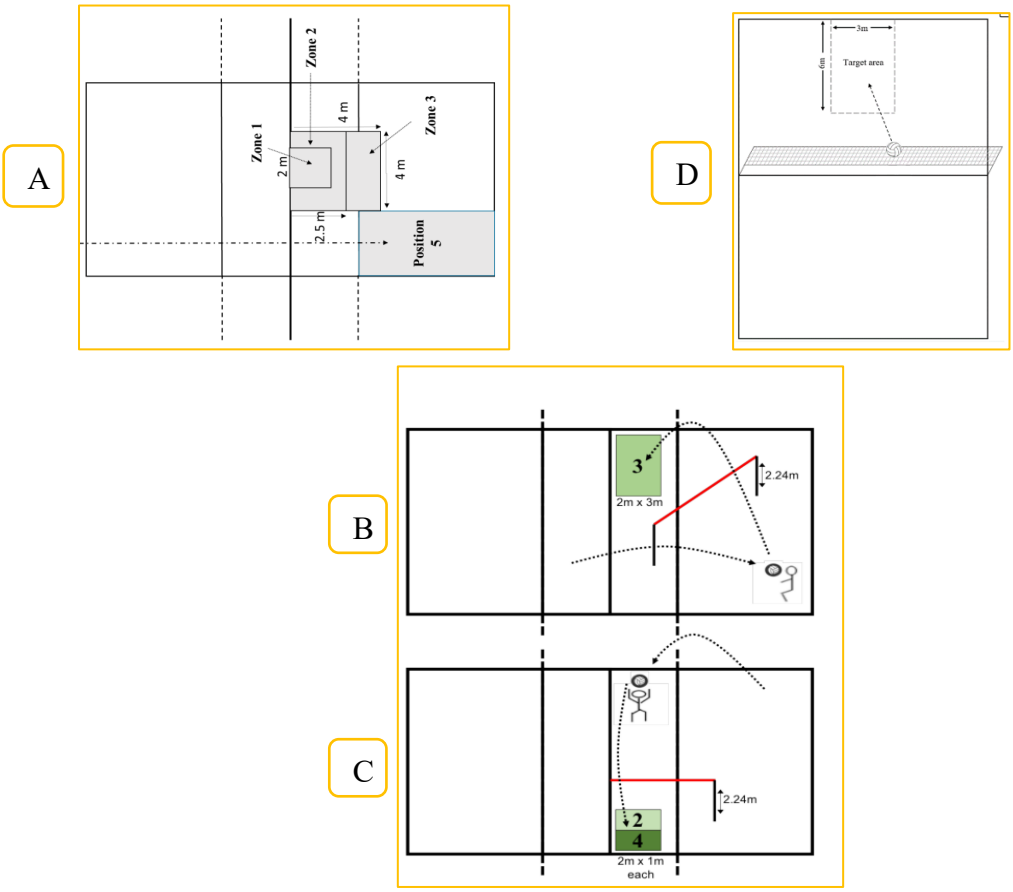

Figure 2. Field for Test Serve (A), Passing (B and C), Spike (D)

TEDL Program

The TEDL program will be implemented from October to November 2025, or for 10-weeks, on-site at Muhammadiyah University of Sukabumi (Indonesia), where this university was chosen as a gathering place for participants to get the TEDL and CG programs (this is because the existing facilities are very adequate). TEDL implementation will be provided in PE classes on Mondays, Wednesdays, and Saturdays from 8:00 a.m. to 9:00 a.m. The activities carried out in TEDL are the first session: (i) the teacher opens the lesson with greetings and prayers, (ii) checks student attendance, (iii) prepares equipment, and (iv) explains and demonstrates volleyball teaching materials such as serving, passing and smashing, (v) the teacher presents a video of a professional volleyball athlete performing basic volleyball movements or techniques. Finally, (vi) prepare several basic volleyball technique training activities. Second session: (i) students practice individually and independently, (ii) students may ask questions or review the video. Third session: (i) the teacher and students evaluate the learning process that has been carried out, and (ii) conclude with a cool-down. The detailed TEDL program is presented in **Table 1**.

Table 1. TEDL Program

Weeks	Focus	Main Activities	Teacher Encouragement Protocol
1		Pretest	
2-3	Serve technique	Demonstration, video, 3×10 serves Partner drills, target serve	("good perform, keep it up, don't give up, nice serve")
4-5	Passing technique	Demonstration, video, 3×10 Passing technique Partner drills, target passing	("nice move, good defense, nice passing")
6-7	Spike technique	Demonstration, video, 3×10 Spike technique Partner drills, target passing	("nice spike, Don't lose, stay focus")
8-9	Game modification	video, 3×10 game 2vs 2, 3 vs 3 and 4 vs 4	("you are the best, you will definitely win")
9		Posttest	

Data Analysis

Data obtained from the attention and volleyball technique measurements from the pretest and posttest stages will be analyzed using the Jamovi application version 23.28. We conducted validity (pearson correlation) and reliability (Cronbach α) testing. In this study, the mean and standard deviation values were used as descriptive statistics. Normality testing (Shapiro-Wilks) was conducted in this study. In addition, we tested delta percentage (%Δ) in the TEDL and CG groups. Finally, we involved the use of Two-Way Analysis of Variance (ANOVA) with repeated measures of group (experimental vs. control) as a between-subject factor and time (pretest and posttest) as a within-subject factor used to compare various indicators of the dependent variable (attention and volleyball technique). The effect size for ANOVA was determined based on partial eta squared (ηp^2) values: $\eta p^2 \leq 0.01$ (small effect), $0.01 \leq \eta p^2 \leq 0.06$ (medium effect), and $\eta p^2 \geq 0.14$ (large effect). A $p < 0.05$ is used as a condition for statistical significance.

RESULTS AND DISCUSSION

Results

Table 2 shows the demographic and anthropometric values of the participants. Meanwhile, **Table 3** shows the validity, reliability, and normality test values for each dependent variable.

Table 2. Demographic and Anthropometric Characteristics of Participants

Variable	TEDL Group (n = 20)	CG (n = 20)	*p*
Age (years)	18.8 ± 1.2	17.1 ± 1.4	0.371
Height (cm)	168.5 ± 6.8	167.9 ± 7.2	0.743
Body Weight (kg)	63.2 ± 8.1	64.7 ± 7.9	0.461
BMI (kg/m^2)	22.3 ± 2.1	23.0 ± 2.3	0.235

Note. TEDL: teacher encouragement deep learning; CG: control group; BMI: body mass index; n: participants.

Table 3. Validity, Reliability and Normality

Variable	Validity (Pearson correlation)	Reliability (Cronbach α)	Normality (Shapiro-Wilks)
Attention (score)	0.91	0.80	0.88
Serve (score)	0.83	0.93	0.90
Passing (score)	0.75	0.83	0.96
Spike (score)	0.66	0.73	0.90

Based on **Table 4**, the results of the two-way analysis of variance (ANOVA) with repeated measures show that there is a significant difference in the effect of teaching on attention (F = 18.2; $p < 0.001$, $\eta p^2 = 0.32$ (large effect). The same results were found that there was an effect of time (F = 207.0; $p < 0.001$, $\eta p^2 = 0.84$ (large effect) and interaction (F = 52.3; $p < 0.001$, $\eta p^2 = 0.57$ (large effect) on attention.

In other aspects, we observed a significant effect on teaching (F = 9.58; $p = 0.004$, $\eta p^2 = 0.20$ (large effect), time (F = 149.71; $p < 0.001$, $\eta p^2 = 0.79$ (large effect) and interaction (F = 5.99; $p = 0.019$, $\eta p^2 = 0.13$ (medium effect) on serving. In addition, we found similar results in the passing aspect, where there was a main effect of teaching (F = 4.94; $p = 0.032$, $\eta p^2 = 0.11$ (medium effect), time (F = 106.03; $p < 0.001$, $\eta p^2 = 0.73$ (large effect) and interaction (F = 4.33; $p = 0.044$, $\eta p^2 = 0.10$ (medium effect). Finally, our research results show that there is a main effect of teaching (F = 10.8; $p = 0.002$, $\eta p^2 = 0.22$ (large effect), time (F = 157.51; $p < 0.001$, $\eta p^2 = 0.80$ (large effect) and interaction (F = 6.04; $p = 0.019$, $\eta p^2 = 0.13$ (medium effect) on spike.

Table 4. Comparison of Attention and Volleyball Technique between the TEDL and CG

Variable	Group	Pretest (Mean±SD)	Posttest (Mean±SD)	%Δ	Teaching	Time	Interaction	Pairwise comparisons
Attention (score)	TEDL (n = 20)	75.0±7.81	88.8±10.3	0.18	F = 18.2 $p < 0.001$ $\eta p^2 = 0.32$	F = 207.0 $p < 0.001$ $\eta p^2 = 0.84$	F = 52.3 $p < 0.001$ $\eta p^2 = 0.57$	$p < 0.001$
	CG (n = 20)	70.3±4.50	74.9±4.23	0.07				
Serve (score)	TEDL (n = 20)	5.45±0.887	7.50±1.15	0.38	F = 9.58 $p = 0.004$ $\eta p^2 = 0.20$	F = 149.71 $p < 0.001$ $\eta p^2 = 0.79$	F = 5.99 $p = 0.019$ $\eta p^2 = 0.13$	$p < 0.001$
	CG (n = 20)	5.05±0.999	6.85±0.933	0.36				
Passing (score)	TEDL (n = 20)	10.4±1.54	14.7±1.72	0.41	F = 4.94 $p = 0.032$ $\eta p^2 = 0.11$	F = 106.03 $p < 0.001$ $\eta p^2 = 0.73$	F = 4.33 $p = 0.044$ $\eta p^2 = 0.10$	$p < 0.001$
	CG (n = 20)	10.8±1.67	12.8±1.63	0.19				
Spike (score)	TEDL (n = 20)	7.20±1.20	9.40±1.05	0.31	F = 10.8 $p = 0.002$ $\eta p^2 = 0.22$	F = 157.51 $p < 0.001$ $\eta p^2 = 0.80$	F = 6.04 $p = 0.019$ $\eta p^2 = 0.13$	$p < 0.001$
	CG (n = 20)	6.50±1.79	9.50±2.72	0.46				

Note. TEDL: Teacher encouragement deep learning; CG: control group; SD: standard deviation.

Discussion

This study aims to examine the effects of TEDL on students' attention and volleyball technique. This is the first finding to demonstrate that using verbal encouragement from teachers during deep learning instruction can improve two important aspects, namely attention and volleyball technique.

This first finding also answers the hypothesis, where TEDL has been shown to have a positive effect on improving attention and volleyball technique. This is because TEDL has several advantages. For example, TEDL can present a much more complex learning process than CG. First, TEDL provides verbal feedback from the teacher to students, thus increasing their focus on learning. This is also in line with and has been reported by several previous researchers, where by continuously applying verbal encouragement from the trainer during training sessions it will have a significant impact on improving several important aspects such as psychological aspects (Hidayat et al., 2025). Sahli et al. (2020) research reported that PE teachers can use verbal encouragement during soccer training sessions to improve aspects of mood state and enjoyment. In addition, the TEDL program not only provides verbal encouragement but also provides a meaningful, caring and enjoyable learning climate for students in accordance with the concepts or pillars of deep learning. On the other hand, Li (2025) explains that deep learning has the potential to improve and optimize performance.

In our current research, we also found that the TEDL program designed and implemented into PE teaching for 10 weeks can significantly improve the technical aspects of volleyball among students. This is in line with several previous studies, firstly Hammami et al. (2023) study applied verbal encouragement during soccer

training sessions and the results showed an increase in technical skills. Second, the research report of Ridwan et al. (2025) shows that consistent use of verbal encouragement can improve low technical football performance to high. Third, similar results were reported by Mekni et al. (2024), where a verbal encouragement program integrated into small-scale game teaching sessions proved effective in improving technical skills among students. Lobo, (2025) deep learning is a learning approach that focuses on creating a learning climate that is attentive, meaningful and certainly enjoyable for students, so that with these characteristics this is the main factor in improving students' abilities, especially in this study related to attention and volleyball techniques.

Our current research also found that CG showed improvements in attention and volleyball technique among students, but not as high as the TEDL group. These improvements occurred because students were exposed to traditional learning, where the teacher directly explained and demonstrated basic volleyball techniques. This proved effective in improving attention and volleyball technique. This also aligns with a previous study that showed that traditional teaching, better known as direct instruction, is effective in improving student performance in PE classes (Guzmán & Payá, 2025). Furthermore, Sierra-Ríos et al. (2020) also reported that 6 weeks of direct instruction was found to improve the quality of physical activity and tactical knowledge in soccer games.

The main strengths of this research findings are: (i) designing a program by combining verbal encouragement from teachers with deep learning (ii) Creating a TEDL program specifically for PE teaching for students at the high school level. However, we realize that there are still limitations in our research, namely: (i) the number of participants only comes from one city, so it cannot generalize the results to other populations, (ii) the TEDL program is specifically for volleyball learning only. Thus, future research is expected to overcome some of these limitations, for example adding participants from high school students from other cities and also designing TEDL programs for other teaching materials such as basketball, soccer, futsal, swimming, hockey or badminton.

CONCLUSION

We affirm that this research proves significant, as the TEDL program implemented for 10 weeks in deep learning instruction in PE classes, improved students' attention and volleyball technique. This research contributes to innovation in the development of learning processes in PE classes, particularly in volleyball teaching materials. Therefore, it is hoped that the research findings, particularly the TEDL program, can be adopted by PE teachers on an ongoing basis in the future.

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CONFLICT OF INTEREST

We confirm that there is no conflict of interest in our current study.

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