European Journal of Physical Education and Sport Science
ISSN: 2501 - 1235
ISSN-L: 2501 - 1235
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejpe.v13i6.6953 Volume 13 | Issue 6 | 2026

IMPROVING THE CONTENT OF EXAMINATIONS AND ASSESSMENTS FOR THE SPORT BIOMECHANICS COURSE FOR STUDENTS OF CLASS 16th AT HO CHI MINH CITY UNIVERSITY OF PHYSICAL EDUCATION AND SPORTS

Nguyen Thien Ly[i],
Vo Thi Ngoc Tho,
Luu Tri Dung,
Nguyen Minh Huan,
Le Thi Thu Hang
Lecturer,
Ho Chi Minh City University of Physical Education and Sports,
Vietnam

Abstract:
This scientific work demonstrates the positive and comprehensive effectiveness of improving the assessment content of the Physical Education and Sports Biomechanics course. The question and exercise system is built according to learning outcomes, ensuring scientific accuracy, timeliness, and practical applicability. The assessment content goes beyond simply memorizing knowledge and focuses on the ability to analyze, apply, and explain movement phenomena in sports. This helps students deeply understand the biomechanical nature of movement techniques and enhances their professional competence. Thus, improving the assessment content of the course not only improves the quality of teaching and learning but also aligns with the direction of higher education reform towards developing students' competencies.

Keywords: assessment, students, biomechanics, physical education and sports

1. Introduction

One of the urgent requirements for improving the quality of teaching is the innovation of teaching methods, including the innovation of comprehensive and accurate assessment of learning outcomes based on students' abilities. Innovating the content of assessment is considered a crucial step in the educational reform process. Objective, rigorous, correct, and well-directed assessment will be a strong motivator to encourage

[i] Correspondence: email lytn@upes.edu.vn

learning, promote exploration and creativity in students, and at the same time provide timely information for lecturers to improve their teaching methods.

Student assessment is one of the most important factors in university teaching. Assessment results will profoundly affect students' future careers. Therefore, assessment needs to be conducted professionally, focusing heavily on assessing knowledge through regular and midterm tests. Evaluation also provides the school with valuable information about teaching effectiveness and student support services. Currently, the school's training program is constantly being reviewed and adjusted to suit modern society. Therefore, the program's output standards are increasingly being improved, helping students have sufficient knowledge and skills to meet the needs of society. Thus, adjusting the content and methods of testing and evaluating the Physical Education and Sports Mechanics course also contributes to helping lecturers accurately and appropriately assess students' abilities upon completion of this course.

Currently, the testing and evaluation of the Physical Education and Sports Mechanics course is purely essay-based, lacking diversity and comprehensiveness. Therefore, the authors boldly researched the topic *" Improving the content of examinations and assessments for the Sport Biomechanics course for students of class 16th at Ho Chi Minh City University of Physical Education and Sports.*"

2. Literature Review

This method was used throughout the research process to synthesize and analyze relevant literature to build a theoretical basis, formulate scientific hypotheses, determine the purpose and tasks, and discuss the research results. During the research process, the selected and analyzed reference materials included school regulations, scientific documents, and scientific articles in the field of sports biomechanics.

3. Materials and Method

3.1. Research Subjects

3.1.1. Participants for Evaluating the Current Status

The study was conducted experimentally on a group of subjects: 148 university students from cohort 16.

3.1.2 Participants for Selecting the Criteria and Revising the Survey Instrument

A total of 9 experts were involved, including 2 PhDs (22%) and 7 Master's degree holders (78%).

All 148 university students from cohort 16 participated in contributing opinions, representing the learners.

3.2. Methodology

3.2.1. Interview Method

This method was used to consult with 9 lecturers, including 2 PhDs and 7 Master's degree holders. This structure demonstrates a reasonable distribution between experts specializing in in-depth research and those closely related to the field. The PhD-level experts primarily played a role in providing theoretical guidance and ensuring scientific rigor, while the Master's-level experts, who directly taught courses such as Sports Biomechanics, Anatomy, Physiology, and Movement Science, played a role in ensuring practical application and relevance to the sports profession. This method helps the study gather expert opinions, perspectives, and practical experiences related to the content of the assessment and evaluation of the biomechanics of physical education and sports course.

3.2.3. Statistical Analysis Method

This method is used to process and analyze the data collected during the research. All data is processed using statistical methods, with the support of SPSS software, to ensure the accuracy, objectivity, and reliability of the results.

4. Research Results and Discussion

4.1 Current Status of Assessment Content for the Biomechanics of Physical Education and Sports Course for University Students at Ho Chi Minh City University of Physical Education and Sports

Regular tests are organized mid-semester or after completing 50-60% of the course content to ensure accurate assessment of students' learning progress. In practice, teachers give students one test during the course to:

- Reduce the pressure of continuous testing for students.
- Allow teachers to easily manage and summarize results.

The end-of-course test is organized at the end of each course. To summarize the content of the questions used in the test, the research group recorded the following:

- **Question 1:** Describe the application of biomechanics to long jump athletes?
- **Question 2:** Describe the musculoskeletal lever?
- **Question 3:** Describe the different types of balance?
- **Question 4:** Describe the characteristics of the center of gravity?
- **Question 5:** What are the dynamic conditions of equilibrium? Muscle contraction power?
- **Question 6:** What are the biomechanical characteristics of the forearm and wrist joints?
- **Question 7:** A ball with a mass of 400g and a diameter of 40cm is at a height of 1.12m and rotates around an axis passing through its center at a speed of 42 revolutions/minute. Find the energy of the ball? g=10m/s2

- **Question 8:** A shot puts athlete releases the shot from a height of 1.68m with an initial velocity of 43.2km/h, and the angle of release with the vertical is 300. What is the range of the shot put? What is the maximum height the shot puts reaches?
- **Question 9:** A ball with a mass of 300g and a diameter of 30cm rotates around an axis 0.5m from the center of the ball at a speed of 30 revolutions/minute. Kinetic energy of the ball (π^2=10, g=10 m/s^2)
- **Question 10:** A figure skater with a mass of 50 kg is initially at rest, then moves in a straight line with a velocity of 6 m/s, covering a distance of 36 m. Find the acceleration? The acceleration force of the skater? Find the time the skater takes?
- **Question 11:** How to determine the error of direct and indirect measurements. Give an example.
- **Question 12:** Describe the characteristics of friction force and inertial force.
- **Question 13:** Describe the characteristics of the forces acting on the body of a running athlete.
- **Question 14:** Describe the characteristics of the forces acting on the body of a swimming athlete.
- **Question 15:** Describe Newton's three laws. State the relationship between force and reaction force.
- **Question 16:** State the characteristics of the body's center of gravity and the base of support.
- **Question 17:** Describe the motion of a ball thrown vertically upwards from a height h until it hits the ground.
- **Question 18:** Present the forms of mechanical energy when the ball is at a height h and is simultaneously moving translationally and rotating.
- **Question 19:** What are the dynamic conditions for equilibrium? How can we increase the stability of equilibrium?
- **Question 20:** Analyze the transformation of mechanical energy during the process of a soccer ball falling from a height h and then bouncing up.
- **Question 21:** Explain why, when performing a rotation, one must contract their body to rotate faster.
- **Question 22:** Why does an angle between the upper arm and forearm greater than 90° reduce the ability to contract the biceps brachii muscle?
- **Question 23:** We can directly measure two quantities x1 and x2. The quantity f is calculated indirectly in terms of x1 and x2. Calculate the error of the quantity f in the following cases:
  a. f = x1.x2 b. f = x1/x2
  c. f = x1 + x2 d. f = x1 – x2
- **Question 24:** An athlete reaches a speed of 8 m/s 1.5s after starting. Assume the motion is uniformly accelerated.
  a. Calculate the acceleration.
  b. Calculate the distance traveled.

- **Question 25***:* A volleyball is thrown vertically upwards from a height of 1 m above the ground with an initial velocity of 5 m/s.
  a. How long does it take for the ball to stop?
  b. Calculate the maximum height of the ball.
- **Question 26:** When the weight leaves the athlete's hand, its speed is 10 m/s, and the final exertion height is 2 m. The weight moves at an angle of 45° upwards with the horizontal. Take g = 10 m/s². Determine the range of the shot.
- **Question 27:** A basketball player throws a ball at a height of 2m above the ground. The player is 3m horizontally from the center of the hoop. The throwing angle is 45°. What is the throwing speed for the ball to reach the center of the hoop? (Knowing that the height of the hoop is 3.05m).
- **Question 28:** A wheel is rotating at a speed of 480 revolutions per minute, then slows down to 360 revolutions per minute for 10 seconds.
  a. Find the angular acceleration of the wheel.
  b. Find the number of revolutions of the wheel.
- **Question 29:** A ball falls freely and hits the ground with a speed of 5 m/s. Knowing that the acceleration due to gravity g = 10 m/s².
  a. Calculate the initial height of the ball.
  b. Calculate the time of fall of the ball.

In reality, the question bank contains only 29 questions used in the exam. This limitation reveals several drawbacks in assessing students' abilities.

Firstly, the small number of questions means a limited scope of knowledge coverage. Many important topics in the course may not be reflected in the exam, leading to situations where students either memorize the right answers or miss important ones. This results in exam results that do not fully reflect students' learning abilities.

Secondly, exam questions taken from the question bank tend to focus on testing basic knowledge, with too few questions designed to assess critical thinking, analytical skills, and the ability to apply knowledge to real-world situations. This means exam results primarily reflect memorization and rote learning rather than students' logical, critical, or creative thinking skills.

Thirdly, due to the small number of questions, the element of randomness in answering the questions increases. Just answering a few questions correctly or incorrectly can significantly impact the final score, reducing the reliability and objectivity of the assessment results.

From these limitations, it can be asserted that testing based on a question bank with too few questions is insufficient to comprehensively assess students' abilities. To improve effectiveness, it is necessary to expand the question bank, increase the number of questions in the exam, and combine diverse assessment methods (essay, presentation, case study, learning project, etc.) to accurately reflect the comprehensive abilities of students.

4.2. Improving the content of the assessment and evaluation of the Sports Mechanics course for students at Ho Chi Minh City University of Physical Education and Sports

4.2.1. Basis for Improving the Content of Assessment for the Sports Mechanics Course

In accordance with Decision No. 1982/QD-TTg dated October 18, 2016, of the Prime Minister approving the National Qualifications Framework of Vietnam, the 2018 General Education Program, Ho Chi Minh City University of Physical Education and Sports has issued the output standards for the undergraduate major in Physical Education (code 7140206) for its students after graduation.

According to Decision No. 515/QD-DHSPTDTT dated December 30, 2022, of the Rector of Ho Chi Minh City University of Physical Education and Sports on the issuance of regulations amending and supplementing some articles of the Regulations on training undergraduate and college students in the credit system, the overall course assessment score (referred to as the course score) is the sum of the component assessment scores, including: attendance score, test score, and exam score, rounded to one. (01) decimal digits, implemented in accordance with the Regulations on Training of the Ministry of Education and Training. In which: - Attendance score: Weight 20.0% - Test score: Weight 20.0% - End-of-course exam score: Weight 60.0%.

4.2.2. Improving the Content of Assessments for the Sports Biology Course

To overcome the monotony in assessment content and improve the quality of student competency assessment, diversifying the forms and difficulty levels is essential. These are effective methods for assessing communication skills, critical thinking, oral presentation skills, and the depth of knowledge understanding. Multiple-choice tests cover the entire course content, reduce subjective grading, and quickly assess basic knowledge and comprehension skills. Meanwhile, essay questions help students demonstrate their analytical skills, critical thinking, logical reasoning, and expressive abilities. Oral examinations also limit rote memorization because students must express themselves in their own words. Instructors encourage specialized assignments, essays, or small projects. This format allows students to apply their learned knowledge to research and analyze a specific problem, thereby developing self-learning skills, teamwork, information searching and processing, and fostering creative thinking.

The assessment content should be divided according to difficulty level (Bloomberg's scale or other cognitive levels):

- **Level 1:** Knowing. (K1)
- **Level 2:** Remembering. (K2)
- **Level 3:** Understanding. (K3)
- **Level 4:** Applying (solving exercises, practical situations). (K4)
- **Level 5:** Analyzing - Evaluating - Creating (open-ended essay, presentation, research topic). (K5)

The content of the multiple-choice question classification table by difficulty level is presented in Table 1 as follows:

Table 1: Classification of difficulty level of multiple-choice question content

Questions	K1	K2	K3	K4	K5
1. Choose the incorrect answer: a. Biomechanics is formed from two Greek words: Biomechanics. b. Biomechanics is composed of Biology and Mechanics. c. Biomechanics is the theory of human movement and activity. d. Biomechanics is a part of the science that studies the movement and activity of organisms.	x				
2. Choose the incorrect answer: The basis of biomechanics a. Physics b. Anatomy - Physiology c. Mathematics d. Chemistry	x				
3. Choose the incorrect answer: a. Direct measurement is a measurement in which the value of the quantity to be measured is obtained as a result of an observation or a count. b. Indirect measurement is finding the measure of a quantity based on formulas and laws relating to the directly measured quantity. c. Indirect measurement is finding the measure of a quantity based on formulas and laws. d. Indirect measurement is necessary when the object of study does not allow direct measurement; the phenomenon under study is not specific.		x			
4. Moment of inertia of a solid sphere of mass m and radius R with an axis of rotation at a distance R from the sphere: a. $I = \frac{25}{2}mR^2$ b. $I = \frac{2}{5}mR^2$ c. $I = \frac{22}{5}mR^2$ d. $I = \frac{2}{3}mR^2$			x		
5. Choose the incorrect answer: a. $A = F.s.\cos\alpha$ b. $P = \frac{A}{t}$ c. $P = F.s.\cos\alpha$ d. $P = F.v.\cos\alpha$			x		
6. Choose the incorrect answer: unit of power a. W b. MW c. HW d. HP	x				
7. Choose the incorrect answer: Some applications of friction in sports: a. In wet weather, a little sand in the hand can help an athlete throw the ball more accurately. b. Table tennis rackets have a special rough surface to increase the coefficient of friction, thus increasing spin. c. Specialized running tracks have a low coefficient of friction to increase friction during running. d. Small pieces, spikes, or sharp points made of rubber, metal, or wood on the surface increase friction.			x		
8. Forces acting on athletes walking and running: a. Gravity; reaction force; friction force; air resistance; inertial force. b. Gravity; reaction force; friction; air resistance; inertial force; mechanical force.					x

c. Gravity; reaction force; friction; air resistance. d. Gravity; reaction force; friction; air resistance; mechanical force.					
9. Based on which law can we explain: A figure skater is performing a rotation around an axis. When the arm retracts, the moment of inertia of the body with respect to the axis of rotation decreases, at which point the rotational velocity increases, and vice versa. a. Law of conservation of momentum b. Law of conservation of angular momentum c. Law of conservation of mechanical energy d. Law of conservation of mass				x	
10. The moment of inertia of a circular cylinder of mass m and radius R whose axis of rotation is at a distance of 2R from the axis of the cylinder: a. $I = \frac{5}{2}mR^2$ b. $I = \frac{3}{12}mR^2$ c. $I = \frac{9}{2}mR^2$ d. $I = \frac{1}{2}mR^2$					x
11. Choose the correct answer: Wheels rolling on the road have a very small coefficient of friction compared to sliding on the road. For the rear wheel, the force keeping the wheel from rotating on the road has a maximum value depending on the pressure applied to the road surface. Therefore, for a vehicle to have high speed, it must have a large mass. a. Static friction force b. Sliding friction force c. Viscous friction force d. Rolling friction force				x	
12. Apply Newton's third law to explain: a. In the case of a jump, when the athlete applies a downward force to the take-off board, the take-off board will apply a downward reaction force to the athlete, directly opposite to the applied force. b. In the case of a jump, when the athlete applies a downward force to the take-off board, the take-off board will apply an upward reaction force to the athlete, directly opposite to the applied force. c. In the case of a jump, if the athlete applies an upward force to the take-off board, the take-off board will exert an upward reaction force on the athlete, directly opposite to the applied force. d. In the case of a jump, if the athlete applies a downward force to the take-off board, the take-off board will exert a downward reaction force on the athlete, directly opposite to the applied force.				x	
13. A person with mass m is released from a state of velocity 0 from the top of a slide at a height h = 7m above the water surface. The time it takes for this person to hit the water (g = 10m/s²) is: a. 0.18s b. 1.18s c. 2.18s d. 3.18s				x	
14. An athlete with a mass of 50 kg is suspended in equilibrium on a horizontal bar. The force exerted by the horizontal bar on the athlete (g = 10m/s²) is: a.200N b.300N c.400N d.500N				x	
15. A ball with a mass of 500g and a diameter of 60cm is at a height of 2m and rotates around an axis passing through its center with a frequency of 30 revolutions/minute. The energy of the ball (π2=10, g=10m/s2): a. 13.15J b. 11.15J c. 12.15J d. 10.15J					x

16. A thin stick with a length of 1m and a mass of 0.4 kg rotates around an axis passing through its center of gravity and perpendicular to the stick with a frequency of 30 revolutions/minute. The kinetic energy of the stick (π2=10): a. $\frac{1}{5}J$ b. $\frac{1}{6}J$ c. $\frac{2}{5}J$ d. $\frac{3}{5}J$					x
17. An athlete with a mass of 55kg moves at a velocity of 10 m/s. The kinetic energy of this athlete is: a. 2750J b. 2650J c. 2550J d. 2850J				x	
18. Apply Newton's third law to explain: a. In the case of a jump, when the athlete applies a downward force to the take-off board, the take-off board will exert a downward reaction force on the athlete, directly opposite to the applied force. b. In the case of a jump, when the athlete applies a downward force to the take-off board, the take-off board will exert an upward reaction force on the athlete, directly opposite to the applied force. c. In the case of a jump, when the athlete applies an upward force to the take-off board, the take-off board will exert an upward reaction force on the athlete, directly opposite to the applied force. d. In the case of a jump, when an athlete applies a downward force to the take-off board, the take-off board will exert a downward reaction force on the athlete, opposite to the applied force.				x	
19. The moment of inertia of a flat slab of mass m, length a, width b, with an axis of rotation passing through its center of gravity and perpendicular to the plane of the slab: a. $I = \frac{1}{2}m(a^2+b^2)$ b. $\mathrm{I} = \frac{1}{12}\mathrm{m}(\mathrm{a}^2+\mathrm{b}^2)$ c. $I = \frac{1}{3}m(a^2+b^2)$ d. $I = \frac{2}{3}m(a^2+b^2)$				x	
20. Choose the incorrect answer: a. Angular acceleration is a quantity that characterizes the change in angular velocity. b. In uniformly accelerated rotational motion, angular velocity changes uniformly. c. Angular acceleration characterizes the speed of change of angular velocity. d. a and c are incorrect.		x			
21. Choose the correct answer: When thrown vertically upwards from below: a. $\mathrm{v} = \mathrm{v}_0 - \mathrm{gt}$ b. $v = v_0 + gt$ c. $v^2 - v_0^2 = gs$ d. $v^2 - v_0^2 = 2gs$			x		
22. Choose the correct answer: a. $L_{\max} = \frac{v_0 \sin 2\alpha}{g}$ b. $L_{\max} = \frac{v_0^2 \sin \alpha}{g}$			x		

c. $L_{max} = \frac{v_0^2 \sin 2\alpha}{g}$ d. $L_{max} = \frac{v_0^2 \sin \alpha}{2g}$					
23. Choose the incorrect answer: a. $\alpha = \text{arctg}\frac{v_0}{\sqrt{v_0^2+2gh}}$ b. $y = (v_0 \sin\alpha)t - \frac{1}{2}gt^2$ c. $-h = (tg\alpha).x - \frac{g}{2v_0^2 \cos\alpha^2}.x^2$ d. $x_{max} = \frac{v_0}{g}\sqrt{v_0^2+2gh}$			x		
24. A cyclist is traveling at 10 m/s when they suddenly brake and stop after traveling 36 m. The acceleration the cyclist achieved is: a. -1,38m/s² b. -2,38m/s² c. -3,38m/s² d.4,38m/s²					x
25. Choose the correct answer: a. Free fall is the fall under the influence of gravity and is not affected by any other factors. b. Free fall is the fall due to the influence of gravity. c. Free fall is the fall under the influence of gravity and is not affected by any other factors. d. Free fall is the fall under the influence of gravity and is not affected by any other factors.			x		
26. Choose the incorrect answer: Free fall motion has the following characteristics: a. The direction of free fall motion is vertical. b. The direction of free fall motion is downward. c. Free fall motion is uniformly accelerated motion. d. Free fall motion is uniform motion.			x		
27. A ball falls from a height of 3.5 m above the ground. The velocity of the ball when it hits the ground (g=9.8 m/s²) is: a. 6.28 m/s b. 7.28 m/s c. 8.28 m/s d. 9.28 m/s					x
28. An object with a mass of 2 kg is at a height of 2.2 m. Potential energy of the object (g=10m/s2): a. 43J b. 44J c. 45J d. 46J				x	
29. Moment of inertia of a hollow sphere of mass m and radius R with an axis of rotation 2R away from the center of the sphere: a. $I = \frac{14}{3}mR^2$ b. $I = \frac{2}{5}mR^2$ c. $I = \frac{9}{2}mR^2$ d. $I = \frac{2}{3}mR^2$				x	
30. A discus thrower, initially at rest, then rotates at a speed of 42 revolutions/minute for 20s. Knowing that the radius of rotation is 50cm, the angular acceleration is: a. 0.07π rad/s2 b. 0.06π rad/s2				x	

c. 0.05 rad/s2	d. 0.04 rad/s2					

The content of the essay and oral question classification table by difficulty level is presented in Table 2 as follows:

Table 2: Classification of difficulty level of essay and oral questions

Questions	K1	K2	K3	K4	K5
1.Explain the law of conservation of angular momentum?			x		
2.Explain the law of conservation of momentum?			x		
3. Explain Newton's three laws?			x		
4. Explain the definition and calculation of error?			x		
5. Explain external forces in sports activities?			x		
6. Explain the law of conservation of mechanical energy?			x		
7. Explain the law of conservation of mechanical energy?			x		
8. Explain Newton's third law? State the relationship between force and reaction force?			x		
9. Explain friction? Give examples in sports of beneficial and harmful friction?				x	
10. Explain the application of biomechanics to athletes running on curves?				x	
11. Explain the application of biomechanics to athletes running?				x	
12. Explain the application of biomechanics to athletes swimming?				x	
13. Explain the application of biomechanics to athletes shooting?				x	
14. Explain the application of biomechanics to high jumpers?				x	
15. Explain the application of biomechanics to long jumpers?				x	
16. Explain skeletal leverage? Analyze a specific example in a sports activity?				x	
17. Explain the different types of equilibrium? Give two examples in sports activities?				x	
18. Explain the characteristics of the center of gravity? What is the significance of a change in the center of gravity in sports activities?				x	
19. What are the dynamic conditions of equilibrium? Muscle contraction power?				x	
20. What are the biomechanical characteristics of the forearm and wrist joints?				x	
21. A ball with a mass of 400g and a diameter of 70cm is at a height of 1.12m and rotates around an axis passing through its center at a speed of 42 revolutions per minute. Find the energy of the ball? g=10m/s2					x
22. A shot put athlete releases the shot from a height of 1.68m with an initial velocity of 43.2km/h, and the angle of release with the vertical is 300. Questions: Range of the shot put? Maximum height reached?					x
23. A ball with a mass of 300g and a radius of 30cm rotates around an axis 0.5m from the center of the ball at a speed of 30 revolutions/minute. Kinetic energy of the ball (π2=10, g=10m/s2)					x
24. A figure skater with a mass of 50kg is initially at rest, then moves in a straight line with a velocity of 6m/s, covering a distance of 36m. Find the acceleration? The acceleration force of the athlete? Find the time the athlete reaches?					x

25. A shot put athlete throws the shot put from a height of 2.13m, with an initial velocity of 11.23m/s and an angle of 60°. Find the maximum range and height of the shot put? Find the optimal performance? Given g=10m/s²					x
26. Find the total error: 5f²=a.c/3e					x
27. A volleyball is thrown vertically upwards from a height of 1.7m with an initial velocity of 7m/s, given g=10m/s². Calculate the time from the moment the ball is thrown until it hits the ground?					x
28. Why does an angle between the upper arm and forearm greater than 90° reduce the ability of the biceps brachii muscle to contract?					x
29. Describe the motion of a ball thrown vertically upwards from a height h until it hits the ground.					x
30. Dynamic conditions of equilibrium. How to improve the stability of balance?					x
31. Using the application of center of gravity and body balance, explain why tightrope walkers carry very long poles.				x	
32. What factors influence the performance of a shot put athlete? Which factor has the strongest influence?				x	
33. Why does a swimmer expend more energy than a runner in the same amount of exercise? Analyze this.				x	
34. Based on the musculoskeletal lever and the change in center of gravity, analyze the performance of a weightlifter from the preparation to the finish line.				x	
35. Based on Newton's three laws, analyze why lifting a 3kg weight results in better performance than lifting a 5kg weight? (Consider the same conditions)				x	
36. When does an object moving in the air have lift? Explain the phenomenon of lift in discus throwing.				x	
37. Based on the law of conservation of energy, analyze the energy transformation during the process of a ball falling from a height h and then bouncing up.				x	
38. Based on the law of conservation of angular momentum, explain why, when performing a rotation, one must contract their body to rotate faster?				x	
39. Apply Newton's third law of interaction forces during the jumping process in high jump and long jump?				x	
40. In which sports is the projection motion applied? State the differences between the theory of projection and the reality of these sports?				x	
41. Analyze the biomechanics of the "back-over-the-bar" high jump technique, which has higher performance than the "step-over" high jump technique.				x	
42. Analyze the biomechanics of the shoulder, forearm, elbow, and wrist joints.				x	
43. Apply the mechanism of stopping a moving object to the actions of catching an object, falling, and landing.				x	
44. Explain the basic principles of fundamental biomechanics? Apply the analysis to the sport of dance?				x	
45. Analyze inertial forces and apply them to some sports.				x	

4.3. Determining the effectiveness of improving the content of the assessment test for the Sports Mechanics course for students at Ho Chi Minh City University of Physical Education and Sports.

The study surveyed 9 experts currently teaching at the Biomedical Department, Faculty of General Biomedical Sciences, studying related fields to Physical Education and Sports Mechanics. We designed questions using Google Forms software with 5 levels of choice corresponding to the score: 5 points – Very suitable; 4 points – Fairly suitable; 3 points – Suitable; 2 points – Less suitable; and 1 point – Not suitable. The results obtained were used by the research team to test the reliability of the question content, as shown below:

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.987	.990	30

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	121.6667	412.500	.842	.	.987
Q2	121.7778	409.694	.881	.	.986
Q3	121.6667	412.500	.842	.	.987
Q4	121.7778	409.694	.881	.	.986
Q5	122.3333	408.000	.800	.	.986
Q6	122.2222	395.944	.939	.	.986
Q7	122.0000	400.250	.929	.	.986
Q8	122.1111	394.611	.942	.	.986
Q9	122.1111	391.111	.902	.	.986
Q10	122.2222	385.444	.959	.	.986
Q11	122.1111	401.611	.906	.	.986
Q12	121.6667	412.500	.842	.	.987
Q13	121.7778	403.194	.848	.	.986
Q14	122.4444	371.028	.943	.	.987
Q15	121.5556	418.278	.689	.	.987
Q16	122.0000	411.000	.772	.	.987
Q17	122.5556	393.028	.921	.	.986
Q18	122.3333	393.250	.915	.	.986
Q19	122.6667	404.500	.851	.	.986
Q20	123.3333	393.250	.915	.	.986
Q21	122.2222	417.444	.563	.	.987
Q22	122.5556	386.778	.962	.	.986
Q23	122.5556	386.778	.962	.	.986
Q24	123.4444	384.028	.970	.	.986
Q25	121.7778	409.694	.881	.	.986
Q26	122.6667	384.000	.899	.	.986
Q27	122.5556	399.528	.884	.	.986
Q28	121.8889	409.611	.839	.	.986
Q29	122.4444	402.278	.881	.	.986
Q30	122.4444	396.028	.899	.	.986

Figure 1: Cronbach's alpha results of the multiple-choice questions

From the SPSS algorithm results, the research team found that the Cronbach's alpha coefficient of the 30 multiple-choice questions was 0.987, indicating that the experts' assessment of the question content was highly relevant to learners and that these opinions were highly reliable.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.993	.994	45

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1	162.0000	1172.500	.962	.	.992
Q2	162.6667	1188.250	.925	.	.992
Q3	160.6667	1191.500	.873	.	.992
Q4	160.4444	1186.528	.952	.	.992
Q5	160.7778	1206.694	.888	.	.992
Q6	161.4444	1186.528	.952	.	.992
Q7	160.3333	1227.000	.682	.	.993
Q8	160.6667	1177.250	.967	.	.992
Q9	160.6667	1177.250	.967	.	.992
Q10	161.5556	1173.778	.956	.	.992
Q11	159.8889	1217.861	.864	.	.993
Q12	161.2222	1203.694	.898	.	.992
Q13	160.6667	1196.750	.941	.	.992
Q14	160.0000	1216.000	.871	.	.993
Q15	160.5556	1204.278	.886	.	.992
Q16	160.5556	1190.028	.962	.	.992
Q17	160.3333	1227.000	.682	.	.993
Q18	160.6667	1177.250	.967	.	.992
Q19	160.6667	1177.250	.967	.	.992
Q20	162.6667	1188.250	.925	.	.992
Q21	160.6667	1191.500	.873	.	.992
Q22	160.4444	1186.528	.952	.	.992
Q23	160.6667	1177.250	.967	.	.992
Q24	161.5556	1173.778	.956	.	.992
Q25	159.8889	1217.861	.864	.	.993

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q26	160.7778	1225.444	.733	.	.993
Q27	160.6667	1196.750	.941	.	.992
Q28	160.7778	1167.694	.963	.	.992
Q29	160.8889	1177.611	.905	.	.992
Q30	163.1111	1209.111	.765	.	.993
Q31	161.4444	1184.278	.867	.	.992
Q32	161.3333	1164.000	.930	.	.992
Q33	160.7778	1192.194	.822	.	.993
Q34	160.4444	1186.528	.952	.	.992
Q35	160.8889	1204.861	.874	.	.992
Q36	161.4444	1186.528	.952	.	.992
Q37	160.3333	1227.000	.682	.	.993
Q38	161.7778	1132.194	.939	.	.993
Q39	160.3333	1207.250	.876	.	.992
Q40	160.4444	1187.528	.821	.	.993
Q41	160.7778	1194.944	.914	.	.992
Q42	160.7778	1206.694	.888	.	.992
Q43	161.4444	1186.528	.952	.	.992
Q44	160.3333	1227.000	.682	.	.993
Q45	160.0000	1216.000	.871	.	.993

Figure 2: Cronbach alpha results of essay questions

From the SPSS algorithm results, the research team found that the Cronbach's alpha coefficient of the 45 essay questions was 0.993. This coefficient indicates that the experts determined the question content to be highly relevant to learners, and these opinions have high reliability. This reflects that the question system was constructed accurately, scientifically, and appropriately for the teaching and assessment objectives of the course. Experts assessed that the selected question content was relatively comprehensive, covering both basic knowledge (Newton's laws, the law of conservation of momentum, angular momentum, mechanical energy) and practical applications (external forces in sports activities, measurement errors). In terms of scientific rigor, the questions were deemed to meet the basic knowledge standards, be clearly worded, and appropriate for the students' level.

5. Recommendations

This study can be replicated for other cohorts and serves as a reference for higher levels of education, such as postgraduate studies. The findings may also provide a foundation for specialized theories and research in sports biomechanics.

6. Conclusion

The study has developed and implemented improved content in the assessment of the Physical Education and Sports Mechanics course, focusing on diversifying content and emphasizing the ability to apply knowledge rather than memorization. The research results show that the improved assessment content is scientific, aligns with training objectives, ensures reliability, and differentiates student proficiency levels. The improvements have contributed to enhancing students' proactive and active learning and simultaneously support teachers in more accurately assessing the level of achievement of the course's learning outcomes.

Acknowledgements
The research team sincerely thanks the group of experts who participated in the interviews and all the students who served as the subjects of this scientific study.

Conflict of Interest Statement
The authors declare no conflicts of interest.

About the Author(s)
Nguyen Thien Ly has been a head of Athletic 1 department, Faculty of Athletics – Swimming and Diving, Athletics expert, Ho Chi Minh City University of Physical Education and Sports, Vietnam.
Vo Thi Ngoc Tho has been a lecturer in Physical Education and Sports Mechanics, Faculty of General Studies – Biomedical Sciences, Sports biomechanics expert, Ho Chi Minh City University of Physical Education and Sports, Vietnam.
Luu Tri Dung has been the Deputy Dean of Graduate and International Training at Ho Chi Minh City University of Physical Education and Sports, Vietnam.
Nguyen Minh Huan has been the Head of Training at Ho Chi Minh City University of Physical Education and Sports, Vietnam.

Le Thi Thu Hang has been a physical education teacher, Faculty of Athletics – Swimming and Diving, Athletics expert, Ho Chi Minh City University of Physical Education and Sports, Vietnam

References

Ho Chi Minh City University of Physical Education and Sports (2006), *Sports Anatomy Textbook*, Physical Education and Sports Publishing House, Ho Chi Minh City

Hoang Trong, Chu Nguyen Mong Ngoc (2008), *Analysis of research data using SPSS*, Volume 2, Hong Duc Publishing House.

Huynh Trong Khai – Nguyen Minh Huan – Vo Thi Ngoc Tho (2015), *Sports Biomechanics Textbook*, National University Publishing House, Hanoi.

Le Van Lam - Pham Xuan Thanh (2008), *School physical education and sports program*, Physical Education and Sports Publishing House, Hanoi.

Luu Tri Dung – Nguyen Van Tri (2022), *Athletics 1 Textbook*, National University Publishing House, Hanoi.

Luu Tri Dung – Nguyen Van Tri (2022), *Athletics 2 Textbook*, National University Publishing House, Hanoi.

Roger Bartlett (2007), *Introduction to Sport Biomechanics,* Routledge, USA. Retrieved from https://www.routledge.com/Introduction-to-Sports-Biomechanics-Analysing-Human-Movement-Patterns/Bartlett/p/book/9780415632423

Susan J. Hall (2002), *Basic Biomechanics, 4Th edition,* Humboldt State University. Retrieved from https://books.google.ro/books/about/Basic_Biomechanics.html?hl=ms&id=kWZFAQAAIAAJ&redir_esc=y

Trinh Hung Thanh (2007), *Biomechanics,* Sports Publishing House, Hanoi.

Trinh Trung Hieu (2001), *Theory and method of physical education and sports in schools,* Publishing House of Physical Education and Sports, Hanoi.