ORIGINAL ARTICLE

Multimedia-enhanced learning of volleyball rules in physical education and sports faculties

Mohamed Tayoush[1,2ABCDE], Ahmad Hamad[2ABCDE], Hamdi Chtourou[1,3ABCDE]

[1] *High Institute of Sport and Physical Education of Sfax, University of Sfax, Tunisia*
[2] *Faculty of Physical Education and Sports Sciences, University of Benghazi, Libya*
[3] *Physical Activity, Sport, and Health, UR18JS01, National Observatory of Sport, Tunisia*

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Abstract

Background and Study Aim: As technology's role in education grows, assessing its efficacy in sports curriculum becomes increasingly crucial. In light of potential limitations in traditional teaching methods, exploring innovative approaches becomes imperative to enhance the learning experience. This study investigates the impact of multimedia usage in teaching the theoretical aspects of volleyball rules within faculties of physical education and sports sciences.

Material and Methods: The research included a total of 87 students. From this pool, 20 students were selected to form two groups, each consisting of 10 students. This study compared two groups using two different teaching methods: a multimedia-based program group and a traditional program group. The research employed a descriptive approach and the causal-comparative study method.

Results: The results indicated that the use of multimedia had a positive impact on teaching the theoretical aspects of volleyball rules courses. There were statistically significant differences between the pre- and post-measurements of the traditional program group, with the post-measurement being superior. Furthermore, significant differences were observed between the two post-measurements of the two groups, with the multimedia-based program group showing a superior outcome.

Conclusions: These results emphasize the potential of multimedia as an effective tool for enriching sports curriculum within faculties of physical education and sports sciences. Further exploration of multimedia's role in education is warranted to harness its full potential for pedagogical enhancement.

Keywords: learning, physical education, multimedia, teaching, volleyball

Introduction

The educational process is vital for societal progress, particularly in nurturing the youth as future pillars. To enhance this process, various methods and tools have been developed. In today's technological era, multimedia plays a pivotal role by simplifying educational content through visuals and text.

Education is considered one of the most important factors in the lives of many people, as it has a positive and comprehensive impact on nurturing a new generation with advanced and modern scientific foundations. Progress in education is evaluated by assessing knowledge of modern teaching and educational methods, means, and theories. Scientific advancements have introduced various tools that educators can utilize to prepare fields of expertise for learners efficiently [1, 2]. Sports knowledge encompasses principles and concepts related to cognitive and mental aspects of sports activities in general. The cognitive goal focuses on developing cognitive skills such as knowledge, comprehension, application, analysis, synthesis, and evaluation, despite its connection with physical education [3]. Traditional teaching methods are inadequate for contemporary educational needs, let alone future requirements, as the demand for expanded educational services increases daily. The knowledge and population explosion is progressing in a manner that traditional education struggles to keep pace with, necessitating the development of new teaching methods to address these challenges [4, 5].

We are currently in the midst of a knowledge explosion era. To harness this knowledge effectively, we must seek tools that allow us to quickly access and assimilate it. This is crucial to keep up with the rapid developments that define our times, enabling us to grasp and comprehend the daily scientific discoveries. Multimedia emerges as one of the most essential means to match the pace of educational advancement, enhancing the overall efficiency and effectiveness of the educational process [6].

The utilization of multimedia educational tools, including cinema devices, various displays, cameras, televisions, slides, films, models, pictures, and interactive books, enhances the effectiveness of teaching methods. These multimedia resources not

doi:10.15561/20755279.2023.0505

only capture learners' attention and engagement but also simplify education, making it more enduring in their minds. Furthermore, they motivate learners, increase their activity and interaction, and create a livelier learning environment. This underscores the importance of multimedia as an effective teaching method [5, 7, 8, 9].

The significance of multimedia is reflected in its ability to address specific behavioral goals within the cognitive, affective, and psychomotor domains of learning. This integration takes place within an educational framework defined by the teacher to fulfill lesson objectives. It also considers criteria for media development and assessment, methods of utilization, environmental specifications, and other factors contributing to educational goal achievement [10].

Research Problem

Education technology in physical education is a vital area of research [12, 13, 14, 15]. Within this domain, studies have delved into the effects of multimedia-based educational programs on the acquisition of basketball skills, as well as the nuanced influence of multimedia computers on the development of gymnastics skills. Ongoing research continues to investigate the multifaceted effects of computer-based educational programs, encompassing their impact on cognitive achievement and the enhancement of foundational volleyball skills.

Explorations into integrating multimedia and computer-assisted teaching methods in physical education have yielded valuable insights [16, 17, 18, 19]. One study focused on enhancing the cognitive education level of new boxing referees through a proposed educational program. Another comparative study assessed the impact of multimedia computer-assisted instruction, traditional instruction, and combined instruction on knowledge acquisition and retention of setting skills in volleyball. Additionally, research explored the integration of computer-assisted teaching methods for volleyball instruction in college physical education. Furthermore, efforts were made to develop interactive learning multimedia to enhance underhand passing and underserving skills in volleyball games for primary school students.

Research in the field of volleyball education and interactive learning media has been fruitful [20, 21, 22]. One study focused on developing interactive learning media for volleyball games using Adobe Flash Professional, aiming to enhance student learning outcomes [20]. Another research project [21] explored the impact of interactive videos on volleyball education, while a different study [22] concentrated on the development of multimedia-based technical learning media for volleyball in a secondary school. These efforts collectively contribute to the advancement of volleyball education.The research has identified a lack of investment in multimedia as a teaching method, even though it can play a crucial role in teaching motor skills for sports and theoretical aspects of sports courses, including volleyball rules. In light of these observations, the study aims to explore the feasibility of using multimedia to teach the theoretical aspects of volleyball rules.

Research Hypotheses

A) There are statistically significant differences between the pre- and post-measurement of the traditional program group to teach the theoretical aspect related to volleyball rules and in favor of the post-measurement;

B) There are statistically significant differences between the two pre- and post-measurements of the multimedia-based program group to teach the theoretical aspect related to volleyball rules and in favor of the post-measurement; and

C) There are statistically significant differences between the two post-measurements of the two research groups to teach the theoretical aspect related to volleyball rules and in favor of the multimedia-based program group.

Purpose of the Study. The current research aims at identifying the effect of using multimedia on teaching the theoretical aspect related to volleyball rules in the faculties of physical education and sports sciences.

Materials and Methods

Participants

The research community consists of 87 students from the Faculty of Physical Education and Sports Sciences, University of Benghazi, and the Faculty of Physical Education and Sports Sciences, University of Tobruk who have been enrolled in the second academic year in both universities (Table 1).

Research Sample

The selected the sample by stratified random sampling, and it consisted of 10 students from each faculty. The first group, from the Faculty of Physical Education and Sports Sciences, University of Benghazi, used multimedia for learning volleyball rules' theoretical aspects. The second group, from the Faculty of Physical Education and Sports Sciences, University of Tobruk, relied on traditional tools for the same purpose. These students were enrolled in the records of both faculties during the academic year 2021/2022, constituting approximately 23% of the total student population (Table 2).

The researchers also calculated the homogeneity of the sample in some of the basic variables that could affect the experiment, namely the age variable and the academic achievement variable. The results were as shown in Table 3.

Table 1. Distribution of the community members.

University	Community	No.	Percentage	Total No. (Percentage)
Faculty of Physical Education and Sports Sciences, University of Benghazi	Teaching division	17	34%	50 students (57.47%)
	Training division	22	44%	
	Rehabilitation division	11	22%	
Faculty of Physical Education and Sports Sciences, University of Tobruk	Teaching division	12	32.43%	37 students (42.53%)
	Training division	15	40.54%	
	Rehabilitation division	10	27.03%	

Table 2. Shows the distribution of sample individuals and their percentage out of the original community.

University	Community	No.	Percentage	Total No. (Percentage)
Faculty of Physical Education and Sports Sciences, University of Benghazi	Teaching division	3	30%	10 students of the first group (50%)
	Training division	4	40%	
	Rehabilitation division	3	30%	
Faculty of Physical Education and Sports Sciences, University of Tobruk	Teaching division	3	30%	10 students of the second group (50%)
	Training division	4	40%	
	Rehabilitation division	3	30%	

Table 3. Shows the homogeneity of sample in the age and academic achievement variables (n = 22).

Variables	Arithmetic mean	Standard deviation	Mediator	Torsion coefficient
Age	17.24	0.51	17.25	−0.06
Academic achievement	297.02	12.53	299.00	0.47

Research Design

The test was applied during the final exams period in the two faculties, which extends from April 06, 2022 to October 06, 2022 for each group in the aforementioned faculties, and the researchers took into account that the teaching takes place as follows:

- The first group: the Faculty of Physical Education and Sports Sciences, University of Tobruk. Throughout the academic year, the volleyball course taught the theoretical aspect related to the rules in the traditional method.

- The second group: the Faculty of Physical Education and Sports Sciences, University of Benghazi. It was taught throughout the academic year of the volleyball course, the theoretical aspect related to the rules, using multimedia.

The two groups were taught under the same conditions and with the same content, with the difference in the method of teaching, which was as described beforehand, and the same test was conducted for the two groups.

Data Collection Tool. The researchers used a test they designed themselves (Table 4). This test is divided into two parts: the first part includes 12 multiple-choice questions, and the second part contains 13 true or false questions. The scoring is based on 50 points, with each question worth two points.

Statistical Analysis

Statistical Package for Social Sciences (SPSS) software, version 21, was relied upon for various calculations and statistical operations, including calculating the arithmetic mean, standard deviation, coefficient of torsion, performing a t-test for two independent groups, and determining Cronbach's alpha coefficient.

To assess the stability of the test measuring the theoretical aspect related to volleyball rules, the researchers used Cronbach's alpha method. The stability coefficient results are shown in Table 5.

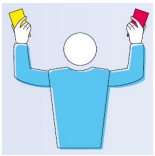
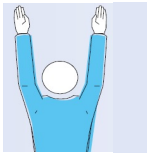
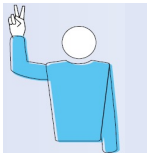
The results indicate a high Cronbach's alpha coefficient value for the data collection tool, nearing 1. This high value demonstrates the test's stability.

To assess the test's honesty regarding the theoretical aspect related to volleyball rules, the peripheral comparison method (discriminatory validity) was used. The results are presented in Table 6.

The results indicate a significance value of less than 0.05, suggesting differences between the two groups in the peripheral comparison. This implies the test's ability to distinguish between the lowest and highest scores, confirming the honesty of the data collection tool. It effectively measures the phenomenon under study.

Table 4. Testing theoretical aspect related to volleyball rules

First: Choose the correct answer from the three options available			
Answer	**1**	**2**	**3**
1. The area of a volleyball court is	18 × 9 m	18 × 8 m	18 × 8 m
2. The height of the air wand is	170 cm	180 cm	190 cm
3. The height of the net is for men	243 cm	244 cm	245 cm
4. The height of the net is for women	223 cm	224 cm	225 cm
5. Each team has the right to designate a .... free player	1	2	3
6. The first impolite behavior in a match is punishable by rules	1 point	2 points	3 points
7. The thickness of all the lines on the volleyball court is	3 cm	5 cm	7 cm
8. The serving area is .... in wide	6 m	9 m	12 m
9. The weight of a volleyball is	160 g	260 g	360 g
10. The team that crosses the 25-point barrier wins	1 point	2 points	3 points
11. The team that beats its opponent .... wins the match	1 round	2 rounds	3 round
12. The ball is in play from the time the serve was authorized by the .... referee	first	second	third

Second: Put a mark (p) in front of the correct statements and (û) in front of the incorrect statements	
Answer	**Statements**
1. Only the first referee may blow the whistle during the match	( )
2. The line monitor performs his duties by using a flag of 40×40 dimensions	( )
3. Free player substitutions are not counted as official substitutions	( )
4. The free player is allowed to replace any player in the front row positions	( )
5. The free player has the right to complete the offensive hit	( )
6. There is only one free player on the field	( )
7. If any outside interference occurs during the game, the game shall be stopped	( )
8. Communication between team members is allowed during the match	( )
9. Sign of exclusion 	( )
10. Sign of expulsion 	( )
11. Net-touch error sign 	( )
12. The sign of the ball out of the field 	( )
13. Two-touch Sign 	( )

Results

The first hypothesis states that there are statistically significant differences between the pre- and post-measurement of the traditional program group in teaching the theoretical aspect related to volleyball rules, favoring the post-measurement.

From Table 7, it becomes evident that there are statistically significant differences between the pre-measurement and post-measurement for the first group in the theoretical aspect of the volleyball course related to the rules, favoring the post-measurement. This becomes evident when examining the significance value, which was found to be smaller than 0.05. This result indicates the presence of significant differences between the pre-measurement and post-measurement of the traditional program group when teaching the theoretical aspect related to volleyball rules. These differences are in favor of the post-measurement.

The second hypothesis posits that there are statistically significant differences between the two pre- and post-measurements of the multimedia-based program group when teaching the theoretical aspect related to volleyball rules, favoring the post-measurement.

Upon examining Table 8, it becomes evident that significant differences do exist between both the pre-measurement and post-measurement of the second group concerning the theoretical aspect of the volleyball course related to the rules. These differences are in favor of the post-measurement, as indicated by the significance value, which was found to be smaller than 0.05.

The third hypothesis postulates that there are statistically significant differences between the two post-measurements of the two research groups when teaching the theoretical aspect related to volleyball rules. These differences favor the multimedia-based program group.

Upon examining Table 9, it becomes evident that significant differences do exist between the two post-measurements of both groups concerning the theoretical aspect within the volleyball course related to the rules. These differences are in favor of the post-measurement, as indicated by the significance value, which was found to be smaller than 0.05. This provides evidence for the presence of statistically significant differences between the two post-measurements of the two research groups in teaching the theoretical aspect related to volleyball rules, favoring the multimedia-based program group.

Table 5. Shows the stability coefficient of the test (n = 10).

Test	Cronbach's alpha stability coefficient
Theoretical aspect related to volleyball rules	0.91

Table 6. Shows the honesty coefficient of the test (n = 10).

Variable	Degree of freedom	T-test value	Significance value
Testing the theoretical aspect related to volleyball rules	8	−3.2135	0.0123

Table 7. The significance of the statistical differences between the pre- and post-measurement for the first group (n = 10).

Pre-measurement		Post-measurement		T-test value	Significance value
M	±S	M	±S		
15.000	1.773	33.000	0.756	−6.236*	0.031

Table 8. The Significance of the statistical differences between the pre- and post-measurement for the second group (n = 10).

Pre-measurement		Post-measurement		T-test value	Significance value
M	±S	M	±S		
15.250	1.488	44.250	1.035	−17.282*	0.000

Table 9. The Significance of the statistical differences between the two post-measurements for the two groups (n = 20).

Post-measurement of the first group		Post-measurement of the second group		T-test value	Significance value
M	±S	M	±S		
33.000	0.756	44.250	1.035	−17.282*	0.000

Discussion

Table 7 provides clear evidence of statistically significant differences between the pre-measurement and post-measurement scores for the first group in the theoretical aspect of the volleyball course related to the rules. These differences favor the post-measurement, as indicated by the significance value being smaller than 0.05. This finding underscores the existence of substantial distinctions between the pre- and post-measurement scores within the traditional program group, favoring the post-measurement.

The researchers attribute this outcome to the traditional teaching method's reliance on explanation alone. While this approach has a positive impact on education, it is not necessarily the most effective method. There are numerous teaching approaches and methods that may yield better and more valuable results for the educational process. One such approach involves educational multimedia-based programs used in the first group.

Thus, the first hypothesis, which posited that there are statistically significant differences between the pre- and post-measurement scores for the first group in the theoretical aspect of the volleyball course related to the rules, favoring the post-measurement, has been substantiated.

Table 8 reinforces the presence of statistically significant differences between the pre-measurement and post-measurement scores of the second group in the theoretical aspect of the volleyball course related to the rules. These differences favor the post-measurement, as indicated by the significance value being smaller than 0.05. This underscores the substantial distinctions between the pre- and post-measurement scores within the multimedia-based program group, with the post-measurement in the lead.

The researchers attribute this outcome to the pivotal role played by multimedia, as it represents one of the most crucial teaching methods in our contemporary era. Multimedia offers learners the opportunity to construct a comprehensive understanding of the information they receive. Additionally, the feedback component of multimedia facilitates rapid information recall.

Thus, the second hypothesis, positing that there are statistically significant differences between the pre- and post-measurements of the multimedia-based program group in teaching the theoretical aspect related to volleyball rules, favoring the post-measurement, has been confirmed.

Table 9 underscores the existence of statistically significant differences between the two post-measurements of the two research groups in the theoretical aspect of the volleyball course related to the rules. These differences favor the post-measurement, with a significance value smaller than 0.05 indicating the substantial distinctions between the two post-measurements.

These results conclusively establish the critical role of multimedia in enhancing the educational process. Multimedia's interactive nature creates an environment that fosters both engagement and precision in description and explanation. Consequently, learners have the opportunity to acquire knowledge in an enjoyable and highly informative setting.

These findings align with the research conducted by Taban and İmamoğlu [21], which demonstrated the positive impact of interactive video-based education on volleyball knowledge. They also correspond with the study by Zhang [18], indicating that multimedia computer-aided networks enhance student engagement and improve the effectiveness of volleyball teaching. Furthermore, they are consistent with Jazar's research [15], revealing that computer-based educational programs positively influence cognitive achievement and fundamental volleyball skills. Lastly, these results harmonize with the findings of Rais et al. [20], highlighting the superior effectiveness of multimedia-based educational programs in enhancing both theoretical and practical aspects of volleyball learning.

Conclusions

The study's results confirm the effectiveness of multimedia-based educational programs in teaching the theoretical aspect of volleyball rules, as they consistently outperformed traditional teaching methods. The statistically significant differences observed in favor of the post-measurements for both groups utilizing multimedia and traditional methods underscore the valuable role of multimedia in enhancing the educational process. These findings align with prior research, further emphasizing the importance of integrating multimedia into physical education.

For future research, it would be beneficial to explore the long-term effects of multimedia-based teaching methods on the retention and application of volleyball rule knowledge. Additionally, investigating the adaptability of multimedia programs for different age groups and skill levels could provide valuable insights into personalized learning approaches within physical education.

Conflict of interest

The authors declare that there is no conflict of interests.

References

1. Al-Tobji HH. Intensifying the preparation of learning centers. In: *The symposium of the leaders of educational technologies in the Arab countries*; 1981. P. 5. (In Arabic).
2. Al-Zahrani AME. The effect of using a multimedia educational bag on the cognitive and skillful achievement of volleyball law. *Journal of Faculty of Education, Assiut University,* 2015;31(3):346-358. (In Arabic). https://doi.org/10.21608/mfes.2015.107421
3. Othman IH. *Computer arbitration in boxing*. Cairo: Dar Al Saada for Printing; 1996. (In Arabic).
4. Ezz El-Din AA. Comparison of the effectiveness of two methods of teaching on the cognitive, physical and skill levels in the lesson of physical education in the preparatory stage. *Journal of Sports Sciences, Minia University*. 1996;8(11):14-20.
5. Kioumourtzoglou J, Zetou E, Giannousi M, Antoniou P, Michalopoulou M. Multimedia as an incentive for internal motivation and use of computers in sports. *European Journal of Physical Education and Sport Science*. 2022;7(6):58-69. https://doi.org/10.46827/ejpe.v7i6.4133
6. Yin J, Song Q. On the Design of Assistant Teaching Using Network Multimedia Database in Volleyball Teaching. Cui T (ed.) *Security and Communication Networks*, 2022;2022: 1–10. https://doi.org/10.1155/2022/8684007
7. Ezz El-Din AA. *Modern trends in methods of teaching physical education*. Mansoura: Dar Al Asdeqaa; 2000. (In Arabic).
8. Gunawan G, Firmansyah D, Widiastuti W. Effect of interactive multimedia learning to learn skills of students sports volleyball. *Journal of Education, Health and Sport,* 2019;9(9):263-70. https://doi.org/10.5281/zenodo.3402038
9. Hartati H, Destriana D, Aryanti S, Destriani D. Macro flash-based multimedia for improvement of the learning result of volleyball game. *Advances in Social Science, Education and Humanities Research,* 2018;262:233-36. https://doi.org/10.2991/ictte-18.2018.41
10. Al-Tobji HH. *Communication and technology in education*. 9th ed. Kuwait: Dar Al-Qalam; 1986. (In Arabic).
11. Salem MM. *Education techniques and means*. Cairo: Dar Al-Fikr Al-Arabi; 2002. (In Arabic).
12. Sharaf AG. *Education technology in physical education*. Cairo: Al-Kitab Center for Publishing; 2000. (In Arabic).
13. Fleifel FM. *The effect of a proposed educational program using the multimedia approach on learning some basketball skills for female students of the Faculty of Physical Education in Minia* [MSc Thesis]. Faculty of Physical Education: Minia University; 2000. (In Arabic).
14. Salama AAA. *The effect of using a multimedia computer on learning some gymnastics skills* [MSc Thesis]. Faculty of Education for Boys, Cairo: Helwan University; 2001. (In Arabic).
15. Jazar MMA. *The effect of an educational program using computers on the level of cognitive achievement and the performance of some basic skills in volleyball* [MSc Thesis]. Faculty of Physical Education for Boys: Mansoura University; 2004. (In Arabic).
16. Ghabn MI. *The effect of a proposed educational program using multi mediators on the cognitive education level of the new boxing referees* [MSc Thesis]. Faculty of Physical Education: Mansoura University; 2006. (In Arabic).
17. Vernadakis N, Antoniou P, Zetou E, Giannousi M, Kioumourtzoglou E. Compasrion of multimedia computer-assisted instruction, traditional instruction and combined instruction on knowledge aqusition and retention of setting skill in volleyball. In: Morris BA, Ferguson GM, editors. *Computer-Assisted Teaching: New Developments*. Nova Science Publishers, Inc.; 2010. P. 100-110.
18. Zhang J. Study on the Integration of Computer-Assisted Teaching Methods for Teaching Volleyball in College Physical Education. Leung MF (ed.) *Mathematical Problems in Engineering*, 2022;2022: 1–8. https://doi.org/10.1155/2022/5028705
19. Ketaren AMP, Sunarno A, Manalu N. Development of interactive learning multimedia to improve the result of underhand passing and underserving skill in volleyball games of IV grade in SD Negeri 106790 Sei Mencirim. Kinestetik: *Jurnal Ilmiah Pendidikan Jasmani*. 2023;7(2):472-83. https://doi.org/10.33369/jk.v7i2.27958
20. Rais AN, Nasuka N, Wahyudi A. Development of interactive learning media for volleyball games based on the adobe flash professional application through student learning outcomes. *JUARA: Jurnal Olahraga*. 2023;8(1):216-27. https://doi.org/10.33222/juara.v8i1.2659
21. Taban Z, İmamoğlu M. The Effect of interactive videos on volleyball education. *Journal of Learning and Teaching in Digital Age*. 2023;8(2):267-75. https://doi.org/10.53850/joltida.1211628
22. Kasih I, Sembiring DRF. Development of technical learning media multimedia based volleyball in SMP Negeri 3 Satu Atap Gebang. *Jurnal Physical Education, Health and Recreation*. 2023;6(2):104-14. https://doi.org/10.24114/pjkr.v6i2.43812

Information about the authors:

Mohamed Tayoush; (Corresponding author); https://orcid.org/0009-0009-5000-525X; mohamed.tayosh@gmail.com; High Institute of Sport and Physical Education of Sfax, University of Sfax (Sfax, Tunisia); Faculty of Physical Education and Sports Sciences, University of Benghazi (Benghazi, Libya).

Ahmad Hamad; https://orcid.org/0009-0003-6225-6220; abo24198014@gmail.com; Faculty of Physical Education and Sports Sciences, University of Benghazi; Benghazi, Libya.

Hamdi Chtourou; https://orcid.org/0000-0002-5482-9151; hamdi.chtourou@gmail.com; High Institute of Sport and Physical Education of Sfax, University of Sfax (Sfax, Tunisia); Physical Activity, Sport, and Health, UR18JS01, National Observatory of Sport (Tunisia).

Cite this article as:
Tayoush M, Hamad A, Chtourou H. Multimedia-enhanced learning of volleyball rules in physical education and sports faculties. *Physical Education of Students,* 2023;27(5):253–260.
https://doi.org/10.15561/20755279.2023.0505

Received: 09.08.2023

Accepted: 18.09.2023; **Published**: 30.10.2023