



The Effect of Educational Exercises Based on the Gamification Strategy on Developing Selected Physical Fitness Components Among Male Students

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Abstract

Examining the efficacy of gamification-based instructional exercises in enhancing certain motor skills specifically , agility, dynamic balance , coordination and transitional speed among College of Physical Education and Sports Sciences students was the primary objective of this research . The purpose of the study was to give evidence that students' interest , participation and engagement in physical learning can be enhanced by introducing game based aspects into educational activities . These factors include challenge , competition , motivation and reinforcement . There was a statistically equivalent control group and an experimental group that underwent post-testing as part of the research design. During the 2025–2026 school year researchers from the University of Baghdad's College of Physical Education and Sports Sciences surveyed 34 male third year students from Section (C) . Each of the two groups consisted of 17 students chosen at random . Using gamification as a framework one set of students engaged in educational activities while the other group received more traditional instruction . Before and after the instructional program was implemented the motor abilities that were investigated transitional speed , agility , dynamic balance and coordination were tested . There was a statistically significant improvement in the experimental group's performance between the pretest and posttests . When comparing the two groups after the test the experimental group performed better on all of the measured variables . According to the results gamification can be a great substitute for traditional physical education methods of instruction and can have a favourable effect on the development of motor skills .

Keywords: educational exercises, gamification strategy, physical fitness components, male students.

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Introduction

In order to fully prepare children physical education and sports sciences are crucial since they develop students' motor skills , cognitive abilities and overall physical and mental health . In this light a primary goal of degree programs in physical education and sports science is the development of fitness components ; these components help improve motor efficiency skill performance , health in general and an individual's capacity to meet the physical demands of various sports (Casey & Goodyear, 2024). Teaching methods and instructors abilities to motivate students encourage active participation and foster meaningful engagement throughout the learning process have a much larger impact on the success of the educational process than does the quality of the instructional content alone (Camacho-Sánchez et al., 2023) .

With the rapid development of modern educational trends gamification has emerged as one of the contemporary educational methods that rely on employing game elements and components in educational environments with the aim of enhancing motivation, improving interaction and increasing learner participation in the learning process. These elements include points, rewards badges, levels, challenges and leaderboards, which contribute to creating a more engaging and exciting educational environment (Arufe-Giráldez et al., 2022). Many studies have indicated that play leads to improved learning outcomes increased motivation and commitment, and enhanced interaction within various educational settings (Oliveira et al., 2021; Nurhayati et al., 2025) .

The play strategy is gaining increasing importance in physical education and sports as it contributes to transforming traditional activities and exercises into educational situations based on challenge positive competition and enjoyment which increases student participation and enhances their engagement in physical activities. It also helps create a stimulating educational environment that encourages learners to exert more effort during physical performance which positively reflects on the development of various physical attributes and sports skills (Ferraz et al., 2022). Recent scientific reviews have shown that incorporating play into physical education classes contributes to improving students' actual participation increasing physical activity raising fitness levels and enhancing motor learning more effectively compared to traditional methods (Camacho-Sánchez et al., 2023; Arufe-Giráldez et al., 2022) .

Recent study results have shown that play-based educational programs contribute to enhancing learners' intrinsic motivation and improving their attitudes toward physical activity leading to increased engagement in exercises and achieving positive physical adaptations that contribute to the development of various fitness elements (Mazeas et al., 2022; Montiel-Ruiz & Calderón, 2025). Studies have also shown that the use of challenge elements competition immediate feedback and educational rewards increases the level of interaction and commitment, leading to improved physical performance among students in various sports activities (Merino-Campos et al., 2025; Sal-de-Rellán et al., 2025).

Through the researcher's experience in university teaching and their field observations of students in the College of Physical Education and Sports Sciences a decrease in motivation among some students toward practicing educational exercises when using traditional methods was noted



as well as limited interaction and participation during the lesson which may negatively affect the development of the targeted physical qualities. This is attributed to the lack of elements of excitement challenge and continuous motivation in some educational situations which the learner needs to maintain a high level of engagement in physical activities. Hence the need arose to prepare educational exercises based on the gamification strategy and to identify their impact on developing certain physical attributes among students of the Faculty Physical Education and Sports Sciences contributing to the development of the educational process and achieving its goals more effectively

The study seeks to create instructional activities utilising gamification techniques and to assess their effect on enhancing specific physical characteristics in students of the Faculty of Physical Education and Sports Sciences . The investigators propose that educational activities utilising gamification techniques positively influence the enhancement of specific physical characteristics in the study's participants .

The study domains encompassed the human aspect represented by third-year students from Section (C) at College of Physical Education and Sports Sciences , University of Baghdad for the academic year 2025-2026 . The chronological domain spanned from February 15, 2026 , to April 10, 2026 , while the spatial domain was illustrated within the classroom and the field and track stadium at the College of Physical Education and Sports Sciences , University of Baghdad.

Methodology

Research Methodology

Due to the nature of the study problem and its objectives the researcher decided for an experimental approach employing a two group design with pre and posttests . This design is equivalent to a control group with two groups . In order to study causal relationships and reveal the effect of the independent variable on the dependent variables this method is highly regarded in the scientific community . It achieves an adequate level of control over the experimental conditions and controls the influencing factors .

Community and Research sample

During the 2025–2026 academic year the study population consisted of 34 third year students from Section (C) at College of Physical Education and Sports Sciences , University of Baghdad. The participants divided equally into 2 groups with 17 students assigned to the experimental group which received educational exercises designed according to the gamification strategy and 17 students assigned to the control group which followed the instructional method traditionally adopted by the course instructor . The participants were deliberately selected based on their suitability for the research requirements and alignment with its objectives . Accordingly , the entire research population was included in the study sample with no students excluded from the original population .

To verify the homogeneity of the research sample with respect to basic variables that could potentially influence the study outcomes the researcher determined the mean , median , standard

deviation and skewness for height , body weight and age. The results of these measurements are presented in Table (1) .

Table 1. Homogeneity of the Sample

Variables	Unit	Mean	Median	Standard Deviation	Skewness
Height	cm	168.121	168.000	1.487	0.152
Weight	kg	66.201	66.000	1.393	0.143
Age	years	21.231	21.000	1.576	0.276

Before beginning experiment , the researcher utilised an independent samples t-test on the pre-test findings of the two groups to ensure that experimental and control groups were equivalent in the physical variables being studied . Table 2 results demonstrated that the significance levels of the error levels Statistical analysis did not reveal any significant differences between the two groups on any of the physical characteristics (i.e., transitional speed , agility , dynamic balance and coordination) as their values were higher than the accepted significance threshold (0.05). This proves that the control and experimental groups are physically identical which gives a solid scientific foundation for conducting the experiments and makes it more likely that any post-test results will be attributable to the experimental variable and not to inherent differences between the two groups .

Table 2. Comparison of the Experimental and Control Groups with Respect to the Physical Variables

Variables	Unit	Experimental Group		Control Group		t-value	Sig.
		M	SD	M	SD		
Translational Speed	sec	4.509	0.124	4.531	0.138	0.478	0.636
Agility	sec	27.015	0.943	27.184	0.887	0.522	0.605
Dynamic Balance	sec	9.012	0.487	9.146	0.531	0.744	0.462
Coordination	sec	11.123	1.098	11.287	1.067	0.431	0.669

Collection methods and tools

- Arab and foreign sources and references
- International information network
- Observation
- Tests and measurement

The devices used in the research

Field and track stadium , medical scale , measuring tape , portable DeLL electronic calculator , stopwatch, handheld calculator , whistle , 10 markers , 10 posts with flags .

The Tests used in the research

1- The transitional speed is 30 meters (Mohamed, A. F. , & Al-Shamaa, H. F, 2021)

- **The purpose of test:** Measuring transitional speed .
- **Tools used:** Track or flat area, measuring tape , stopwatch , whistle , markers to indicate a distance of 30 meters .



- **Performance description:** The tester stands behind the starting line in the high start position and upon hearing the start signal (the whistle) they sprint at maximum speed to cover a distance of 30 meters to the finish line .
- **Recording method:** The time taken to cover a distance of 30 meters is measured from the moment the start signal is given until crossing the finish line and the time is recorded in seconds to the nearest hundredth of a second . The tester is given two attempts and the best attempt is counted .

2- Agility Test: Zigzag Run Test (Barrow, 2016)

- **The purpose of test:** measure agility and ability to change direction quickly and accurately while in motion .
- **Tools used:** Flat ground , stopwatch , five markers or cones , measuring tape , whistle .
- **Performance description:** The markers are arranged according to the specific shape of the Barrow test and the tester stands behind the starting line . Upon hearing the start signal he sprints at maximum speed, zigzagging between the markers along the predetermined path until crossing the finish line .
- **Recording method:** The time taken from the start signal until crossing the finish line is measured and recorded in seconds to the nearest hundredth of a second . The tester is given two attempts, and the best attempt is counted .

3- Balance: Running on the balance beam (Aljorani, 2023)

- **The purpose of test:** To measure the student's dynamic balance during motor performance
- **Tools used:** Wooden balance beam , stopwatch , whistle , measuring tape .
- **Performance description:** The tester stands at the beginning of the balance beam and upon hearing the start signal begins to run or walk quickly along the beam to its end while maintaining balance and avoiding falling or touching the ground . In case of losing balance the tester is returned to the point of losing balance to complete the performance .
- **Recording method:** The time taken from the start signal until the tester reaches the end of the beam is measured and recorded in seconds . The tester is given two attempts and the best attempt is counted .

4- Coordination: Numbered Circles Test (Younis, 2016)

- **Purpose of test:** To measure the motor coordination between the eyes and legs and the speed of motor response .
- **Tools used:** Eight numbered circles (1–8) drawn on the ground , chalk or adhesive tape to mark the circles , a stopwatch , a whistle .
- **Performance description:** The numbered circles are arranged on the ground according to the approved test layout . The tester stands inside circle number (1) and upon hearing the start signal they move by jumping or touching with their feet to the circles in the order of their numbers from (1) to (8) as quickly as possible while maintaining the correct order of the numbers .
- **Recording method:** The time taken from the start signal until reaching the last circle is measured and recorded in seconds to the nearest hundredth of a second . The tester is given two attempts, and the best attempt is counted .



The pilot study

The researcher conducted the pilot experiment on 15/2/2026 on (6 students) outside the research sample and the aim of the experiment was as follows .

1. Verifying the accuracy of the instruments employed
2. Guaranteeing the team's comprehension of executing tests and measures
3. Facilitating the administration of the assessments and their appropriateness for the samples proficiency level
4. Recognising possible hindrances and averting mistakes and disruptions in the task
5. Estimating the duration necessary for executing the assessments

Procedures

Pre tests

The researcher conducted the pre-tests for the research sample on (18/2/2026) at the track and field stadium in the College of Physical Education and Sports Sciences – University of Baghdad after preparing all the necessary supplies and tools for the tests and providing the appropriate conditions for their execution . The tests were conducted for all members of the research sample from both the experimental and control groups according to a unified sequence and fixed procedures to ensure the accuracy of the results and reduce the impact of external factors

Before starting the tests the mechanism for performing each test was explained and the sample members were informed of the execution requirements. Then a general and specific warm-up was conducted in accordance with the nature of the physical tests. The researcher also ensured the standardization of testing conditions in terms of the execution location the tools used and the rest periods between tests, in addition to enlisting the help of an assistant team to record the results and monitor the procedures accurately.

The pre-tests included measuring the research variables represented by transitional speed, agility, dynamic balance and coordination . The results for each student were recorded in preparation for using them as a basis for comparison with the post-test results after the implementation of educational exercises based on the gamification strategy .

Main experiment

Once the pretests were finished and the researchers confirmed that the two groups were similar they started using gamification based educational exercises with experimental group while control group continued to learn using the instructor's method .

The main experiment was initiated on (22/2/2026) and continued until (7/4/2026) taking (6) weeks to implement the educational program at a rate of two educational units per week resulting in a total of (12) educational units executed. Sixty minutes were allocated from the main section for each educational unit . The control of the physiological variables of the exercise was taken into consideration with rest periods between repetitions being (45 - 60 seconds) and between sets (2 - 3 minutes) to ensure semi-physiological recovery while considering the performance

intensity which ranged between (70% - 85%) of the student's maximum speed to ensure the achievement of the required physical adaptations .

The researcher relied on the principles of the play strategy in preparing the educational exercises by employing elements of excitement, challenge, positive competition, immediate feedback and a points and rewards system, in accordance with the nature of the students and the lesson objectives . The exercises were designed in a gradual manner from easy to difficult taking into account the individual differences among the sample members and their physical levels with the aim of developing the physical attributes in this study which are represented by transitional speed, agility, dynamic balance and coordination as shown in Table 3.

Game strategy elements were employed in the educational units according to organized procedural mechanisms where the student was awarded 10 points for each correct performance of the motor task within the specified time and these points were accumulated throughout the program . Symbolic badges such as the "Speed Badge" and "Agility Badge" (in the form of stickers or group applause) were also awarded to the student who achieves the best time within their group in each educational unit . The performance levels were divided into three levels: beginner, advanced and expert . A student moves to the advanced level after accumulating 50 points and to the expert level after accumulating 100 points with a gradual increase in the difficulty of the exercises corresponding to the level of progress such as reducing distances or increasing the number of markers . To enhance the spirit of competition a paper leaderboard was used updated at the end of each educational unit to display the names of the students with the highest total points . The student or team with the highest score at the end of the educational unit is considered the winner and is rewarded by leading the warm-up process at the beginning of the next unit or by choosing the type of cool-down exercises at the end of it .

Table 3. *Components of the Educational Curriculum Based on the Play Strategy*

Week	Educational Unit	Targeted Physical Fitness Component	Content of Educational Exercises Based on the Play Strategy
1	First	Translational Speed	Competitive short-distance sprinting games involving individual and team point scoring
	Second	Translational Speed	Short challenge races using a reward and badge system
2	Third	Agility	Zigzag running between cones using a progressive challenge format
	Fourth	Agility	Competitive movement stations based on rapid changes of direction
3	Fifth	Dynamic Balance	Walking and running on a balance beam at progressively increasing levels
	Sixth	Dynamic Balance	Individual and team balance competitions with immediate performance reinforcement
4	Seventh	Coordination	Performing numbered circuit exercises according to a point-scoring system
	Eighth	Coordination	Movement games requiring eye–leg coordination
5	Ninth	Speed and Agility	Races and competitions combining speed and changes of direction
	Tenth	Balance and Coordination	Combined movement stations based on balance and coordination



6	Eleventh	All Physical Fitness Components	Comprehensive competitive games incorporating the elements of the educational program
	Twelfth	All Physical Fitness Components	Final competitions and challenges based on the play strategy

The elements of the game strategy represented by points, badges, levels, challenges, leaderboards and instant feedback have been employed in all educational units in accordance with the objectives of each unit .

To maintain consistency throughout the implementation of the educational units the researcher controlled the main experimental conditions including the place of application duration of each educational unit equipment and tools employed , and procedures used to perform the exercises . This standardization was intended to minimize the potential influence of external variables on the experimental outcomes . In addition , participants attendance and active involvement were regularly monitored throughout the intervention period . Continuous encouragement and timely feedback were also provided in accordance with the principles and requirements of the play-based strategy adopted in the study .

These exercises contributed to creating an interactive educational environment characterized by enjoyment, excitement and competition which enhanced students' motivation to participate positively in educational and physical activities and helped increase engagement in performing the exercises and achieving the desired educational goals.

Table 4. Model Educational Unit for the First Week Based on the Play Strategy

Educational Unit Sections	Time (min)	Unit Content
Preparatory Section	20	General warm-up (light jogging, stretching exercises, and warm-up exercises for the joints and working muscles).
Instructional Section	10	Explaining the objectives of the unit, challenge rules, and the mechanism for calculating points and rewards.
Practical Section	50	1. 30-m sprint from a standing start (4 sets × 3 repetitions, 45-sec rest). 2. Relay race between groups (3 sets × 4 repetitions). 3. Running to reach a designated cone according to different signals (3 sets × 5 repetitions). 4. Point-collection game involving sprinting between stations (4 rounds).
Closing Section	10	Cool-down and relaxation exercises, followed by announcing the points and the winning group.

Mechanism for Implementing the Play Strategy

- Awarding 10 points to the winner of each challenge
- Awarding a Performance Excellence Badge for the best performance
- Displaying the Leaderboard at the end of the educational unit
- Providing immediate feedback after each activity

Table 5. Model Educational Unit for the Sixth Week Based on the Play Strategy

Educational Unit Sections	Time (min)	Unit Content
Preparatory Section	20	General and specific warm-up exercises for all body parts, along with short activation games.
Instructional Section	10	Explaining the stages of the final competition and the mechanism for calculating the final points for the groups.



Practical Section	50	1. 30-m sprint between groups (3 repetitions).2. Barrow zigzag run (3 repetitions).3. Running on a balance beam (3 repetitions).4. Numbered circuit test (3 repetitions).5. A combined station race incorporating all physical fitness components (4 rounds).
Closing Section	10	Cool-down and relaxation exercises, followed by announcing the final results and distributing badges and symbolic rewards.

Mechanism for Implementing the Play Strategy

- Using a level-based system (Beginner – Advanced – Outstanding)
- Awarding additional points for commitment and cooperation
- Using team-based competition between groups
- Announcing the winning team at the end of the program
- Providing immediate reinforcement and continuous encouragement to participants

The control group underwent learning according to the traditional method (the conventional approach) based on (command and practice) without employing any elements of the play strategy . To ensure the scientific comparison's integrity this group was matched with the experimental group in the number of educational units (12 units) the duration of the practical session (60 minutes) the type of exercises targeting the four physical attributes (30m sprint , zigzag run, balance beam , numbered circles) the number of repetitions (3-5 repetitions) the rest periods between repetitions and sets (45-60 seconds and 2-3 minutes respectively) and the performance intensity (70%-85%) with the only difference being the presentation method which relied on verbal explanation and model performance by the researcher and traditional feedback without the presence of a points or badges system or competitive challenges .

Post-tests

The researcher conducted the post-tests for the research sample members on (10/4/2026) at the track and field stadium in the College of Physical Education and Sports Sciences , University of Baghdad after completing the implementation of the educational program based on the gamification strategy for the experimental group during the specified trial period.

The researcher was keen to provide the same conditions in which the pre-tests were conducted in terms of the test location the tools used the sequence of test execution and the rest periods between the tests with the aim of achieving the highest degree of objectivity and accuracy in the results and ensuring the comparability of the pre-test and post-test results . The same assisting team that participated in conducting the pre-tests was also utilized to standardize the measurement and recording procedures .

Before starting the tests a general and specific warm-up was conducted for the sample members in accordance with the nature of the physical tests. Then the tests specific to the research variables , which include transitional speed , agility , dynamic balance and coordination , were carried out according to the same conditions and instructions followed in the pre-tests. After completing the tests the data was collected and the results were recorded in preparation for statistical analysis and comparison of the results of the experimental and control groups to identify

the impact of the educational program on the development of the physical attributes under investigation .

Statistical Analysis

The study used the Statistical Package (SPSS) to process the research data and the following statistical methods were employed:-

- Mean
- Standard deviation
- The median
- Skewness
- Independent samples T-test
- Paired sample T-test

Results

Table 6. Results of the Differences Between the Pre and Post Tests for the Experimental Group

Variables	Unit	Pre Test		Post Test		Mean Difference ($\bar{d}$)	t-value	Sig.
		M	SD	M	SD			
Translational Speed	sec	4.509	0.124	4.209	0.176	0.300	7.842	0.001
Agility	sec	27.015	0.943	25.003	0.821	2.012	9.364	0.001
Dynamic Balance	sec	9.012	0.487	7.005	0.496	2.007	12.476	0.001
Coordination	sec	11.123	1.098	9.008	0.764	2.115	8.953	0.001

Table 7. Results of the Differences Between the Pre and Post Tests for the Control Group

Variables	Unit	Pre Test		Post Test		Mean Difference ($\bar{d}$)	t-value	Sig.
		M	SD	M	SD			
Translational Speed	sec	4.531	0.138	4.468	0.132	0.063	2.386	0.030
Agility	sec	27.184	0.887	26.812	0.841	0.372	2.741	0.015
Dynamic Balance	sec	9.146	0.531	8.914	0.503	0.232	2.497	0.024
Coordination	sec	11.287	1.067	11.018	1.021	0.269	2.311	0.035

Table 8. Results of the Differences Between the Experimental and Control Groups in the Post-Test

Variables	Unit	Experimental Group		Control Group		t-value	Sig.
		M	SD	M	SD		
Translational Speed	sec	4.209	0.176	4.468	0.132	4.935	0.001
Agility	sec	25.003	0.821	26.812	0.841	6.382	0.001
Dynamic Balance	sec	7.005	0.496	8.914	0.503	11.162	0.001
Coordination	sec	9.008	0.764	11.018	1.021	6.544	0.001

Discussion

The findings presented in Table (6) revealed statistically significant in the post test results between the two groups with experimental group demonstrating superior performance in transitional speed , agility , dynamic balance and coordination . The researcher considers this



improvement to be associated with the effectiveness of the educational exercises developed according to the gamification strategy which provided learners with motor information and practice opportunities in an engaging manner while reducing unnecessary effort and maximizing learning benefits . This interpretation is consistent with Robb (2009) who emphasized the importance of the dynamics involved in the acquisition and development of motor skills . Furthermore , the findings suggest that the teacher's role extends beyond conventional explanation , demonstration and lecturing. Rather , the teacher is increasingly required to design and implement contemporary instructional strategies including gamification in which teaching methods , learning activities and educational resources are integrated systematically to achieve the intended learning objectives (Schmidt, 2008) .

The success in improving physical performance lies in combining the practice of motor activity with the design of the educational environment ; the procedural mechanism of the Gamification strategy represented by the system of points, levels and challenges creates a competitive environment that drives the student to exert maximum physical effort to accomplish motor tasks and respond quickly and accurately to obtain rewards (Karen Clippinger, 2011) . The reason for the development of the studied physical attributes (transitional speed , agility , balance and coordination) is the preparation of purposeful exercises within an interactive environment based on progressive challenges which created high motor interaction during the lesson that helped in retaining and developing motor performance (Amara, Samiha, & Easa, F, 2024) .

Regarding the details of the variables, the significance of the differences in the transitional speed variable between the pre-test and post-test and its effective and rapid development is attributed to the students commitment to the educational units their regularity and the application of the prescribed exercises in a structured manner (Nagim, J., & Al-Sudani, A, 2020) . The educational units also contributed to the development of agility which was evident through the reduced performance time resulting from the effectiveness of exercises based on rapid direction changes (F.M. Al – Dulaimi, R., & Easa, F, 2024) . As for the variable of dynamic balance its improvement is attributed to the nature of the exercises that significantly contribute to the performance of most movements and motor tasks with precision and balance (Naeem, A., & Al-Fadhli, S, 2020) . While the improvement in the coordination variable indicates the enhancement of students' ability to perform multiple motor forms that merge into a single skill, highlighting the importance of motor exercises designed according to the direction and type of movement (Easa et al., 2022).

On the other hand and to ensure objectivity in interpreting the results it is noted from Table (8) that the control group (which learned using the traditional method) also achieved a significant improvement between the pre-test and post-test . This is attributed to the effect of repetition and the natural learning resulting from performing the exercises as well as the effect of getting accustomed to performing physical tests. The degree of improvement in the control group was less compared to the experimental group which confirms the additional and effective role played by the elements of the play strategy in enhancing physical adaptation efficiency compared to the traditional method .



Conclusions

1. Educational activities incorporating gamification techniques contributed to improving the development of transitional speed , agility , dynamic balance and coordination as essential motor competencies among students of the College of Physical Education and Sports Sciences
2. The experimental group demonstrated significant improvements across the study variables from the pretest to the posttest with effect sizes ranging from medium to large and showed greater gains than the control group
3. The control group also demonstrated measurable improvements in the investigated variables which may be attributed to repeated practice and natural learning resulting from the conventional command based instructional method ; the magnitude of improvement was lower than that observed in the experimental group
4. The experimental group achieved significantly better posttest results than the control group suggesting that incorporating game based procedural elements , such as points , badges , levels and leaderboards , into educational exercises can increase training effectiveness and support the development of motor skills more effectively than traditional instructional methods

Recommendations

1. Adopting educational exercises based on the gamification strategy and employing its procedural mechanisms (points , badges , levels) in physical education classes due to their positive impact on developing motor skills
2. Encouraging physical education and sports science teachers to move away from the traditional method (command and control) only and to employ challenges and organized competition within educational units to enhance physical performance
3. Incorporating gamification strategies into the curricula and educational programs implemented in physical education and sports science colleges to contribute to the development of the training process
4. Conduct future studies that rely on measuring psychological variables (such as motivation and engagement) with approved scales to determine their correlation with improvements in motor skills when using the gamification strategy
5. Conduct research to compare the gamification strategy with other modern educational strategies to determine which is more effective in improving learning outcomes in physical education



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