



THE EFFECT OF THE BLENDED LEARNING STRATEGY ON THE SOME TECHNICAL PERFORMANCE OF GYMNASTIC SKILLS FOR STUDENTS

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Recieved: February 23, 2026 **Accepted:** April 19, 2026

ABSTRACT

Background. The importance of this research has emerged in its focus on blended learning to help students increase their motivation to learn, develop cognitive and performance skills, and meet their individual needs so that each student learns at their own pace. It also increases their sense of equality in educational opportunities. **Objectives.** The purpose of this paper is to design an educational program using a blended learning strategy and to determine its impact on students' gymnastic skill performance. **Method.** The researcher used the experimental method, given its suitability for the nature of this research, adopting a single-group experimental design with pre- and post-tests. After conducting the pre-tests and entering the data into Excel, the researcher implemented the main experiment on the research sample for 12 weeks, with two units per week. After completing the main experiment, the post-tests were conducted, and the data were entered into Excel. This data was processed using the SPSS statistical package. **Results.** The total average arithmetic mean for the regular physical education lesson is (1.79), and the total average arithmetic mean for the physical education lesson with applications of the blended learning strategy is (2.96). **Conclusion.** There are statistically significant differences between the average pre- and post-tests of the experimental group regarding gymnastic skill performance, in favor of the post-test.

Keywords; learning strategies, blended learning, technical performance, gymnastics skills.



A. INTRODUCTION

The continuous progress in science, education, and teaching methods is not limited to a specific point. The transfer of information and knowledge from teacher to student depends on many methods and strategies. The best of these strategies are those that properly convey knowledge to the student receiving it. There is no doubt that the strategy followed must be at the student's mental, intellectual, and physical level, so that the student can harmonize with it and extract the best motor skill level from him. The blended learning strategy is one of those strategies that simulates the mental as well as the intellectual side of the recipient. Its keeping pace distinguishes this strategy with modernity, communication methods, and visual and auditory means. Vision and hearing provide the learner with the details of the physical, motor, and skill tasks during the lesson (Adriani, et al., 2025; Chafidz, et al., 2023; Haidar, et al., 2024)..

The more the student uses more than one sense to receive information, the greater the share of that information in the student's memory. Hearing and sight do not affect motor performance unless they are applied meteorically. This is what happens with all motor skills, including gymnastic skills, as gymnastic skills require great mental and intellectual abilities. The importance of the blended learning strategy and its effectiveness for the student and the teacher is what drives us to understand why. Interest in it has emerged in this way. The impact of blended learning on achievement is significant. Students who learned through blended learning achieved higher achievement than students who learned through traditional (face-to-face) and fully e-learning. It also has an impact on increasing student retention compared to traditional (face-to-face) and fully e-learning.

Blended learning has also led to improved student achievement, as blended learning has cut the learning time by nearly half and the cost by combining direct e-learning, self-paced learning, and face-to-face classroom learning. Student attitudes toward using e-learning technology in the classroom may contribute to the educational process. The importance of research has emerged in focusing on blended learning to help students increase their motivation to learn, develop cognitive and performance achievement, meet their individual needs so that each student learns at their own pace, and increase their sense of equality in educational opportunities.

The study of the blended learning strategy within the context of technological presence and the changes occurring in our society, including the development of the educational system, technological advancements, the pursuit of post-reality (metaverse), and the use of data science through research and study of time series to develop and implement digital globalization and digital transformations for educational environments, leading to the Fourth Industrial Revolution, which seeks to build educational policies within the framework of digital transformation, directly impacting the course of the physical education lesson. This prompts those involved in scientific research and those responsible for the educational and training process to take a scientific approach to research and study of this variable, which the world seeks to reach scientific axioms, results, and recommendations through scientific conclusions from these variables within the framework of building a sustainable society specific to the educational activity of physical education lessons, leading to the development of a good teaching system for physical education lessons.

Importance of the Study, Interaction and collaboration with classroom members together in real time during the lesson. The presence of diverse spaces similar to or superior to real spaces in which virtual life is practiced. Time series coding of data related to the

educational process. This research aims to design an educational program using a blended learning strategy and to determine its impact on students' gymnastic skill performance.

Blended Learning Strategy: A strategy used to integrate physical reality with virtual environments through a connected network that includes continuous, multi-person interactions. It includes open-ended play worlds based on virtual reality (VR) and augmented reality (AR). Avatars that interact in real time represent users, creating an immersive experience for the users (Avatar) (Mystakidis, 2022, p. 87).

B. METHOD

Participant

The research community was identified as third-year students in the College of Physical Education and Sports Sciences, University of Wasit, numbering (85) students distributed across five classes. The research sample was randomly selected by lottery and consisted of (10) students from Class D. The survey sample consisted of four students from outside the research sample. Thus, the research sample represented (11.7%).

The study was conducted in three Stages

Stage One, "Preparation": Defining the general framework of the study, its scope, objectives, and the main variables to be analyzed, as well as identifying the study steps, appropriate tools, and data collection methods. Preparing the required tools and equipment and ensuring their validity and accuracy. Electronic laboratories were also available. Stage Two, "Exploratory Studies": The first exploratory study: The researcher conducted it on a sample of (5) students on Wednesday, December 28, 2024. Its objectives were to: Verify the validity of the study and obtain approval from the administrative authority to conduct the study. Stage Three, "Basic Study": The researcher conducted measurements on the study sample, including age, height, and weight. The normality of the research sample regarding the variables under investigation.

Table 1. Arithmetic mean, standard deviation, and skewness coefficient for the variables of age, height, and weight (N = 10)

Variables	Measuring unit	Mean	Std. Deviations	Median	Skewness
Age	Year	15.49	2.25	15.30	1.37
Length	Cm	160.22	1.21	160.00	1.57
weight	Kg	55.11	2.24	48.00	0.98

Table (1) shows that the values of the skewness coefficient for the research sample ranged between (± 3), indicating that the sample members were moderate in these variables.

Table 2. Arithmetic mean, standard deviation, and skewness coefficient in the physical and skill tests (N = 10)

No.	Tests	Arithmetic mean	Standard deviation	Minimum	Maximum	Skewness
1	Standing Broad Jump	19.500	3.739	190	210	0.042-
2	Sargent's Vertical Jump	33.600	2.722	30	38	0.157
3	Lie-Down	30.300	3.555	25	36	0.350

4	800g Medicine Ball Push	10.242	1.208	8.40	13.50	0.403-
5	Standing Vertical Jump with Half Bent Knees	24.3300	3.362	29	40	0.131-
6	Handstand	12	2.575	10	17	0.308
7	Front Somersault	24.707	3.249	19.90	30	0.158
8	Side Somersault	2.050	0.825	1	3	0.098-
9	Open Jump on the Pony	20	2.051	17	24	0.366
10	Front Roll	3.950	0.825	3	5	0.98

Table (2) shows that the values of the skewness coefficient for the research sample ranged between (± 3), indicating the sample members' average performance in the physical tests and the skill level under study.

Research Design

The researcher used the experimental method, given its suitability to the nature of this research. This was achieved by adopting an experimental design for a single experimental group with pre- and post-tests.

Data Collection Tools

Tools and Devices Used in the Research: Restameter to measure height to the nearest 1/2 cm, Stopwatch, Electronic Scale to measure weight to the nearest 1/2 kg, Cones, Medicine Balls weighing 800 grams, Mattresses, and High Jump Device.

Skill Performance Level Tests

Tests and scales that measure basic gymnastics skills were identified and selected based on a reference survey of references and scientific studies, which resulted in the following tests:

Table 3. Validity coefficients for the skill tests under study n1 = N2 = 10

Variables	Non-privileged group		Privileged group		arithmetic mean of difference	T value calculated
	Arithmet ic mean	Standard deviation	Arithmet ic mean	Standard deviation		
Handstand	14.21	0.89	27.60	1.57	9.41	6.51
Front Somersault	24.10	0.75	25.20	2.83	14.08	17.16
Side Somersault	2.40	1.48	7.40	1.89	4.96	9.43
Open Jump on the Pony	15.14	1.87	27.51	2.65	9.28	6.48
Front Roll	1.5	2.86	7.32	2.87	6.18	12.64

Table t-value at a significance level of 0.05 and a degree of freedom of 22 = 2.074

Table (3) shows that there are statistically significant differences in the scores of the skill tests between the undistinguished and distinguished groups at a significance level of (0.05). The calculated t-value ranged between (6.48 - 17.16), which is greater than the critical values for the t-test, which amounted to (1.72), indicating the validity of the tests used in the research.

Table 4. Reliability coefficients for the skill tests under study: n = 10

Variables	First application	Second application	R	R value
			Critical value	

	Mean	Median	Std. Deviations	Mean	Median	Std. Deviations	0.01	0.05	calculated
Handstand	20.19	20	1.89	29.60	30	1.57	0.558	0.485	0.713
Front Somersault	25.12	25.26	1.75	39.20	40.11	2.83	0.615	0.444	0.705
Side Somersault	3.44	3.45	2.48	8.40	8.6	1.89	0.620	0.432	0.610
Open Jump on the Pony	20.23	21	3.87	29.51	30	2.65	0.611	0.425	0.622
Front Roll	1.14	1.03	3.86	7.32	7.56	3.87	0.658	0.417	0.826

The tabular "r" value at a significance level of 0.05 and a degree of freedom of 10 in one direction = 0.497.

Table (4) shows a statistically significant correlation between the first and second applications of the skill tests. The correlation coefficient values ranged between (0.610 - 0.826), which are values greater than the critical value of the Pearson correlation coefficient, which reached (0.05 = 0.497, 0.01 = 0.658) at a degree of freedom of (22), demonstrating the reliability of the test used.

Study questions

What are the blended learning strategy techniques used in the work environment (physical education lesson)?

Based on benchmark studies on blended learning strategies, educational science, and the potential of metaverse applications to simplify the teaching and learning process, particularly in simplifying lesson presentations and specifically in gymnastics passing and aiming skills, and to leverage the potential of the metaverse as a three-dimensional, global, interconnected, and immersive online space in real time, we need new ways to connect the physical world with augmented and virtual reality experiences (Hirsh-Pasek, 2022, p. 22). (Kwang-Hyung Lee (2022) asserts that delivering education within a blended learning strategy can help students increase their chances of making up for lost time in traditional education by using virtual reality tools. (Lee, 2022, p. 58)

By utilizing the skills of jumping, rolling, and somersaulting in gymnastics under study, through technical steps and a review of educational steps, as well as a review of skill and planning steps, and through augmented reality and virtual reality and the use of 3D technologies, students were transferred from real reality to virtual reality. Physical Education in the Metaverse Environment. In the field of physical education, interest and demand for teaching and learning activities based on virtual reality or augmented reality are increasing, and are currently being developed among metaverse technologies. Virtual reality has achieved significant publicity in education by establishing and supporting skills in physical education lessons (Gurrin, Smeaton, & Doherty, 2022, p. 98). The study also focused on the specific standards for metaverse applications by designing a lesson on the skills of handstand, front flip, side flip, open jump on a horse, and front roll in gymnastics, and specific to metaverse applications, namely: (reality Augmented Reality, Spatial Computing, Data Science, Virtual Reality (Appendix (1))

1. Augmented Reality: A sporting activity that creates non-real information by superimposing virtual objects or interfaces on the user's familiar physical environment, through an explanation of the educational and skill steps of the skill under study (Hwang & Chien, 2022, p. 37)

2. Data Science: Sporting activities in a virtual space allow users to directly record information, emotions, and behaviors to create data content about that skill (Egliston & Carter, 2022, p. 80)
3. Virtual Reality: A virtual sporting world that extends real sporting activities and similar activities.
4. It constructs alternative virtual models by simulating the real world (Hwang & Chien, 2022)
5. Spatial Computing: An integrated technology that realistically reproduces the physical world but expands this information into the sporting world. (Jeong, Yi, & Kim, 2022, p. 47) (Gastón Sanglier Contreras and Aurora Hernández González, 2022, p. 147)

What is the technological model for physical education lessons using blended learning techniques?

Metaverse technologies, which enrich the educational process, are among the technologies that help me innovate within the framework of the standards for these technologies, the design was designed within the framework of technology and specifically for displaying the skills of jumping, rolling, and somersaulting in gymnastics. The researcher emphasizes the innovation of this design based on the following:

1. Collecting information related to the skill and technical aspects and the educational steps for the skill under study
2. Studying the actual reality from the scale of the gymnastics field
3. Studying data related to the timing of skill performance
4. Studying spatial computing to implement this skill through implementation in virtual reality
5. Studying the timing during the implementation of this skill
6. Implementation was carried out in school electronic laboratories and through programming using Metaverse technologies.

Pre-tests

Pre-tests were conducted for the experimental and control groups from January 2, 2025 to January 4, 2025, on physical and skill-based gymnastics tests in the gymnastics hall within the college, accompanied by the assistant staff and judges.

Main Experiment

The researcher followed the following steps in developing the educational program content:

1. The program was for a period of (12 weeks). Program timing (during the preparation period) was in the gymnastics hall of the College of Physical Education and Sports Sciences at University of Wasit. The number of weekly educational units was (2 units) (Sunday-Wednesday). The duration of the daily educational unit was (90 minutes) out of a weekly training (180 minutes). The educational lesson components (administrative work, general warm-up, general and special physical preparation, the educational part, the practical part, and the concluding part) include a warm-up and preparation part that includes physical preparation exercises for the body's systems

and practicing the activities that will be included in the educational unit. It is divided into three parts:

2. Introduction and administrative work: (5) minutes, including preparation and equipping all tools, as well as recording attendance and absence.
3. General warm-up: (5) minutes, including stretching and flexibility exercises to prepare the body. It also includes preparation exercises for passing and shooting.
4. Physical exercises and special physical preparation: (10) minutes, including comprehensive and varied exercises in different positions, serving the skills (jumping, rolling, and somersaulting).
5. Educational part: (35) minutes, including various exercises specific to the teaching method of these skills (jumping, rolling, and somersaulting) in gymnastics. It includes the exercises to be improved and which have the main impact on achieving The objectives of the educational unit are to diversify the use of exercises and the tools necessary to implement the exercise, progressing from easy to difficult, which contributes to the development of students' educational status. This represents the longest time of any part of the educational unit.
6. The practical part: (30) minutes, includes various highly skilled exercises using various teaching methods for gymnastics skills (jumping, rolling, somersaulting) with the aim of activating the learning process and raising the level of skill performance, as well as positively engaging students in the educational process and overcoming various teaching shortcomings. This is achieved through the effectiveness of teaching using metaverse techniques and taking into account individual differences between different levels to enable a large percentage of students to reach the level of advancement, in line with their age level and the nature of the skill. This enables students to reach the level of skill performance, accuracy, focus, and achievement of the desired research objective as quickly as possible. - The concluding section: (5) minutes, and includes various exercises, such as relaxation exercises aimed at returning the student to their normal state.
7. Radwan Mustafa (2022) points out that the use of educational activities is a new and innovative approach to enhancing student productivity and increasing the effectiveness of their educational performance in virtual reality. The implementation of this method within educational programs requires targeted standardization (Radwan, 2022, p. 44).

The percentage of contribution of metaverse applications to the development of physical education lessons.

Stage One: Analysis Stage

The researcher reviewed specialized scientific studies and references to identify the technical stages, educational steps, technical errors, and how to correct them in basic gymnastics skills. He also studied the sample on which the program would be applied to determine their abilities and educational levels, ensuring that the Metaverse technology path is in the right technological direction.

Stage Two: Design Requirements Preparation Stage:

In this Stage, the program design requirements were prepared for use in the design process, as follows:

1. Preparing Still Images: The program images were prepared in various forms (illustrative images - motion sequences) and entered into the computer using an Acer scanner using the MiraScan program. The images were then processed using Adobe Photoshop.
2. Preparing Video Clips (Moving Images): The researcher prepared video files in various forms, which were entered into the computer using a Life View TV Tuner Card using Windows Movie Maker. Editing and editing were performed using Director 6.1. Audio Preparation: The program's audio files were prepared in various forms (music, voiceover, and sound effects) and entered into the computer using Jet Audio 4.7.

Stage Three: Script Writing

The researcher wrote the program's script according to the previously defined content. The program consisted of (1) educational unit, lasting (12) weeks, with one educational unit per week, and each unit lasting (120) minutes.

Stage Four: Design

The researcher used the following programs to design the program: Avtar program, Augmented reality program, and virtual reality programs, The researcher designed the educational unit to consist of several parts. The main screen: This contains the skills referred to in the gymnastics unit, a background for virtual reality simulation, and a gymnastics field simulation, which is not controlled by the students.

Stage Five: Initial Experimentation and Evaluation

The researcher presented the program content in its final form to a group of experts in teaching methods and gymnastics to obtain their opinions on the program's suitability for application.

Post-test

Pre-tests were conducted for the experimental and control groups between February 19, 2025, and February 21, 2025, on the level of physical and skill tests for gymnastics in the gymnastics hall within the college, accompanied by the support team and judges.

Statistical Methods

The researchers processed the study results electronically using the Statistical Package for the Social Sciences (SPSS), taking into consideration the scientific method in analyzing the results to achieve the research objectives.

C. RESULTS AND DISCUSSIONS

Results

Table 5. Statistical Significance of Differences in the Pre-tests for the Experimental Group on Physical and Skill Tests (N = 50)

No.	Tests	Unit of measurement	Arithmetic mean	Standard deviation
1	Standing Broad Jump	cm	198.14	3.44

2	Sargent's Vertical Jump	cm	32.16	2.66
3	Lie-Down	Number	29.14	3.13
4	800g Medicine Ball Push	Meter	10.92	1.35
5	Standing Vertical Jump with Half Bent Knees	Number	33.45	2.88
6	Handstand	Number	12.7	2.16
7	Front Somersault	Meter	23.79	2.85
8	Side Somersault	Number	2	1.13
9	Open Jump on the Pony	Number	21	2.22
10	Front Roll	Degree	3.42	0.65

Table 6. The statistical significance of the differences in the pre-test for the experimental group regarding the contribution of metaverse applications to the development of physical education lessons

Variables	Impact	Regular Physical Education Lesson		Physical Education Lesson Using Metaverse Technologies		Metaverse technology improvement rates
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation	
Augmented Reality	Physical Education Lesson	1.3	0.1	2.3	0.12	%20
Spatial Computing		2.5	0.5	4.3	0.24	%40
Data Science		3.85	0.4	5.6	1.2	%50
Virtual Reality		0.89	0.0	00	000	%50
Gymnastics Skills		0.45	0.0	2.6	0.1	%40

Discussion

It is clear from Table (6): The total average arithmetic mean for the regular physical education lesson is (1.79), and the total average arithmetic mean for the physical education lesson with applications of the blended learning strategy is (2.96). Therefore, there is a kind of high average ratio in the numerical value that gives a kind of improvement in the use of technology towards change. This is consistent with (Egliston & Carter, 2022; Hwang & Chien, 2022; Jeong, Yi, & Kim, 2022). The improvement rates came through the use of technologies and standards for applications of the blended learning strategy as follows: augmented reality standards at a rate of (20%), and this is an advanced percentage within the framework of digital transformations in the use of augmented reality, and this is consistent with reference studies of (Hwang & Chien, 2022), spatial computing at a rate of (40%), and this is an advanced percentage within the framework of using artificial intelligence technologies, and this is consistent with reference studies of (Hwang & Chien, 2022), (Salloum, (2022), (Hirsh-Pasek, 2022), data science (50%), which is an advanced percentage in the framework of modeling and time series, and behind the continuous assessment of technological skills and performance prediction, and is consistent with (Jeong, Yi, & Kim, 2022; Gurrin, Smeaton, & Doherty, 2022), virtual reality standards (50%), which is an advanced percentage. Spatial computing and the link between reality and virtual reality in teaching physical education lessons are consistent with reference studies (Lee, 2022) (Jeong, Yi, & Kim, 2022; Gurrin, Smeaton, & Doherty, 2022).

D. CONCLUSION AND RECOMMENDATIONS

The total mean arithmetic mean for the physical education lesson and the blended learning strategy was (2.96). The highest percentage of technological influence on the physical education lesson was data science standards (5.6). Virtual reality standards (50%). The percentage of improvement in the use of applications Blended learning (40%). Recommendations: Encourage the use of technological innovations in the educational process. Integrate the blended learning strategy into the educational process. Apply blended learning strategies in various physical education games.

E. ACKNOWLEDGMENT

The author extends sincere appreciation to all those who contributed to the success of this research.

F. AUTHOR CONTRIBUTION STATEMENT

Ameen Atta Hassan is responsible for the manuscript in this study.

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