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The impact of interactive teaching on logical thinking and learning the skills of the smash hit and block for third-year, middle school students.

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Abstract

This study investigated the effectiveness of interactive learning strategies, as an active-learning approach, in developing convergent thinking and improving volleyball preparation and serve-reception skills among second-year middle school students during the 2024-2025 academic year. The study population comprised 100 students distributed across five classes. An experimental design involving two equivalent groups was adopted to determine the effect of the instructional intervention under controlled field conditions. A sample of 45 students was randomly selected from Classes D and E, with Class D assigned as the experimental group and Class E as the control group. The research procedures involved designing an interactive learning strategy specifically aligned with the targeted cognitive and volleyball skills, conducting a pilot study to establish the suitability of the procedures and instruments, and implementing the main field experiment. Both groups underwent pre-intervention assessments, after which the experimental group received instruction using the interactive learning strategy, while the control group was taught using the conventional instructional approach. Post-intervention assessments were subsequently administered to evaluate changes in convergent thinking and performance of the targeted volleyball skills. The findings demonstrated that the interactive learning strategy produced improvements in students' convergent thinking abilities and enhanced their proficiency in preparation and serve reception compared with conventional instruction. These findings underscore the pedagogical value of integrating interactive and active-learning techniques into physical education instruction. The study therefore recommends the systematic adoption of interactive learning strategies in volleyball teaching and training programmes, particularly for developing cognitive problem-solving abilities alongside technical performance. Incorporating contemporary interactive instructional techniques may enhance student engagement, facilitate skill acquisition, and improve the effectiveness of volleyball instruction at the middle-school level.

Keywords

Interactive Learning; Convergent Thinking; Active Learning; Volleyball Skills; Serve Reception.



Introduction

Correct scientific planning is regarded as the successful way in which all kinds of advancement can be arrived at; in addition, sports is one example. Scientific inquiry continues to enrich life's essence with scientific findings in every part. Basic skills are important to a person; in terms of their physical, psychological, and social progress, they play an important part. The phenomenon of the educational process, in its various aspects has intrigued many researchers and those interested in the educational process. Instead of explanation and clarification and following traditional modes in the educational process, the teacher's role expands, and their primary and main task is to "develop plans in units of educational strategies, which apply modern forms of education in order to achieve specific goals". The development of modern educational approaches and tools leads to more successful educational curriculum, enriches education, arouses the learner's mind, "and they can realize the process of explanation and retention and recall, focusing attention on and paying attention to it.

Logical thinking is a way to think about different things, being the ability to take a sample of data from a set of things you can then try to derive a better, more comprehensive answer that you can generalize from using the data as you are given it, where you develop it to be useful through logic, use classification, measurement, analysis, and comparisons with objectives. The performance of basic skills has a significant and substantial impact on the game of volleyball, and it, in turn, requires a high level of mental and physical abilities and the connection between them for the effective and ideal performance of these skills. Therefore, it was necessary to find

educational tools and models that would contribute to employing and invoking all the requirements of logical thinking processes.

And here lies the importance of the research in preparing an interactive teaching strategy due to its role in developing logical thinking and learning the skills of spiking and blocking in volleyball.

The theoretical significance of the study provides a cognitive framework for members of the teaching staff of intermediate schools in Al-Muthanna Governorate. With respect to the practical significance of this study, it can be seen by looking at:

- Results and recommendations that may help answer some questions about logical thinking and learning the skills of spiking and blocking in volleyball.
- Identifying appropriate goals and means that contribute to the development of logical thinking and the learning of the skills of spiking and blocking in volleyball.
- Emphasizing the importance of using the interactive teaching strategy and raising awareness among teachers about the necessity of adopting it as one of the modern programs in active learning.

1-2-Research Problem:

The researcher, based on the physical education lessons monitored and some random tests for students, discovered that logical thinking and learning the spike and block in volleyball are weak points. The researcher thinks that the reason could be the traditional way of teaching (authoritative) where everything goes onto the teacher for the entire lesson as far as learning" skills and logical thinking. This does not suit the learning field's Improvements to today's modern

practice, which is based on improving the learning process and models for some. Today students' needs are changing rapidly "(sometimes faster than the technology that's trying to woo them) even the students are growing the fastest. So, the researchers realize that the approach to solve this issue employing the constructivist learning model is essential. Hence, this study was conducted.

Research Objectives: -

1-Identifying the impact of interactive learning on logical thinking and the acquisition of the skills of spiking and blocking in volleyball for third-year middle school students for the academic year 2024-2025.

2-Identifying the impact of interactive learning on logical thinking and learning the skills of spiking and blocking in volleyball for third-year middle school students for the academic year 2024-2025.

1-4-Research Hypotheses:

- 1- Interactive education has a positive impact on logical thinking and learning the skills of spiking and blocking in volleyball for third-year middle school students for the academic year 2024 - 2025.
- 2- Interactive education has a positive impact on logical thinking and learning the skills of spiking and blocking in volleyball for third-year middle school students for the academic year 2024 - 2025.

1-5-Research Fields: -

1-5-1-Human Field: For third-year middle school students for the academic year 2024-2025.

1-5-2-Temporal Scope: From 15/12/2025 to 10/4/2026.

1-5-3-Spatial Scope: The intermediate school playground in Al-Muthanna Governorate for the academic year 2024-2025.

2-Research methodology and field procedures:

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2-1-Research Methodology: -

The researcher used the experimental method - with the design of two equivalent groups with pre-test and post-test - due to its suitability for the nature of the problem, its objectives, and hypotheses, leading to the solution.

2-2 Tools, means, and devices used in the research:

2-2-1 Research Tools:

The researcher utilized the following research tools to reach the results and achieve the objectives, including:

2-2-1-1 Research Community:

The research community included third-year middle school students for the academic year (2024-2025), totaling (80) students representing four student sections: sections (A, B, C, D), with (80) students in total. The researcher selected a sample of (45) students from sections (A, B) thru random lottery. Section (A) became the experimental sample with (20) students, and section (B) became the control sample with (19) students. The sample percentage from the community was (48%).

Table (1) It shows the homogeneity and equivalence of the control and experimental groups

Variables								
	x	y	x	y	T calculated	Significant	Levin	significan t
Logical thinking	13.370	0.961	13.310	0.835	0.227	0.842	0.239	0.856
Smash skill	.29071	0.725	27.714	0.719	0.259	0.604	1.274	0.211
Block skill	3.214	0.975	2.786	0.802	0.738	0.398	1.270	0.215

2-2-1-2 Data Collection Strategies:

Method(s) needed for data collection for this study:

1- The questionnaire:

2- Observation:

2- Testing and Measurement:

2-2-2 Equipment (tools and equipment), support:

The researcher made use of a variety of devices and tools (equipment) to support their data collection.

1. Measuring tape

2. Volleyballs, 10 pieces

3. Volleyball court

4. Handheld calculator

5. Adhesive tape

6. Personal computer (Lab Tub)

7. Stationery (papers and pens)

8. Test Results Registration Form

2-3-Research Test:

2-3-1- Logical Thinking Test ():

Based on the evaluation of various logical thinking scales in Arabic, the (Ezek Wilson)" scale was adopted on this study and modified for Iraqi setting. The scale consists of (30) items as described in Appendix, and the response method is yes or no. These items (20) reflect positive attitudes towards logical thinking, specifically ones (1-2-3-5-6-7-8-9-10-13-14-15-16-17-18-19-20-22-23-27)." In order to answer these items, the respondent is given (one point) and given (zero points) for not answering. The ten items (4-11-12-20-24-

25-26-28-29-30) signify negative attitudes toward convergent thinking" ; they give the respondent (one point) for answering (no) and (zero points) for answering (yes), making total score ranges from (zero) to (30). As far as logic is concerned, the score ranged from less than 10 points is weak. 10-19 degrees is an average level. 20-30 points indicate a good level.

2-3-2- Volleyball Tests: -

First - Test for evaluating the technical performance of the blocking skill. Secondly - Test for evaluating the technical performance of the spiking skill.

2-3-3-Scientific foundations of the tests:

1- Face Validity:

The researcher has deduced the face validity, which is based on the extent to which the test represents the phenomenon it measures, logical thinking, basic volleyball skills (logical thinking, spiking skill, blocking skill), thru the questionnaire distributed to (5) specialists (*), who indicated the test's validity as follows: "The test is considered valid if it achieves a percentage of (100%), from the total expert opinions agreeing on the test's representation of the phenomenon it measures." After collecting and processing the data, the researcher used the Chi-square test, which showed that the tests were accepted for nomination as they achieved values greater

than the tabulated Chi-square value of 3.84, at 1 degree of freedom, and a significance level of 0.05. Table (2) shows the validity of the logical thinking tests, the skills of the spike and block in volleyball

Table (2) shows the validity of convergent thinking tests and the skills of setting and reception in volleyball.

test	No. of answer		Value X^2		Significance
	Function	No function	Function	No function	
Logical thinking	5	-	5	3.84	High
Smash skill	5	-	5	3.84	High
Block skill	5	-	5	3.84	High

-The Discriminative Ability of the Logical Thinking Scale:

To reveal the discriminatory power of the logical thinking scale under investigation, which was applied to a sample of 45 third-year intermediate students, the researcher conducted a comparison of the test results for the pilot sample. For each item of the scale, a t-test for two independent samples was used after dividing them into a high group and a low group (50%). When comparing the calculated t-value, which ranged between (8.631 - 18.824), with the tabular value of (2.091) at a degree of freedom of (43) and a significance level of (0.05), the statistically significant t-value was considered an indicator of the logical thinking scale's discriminative ability.

2 - Reliability:

At the end of the seven-day period, the researcher searched for the reliability coefficient of the tests of spike and block in volleyball to find the correlation between their results and their scores from the retest. Once the Pearson correlation coefficient for the two measures was computed, the correlation was significant as the calculated correlation coefficients are (.845, 0.754) of the spike and block skills tests in volleyball. All values were

more than the tabulated value (0.428) at 18 degrees of freedom and a significance level of (0.05), implying that the test under investigation had a high degree of reliability, as shown in Table (3).

As for the reliability of the logical thinking scale, the researcher used the split-half method and calculated the correlation coefficient for the half-test reliability, which was (0.772). To obtain the full test reliability, the researchers applied the Spearman-Brown formula, and it was found that the Spearman-Brown coefficient was (0.865).

3- Objectivity: -

The tests were conducted under the supervision of referees by the specialized assistant team in physical education and sports sciences, taking into account the same conditions and method of conducting the tests. After collecting the results and data, they were statistically processed, where the simple correlation coefficient (Pearson) between the scores of the neutral referees was calculated. The correlation coefficient values were significant, and after comparing them with the tabular value of (0.782) at a degree of freedom of (18) and a significance level of

(0.05), it was found that all the tests enjoy a degree of objectivity because their values are

higher than the tabular value, indicating the objectivity of the tests, as shown in Table (3).

Table (3) The reliability coefficient shows the tests applied to the pilot sample

Test	Reliability coefficient	Significance	Objectivity coefficient	Significance
Smash skill	0.765	Sig.	0.769	Sig.
Block skill	0.860	Sig.	0.856	Sig.

2-4- Field Research Procedures

2-4-1-Pre-test: -

The pre-test for the research sample (control and experimental groups) was conducted on 5/1/2025, Tuesday at 9:00 AM in the courtyard of Al-Tali'a School in Al-Muthanna Governorate.

2-4-2- The educational curriculum using the constructivist model:

Once the sources and literature were established, the researcher implemented the logical education approach on the research sample. The researcher prepared the educational units for applying the educational curriculum using the logical education strategy according to the research pre-tests, two educational units per week, following the stages of the interactive education strategy, which are: (Preparation and motivation phase; content presentation phase; interaction and application phase; formative evaluation phase; summarization and final knowledge construction phase; final evaluation phase)

As the researcher adjusted to the students' level as well as the prescribed educational units and lecture timings, a total of 16 educational units over 8 weeks were assigned in total. The sections of the educational units each week included a preparatory section of 20 minutes, and the percentage is 20%, with a

total time of 320 minutes, and the main section is 70 minutes, and the percentage is 70%, with a total time of 1120 minutes during the educational curriculum, and the final section is 10 minutes, and the percentage is 10%, with a total time of 160 minutes from the total curriculum.

2-4-3-Post-test:

The post-test for the research sample was conducted on Monday, March 2, 2026, after the completion of the interactive teaching strategy application period, which lasted for 8 weeks.

2-5-Statistical methods: -

The statistical package (SPSS) was used to process the data. 3- Presenting, analyzing, and discussing the results

3-1 - Presentation of the results of the differences in logical thinking and the learning of the skills of the smash and the block for the pre-test and post-test of the control group, and their analysis and discussion.

Table (5) It shows the differences between the pre-test and post-test for the control group in logical thinking and learning the skills of the smash hit and the block wall.

Table (5) The differences between the pre-test and post-test for the control group in logical thinking and learning the skills

Variables	Pre-test		Post-test					
	x	y	x	y	xf	yf	T calculated	Significant
Logical thinking	11.380	0.965	14.401	0.877	-3.077	1.409	7.074	0.000
Smash skill	3.101	0.602	5.659	0.558	-3.571	1.158	10.545	0.000
Block skill	3.287	0.980	5.615	0.840	-2.357	1.082	9.153	0.000

The tabulated value of (t) at 18 degrees of freedom and a significance level of 0.05 = 2.145

3-2 - Presentation of the results of the differences in logical thinking and learning the skills of the smash and block for the pre-test and post-test of the experimental group, and their analysis and discussion.

Table (6) It shows the differences between the pre-test and post-test for the experimental group in convergent thinking and learning the skills of preparation and reception of transmission.

Variables	Pre-test		Post-test					
	x	y	x	y	xf	yf	T calculated	Significant
Logical thinking	12.308	0.855	21.154	0.801	-8.846	1.345	19.188	0.000
Smash skill	2.714	0.726	9.143	1.406	-6.429	1.505	15.987	0.000
Block skill	2.786	0.802	8.643	1.008	-5.857	1.292	16.957	0.000

The tabulated value of (t) at 26 degrees of freedom and a significance level of 0.05 = 2.145

3-3 - Presentation of the results of the differences in logical thinking and the learning of the skills of the smash and block performance for the post-test measurement of the control and experimental groups, and their analysis and discussion

Table (7) It shows the differences between the post-test measurements of the control and experimental groups in convergent thinking and the learning of the skills of preparation and reception

Variables	Unit of measure	Control group		Experimental group			
		x	y	x	y	T calculated	Significant
Logical thinking	Degree	14.425	0.877	20.145	0.801	14.187	0.000
Smash skill	Degree	7.634	0.929	10.148	1.406	6.550	0.000
Block skill	Degree	6.573	0.852	9.610	1.008	9.708	0.000

The tabulated value of (t) at 44 degrees of freedom and a significance level of 0.05 = 2.048

Discussion of the Results:

Based on the results presented in tables (5, 6, 7), third-year middle school students for the academic year 2024-2025 have improvement in logical thinking and learning the smash and block skills. And this is due to the members of the control group between the pre-test and post-test, favored in post-test because of the curriculum taught by the subject teacher. And Table 6 relates to the pre-test and post-test of experimental group members, who employed interactive" teaching strategy. Results show a preference for the post-test. This indicates that, in comparing the control group and experimental group in the post-test, experimental group achieved the best results.

The diversity and difference between the third-grade middle school students that the interactive teaching strategy produced caused their motor response to shift towards flexible
 () "response to the rigid traditional solutions, as the interactive method allowed distinct differences via various motor variations than other teaching methodologies. If there is some degree of flexibility in creativity across people, Morris Stein (Stein) states, "If the creative activities are of a high degree of flexibility that are offered, supported (in any way), and evaluated by the surrounding environment, these creative activities can be increased (and increased over time) among many individuals." The integrity of the educational programs ensures these scientifically selected exercises with the correct and consistent repetition to make them suitable for the level and abilities of sample subjects, based on practice, and therefore contributes more experience and growth in muscular and physical capacity. As such, practice is one of the critical factors for

the learning of both very difficult and very easy skills"

And therein lies one of the fundamental principles that is employed in the delivery of manual activity and motor skills. Dhafer Hashem (2002) reaffirmed this statement stating that "It is a natural process of learning that there must be improvement in learning as long as the teacher or coach goes through the correct basic sequence about learning method, teaching method, implementing the correct performance method, the repeated attempt and refiguring, constantly and until the performance is solidified and stabilized."

Every time that the performance is tried again, with feedback after every task we will ensure that the mastered skills has a motor program in the brain, and each time with repeated performance there will be a refinement of the performance until the completed task to the correct standard for the motor program that is encoded in the brain following feedback to be adapted based on the performance. Schmidt (1992) further corroborates this claim, stating that "for every skill learned in the course of our learning, there's a motor program for this skill stored in the brain, and the more accurately and unambiguously mastered, the more precise the motor program, the clearer the mastered motor program," indicating a distinct difference in how quickly and accurately the learned skills can be learned.

In this case, the teacher in the learning process provides instructions and guidance to the students without inhibiting them or robbing them of the opportunity to generate ideas about the movement they have to produce. After that, they answer questions

about the shape of the movement parts with motor responses. Also, when we were continuously in question in the educational units about the shape of the movement, it really helped with quick learning of the sample members. As soon as they knew the areas of movement, they could remember how to respond when it did occur incorrectly.

So, they got the skill of error detection and fixing it by finding the movement details and parts to it. Teacher feedback should take place during learning period. For feedback is knowing, measuring, evaluating and benefiting from learning, with reference to the information through one's actual motor response, and the contribution of that learning to motor behavior. From here, the role of the teacher in providing feedback about this method is entirely different compared to other ways. No longer is it the lecturer or the reply to the questions of the student but the asker that is asking and the question and also has the student reflect on the movement to which they have to think.

4.1 Conclusions

Based on the findings of the study, the following conclusions were drawn:

1. The interactive teaching strategy had a significant positive effect on the development of logical thinking abilities among third-year middle school students. The strategy provided students with opportunities for active participation, discussion, problem-solving, and meaningful engagement with learning activities, thereby contributing to the enhancement of their logical reasoning and cognitive abilities.

2. The interactive teaching strategy was effective in improving the acquisition and performance of selected basic volleyball skills among third-year middle school students. The active involvement of students in the learning process, together with continuous interaction, practice, feedback, and correction, facilitated better understanding and execution of the targeted volleyball skills.
3. The findings demonstrate that the interactive teaching strategy can effectively integrate cognitive and psychomotor learning outcomes in physical education. Its effectiveness in developing both logical thinking and basic volleyball skills suggests that interactive approaches can provide a more comprehensive learning experience than approaches that primarily emphasize teacher-directed instruction.
4. Overall, the study confirms the educational value of adopting learner-centred and interactive instructional approaches in physical education, particularly where the objectives of instruction involve the simultaneous development of thinking abilities and practical motor skills.

4.2 Recommendations

In light of the findings and conclusions of the study, the following recommendations are proposed:

1. Physical education teachers should be trained and encouraged to use a variety of contemporary teaching strategies rather than relying exclusively on conventional or teacher-centred methods. Teachers should

select instructional strategies according to the nature of the learning objectives, students' characteristics, the skills being taught, and the specific educational situation.

2. The interactive teaching strategy should be incorporated into the teaching of volleyball and other physical education activities, particularly when instruction is intended to develop both cognitive abilities and motor skills.
3. Physical education teachers should provide learning environments that encourage active student participation, interaction, discussion, cooperative learning, problem-solving, practice, and constructive feedback, as these elements can contribute to improved cognitive and psychomotor development.
4. Educational institutions and relevant authorities should organize training programmes, workshops, and professional development activities to familiarize physical education teachers with interactive teaching strategies and their effective application in practical lessons.
5. Further studies should investigate the effectiveness of the interactive teaching strategy in teaching other sports skills and developing additional cognitive, psychological, and motor abilities, such as problem-solving, decision-making, creative thinking, coordination, accuracy, and motor performance.
6. Future research may also examine the effectiveness of interactive teaching strategies across different age groups, educational levels, sports

activities, and learning environments to establish the broader applicability of the strategy in physical education.

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