

The knowledge outcome of students majoring in physical and health education during the COVID-19 pandemic



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ABSTRACT

The objective of this study was to identify the knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University studying the principles of sports training, nutrition for athletes, and sports anatomy during the COVID-19 pandemic. The study adopted the descriptive analytical approach, where the curricula for the principles of sports training, the nutrition curriculum for athletes, and the sports anatomy curriculum were chosen, which were taught during the second semester of the academic year 2020/2021. In order to determine the degree of the knowledge outcome of the students, the study adopted the purposive sampling method in selecting the study sample. The students of physical and health education specialization at Al-Balqa Applied University were identified, where the sample consisted of 135 male and female students. The study concluded that the ratio of the total knowledge outcome to the knowledge outcome was at a moderate level with a percentage of 61.1, while it was low in the sports Anatomy curriculum 58.8. The results showed that there were statistically significant differences in favor of the students of Princess Alia College, and the results showed that there were no statistically significant differences between males and females in the nutrition and sports anatomy domain, while there were statistically significant differences in favor of males in the principles of sports training domain. This study increased the depth of understanding of knowledge outcome during the COVID-19 pandemic, whereas other studies were performed in normal non-stressful situations.

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1. Introduction

We live these days in light of a health and a dangerous pandemic "COVID-19", which imposed many challenges on all aspects of life, especially the educational process, as most countries of the world resorted to adopting distance education using modern technology in education (Daniel, 2020). Despite the scientific acceleration in terms of knowledge and technological development, there were many difficulties and challenges facing the distance education process, and since physical education is modern science that relies heavily on the practical and theoretical side; therefore, the size of the challenges imposed by the pandemic was very large (Al-Mahadin, 2020).

Academic institutions depend on the development and modification of their curricula on the results of research and scientific studies to reach the feedback to identify the degree of achievement of the educational goals and outcomes of their curricula (Keegan and Bannister, 2021).

Tuaima et al. (2009) reported that there is an urgent necessity of developing the educational system, modifying curricula, and experimenting with new curricula that keep pace with the accelerating scientific and technical progress, meet the requirements of life, and achieve the aspirations and aspirations of students, and work on developing their creative abilities. Therefore, the process of developing or modifying the curriculum is an important process, no less significant than the process of its construction. And this requires determining the extent of the success of the curriculum with all its elements in achieving the objectives and outputs set for it at all levels, so it is necessary to identify the positive and negative aspects in this regard, hence the importance of evaluating the current curriculum (Alsubaie, 2016).

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The curricula are the cornerstone of the educational learning process, and in order to keep pace with the development taking place in societies, the curricula must be constantly developed, updated and developed, and in line with the requirements of the times. And that is why higher education institutions keep pace with the knowledge development that is taking place, and to overcome crises, obstacles and challenges that confront the march (Acedo and Hughes, 2014). There is no doubt that the current COVID-19 crisis has affected the educational system in general and the educational process, as it posed many challenges to the elements of the educational process (Gaur et al., 2020).

Crises occur due to disturbances in the conditions of the institution, which are characterized by instability, and whose results may lead to disturbance and the inevitable transition to more negative situations, and constitute a dangerous unexpected threat that causes confusion and limits the ability to make sound and correct decisions (Waller et al., 2014).

Therefore, it has become necessary for higher education institutions, in light of this COVID-19 pandemic, to search for alternatives for the continuation of the educational process, as these institutions relied on e-learning from a distance to achieve the goals of the curricula and it worked on training faculty members and students on the use of e-learning and overcoming the obstacles that hinder the educational process (Saide and Sheng, 2021).

Here, Varea et al. (2020) confirmed that the physical education teacher is one of the main pillars in the teaching-learning process and that the lack of knowledge of information related to the scientific, cognitive, and technological aspects of physical education represents a gap in the educational process that cannot be avoided even in the presence of the curriculum.

Therefore, the teacher or coach's possession of the scientific and cognitive aspects of sports science makes him/her superior and creative in his/her field. In addition, Elshafei et al. (2015) confirmed that sports training depends on educational and scientific foundations that aim to lead and prepare athletic abilities and levels to achieve the best results in sports and practice.

Moreover, due to the significance of equipping teachers with basic competencies, efforts have been directed to modernizing education due to the changes that have occurred in the nature of physical education, as change is an important, objective, and organized process (De Vera et al., 2021).

It becomes clear to us that the advancement of the educational process depends primarily on the development of the elements of the educational process, the curriculum, the teacher, and the student, and that the development process comes through studies, research, and scientific trials that show the extent to which the desired goals are achieved through clear scientific results (Daling, 2017).

There is no doubt that the COVID-19 pandemic that has stroke the whole world has affected various

sciences, including physical education, and this pandemic has imposed very great challenges on educational institutions, as academic institutions have adopted distance education to continue the educational process. Therefore, the course of the educational process in this way entailed many challenges and difficulties.

In order to find out the outputs and results of distance learning during this pandemic, it was necessary to identify the level of educational achievement of students during the period of the COVID-19 pandemic.

Recently, Al-Balqa Applied University introduced the specialization of physical and health education to the level of the intermediate university degree, and since this specialization is recent in the university, it was necessary to identify and determine the outputs of this specialization and the knowledge outcome of students in some of the curricula that were taught during the period of the COVID-19 pandemic. Through the researchers' experience in the field of higher education and their work at Al-Balqa Applied University, where the researchers taught some curricula in this program and the urgent need to find out the outcomes of the curricula that were actually taught, in addition to the researchers' desire to obtain feedback on the taught curriculum, so that the academic institution can modify or develop curricula based on the results of scientific studies conducted in this field, which indicated that many scientific studies conducted in this field indicated that the cognitive and knowledge outcome was low and medium in some cases, such as the study of Ayers (2004) and the study of Backman and Larsson (2016) and the study of Williams and Kendall (2007).

From this point, the researchers formulated the problem of the study to find out "the knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University studying the principles of sports training, nutrition for athletes and sports anatomy during the COVID-19 pandemic." Where this study aimed to identify:

1. The knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University studying the principles of sports training, nutrition, and sports anatomy during the COVID-19 pandemic.
2. Differences in the knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University studying the principles of sports training, nutrition, and sports anatomy during the COVID-19 pandemic are referred to as the gender variable
3. Differences in the scientific outcome of students majoring in physical and health education at Al-Balqa Applied University studying the principles of sports training, nutrition, and sports anatomy during the COVID-19 pandemic are referred to as the college variable

In light of these objectives, the study questions are as follows:

1. What is the level of the knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University studying the principles of sports training, nutrition, and sports anatomy during the COVID-19 pandemic?
2. Are there differences in the knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University studying the principles of sports training, nutrition, and sports anatomy during the COVID-19 pandemic referred to as the gender variable.
3. Are there differences in the knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University studying the principles of sports training, nutrition, and sports anatomy during the COVID-19 pandemic referred to the college variable for female students only.

Through what is approved by the theoretical literature and scientific studies in this field, the significance of the study is clear. The study provides feedback on the knowledge outcome of students majoring in physical and health education in the curricula (nutrition for athletes, principles of sports training, and sports anatomy), in order to benefit curricula experts and faculty members in universities. Providing information on the strengths and weaknesses in the elements of the taught curriculum during distance education. The need of the Arab and international library for such a study, which studies the reality of higher education during the COVID-19 pandemic.

The limitations of this study are as follows:

- Human limitations: This study was confined to the students majoring in physical and health education at Al-Balqa Applied University at the intermediate diploma level, students of Salt College for Human Sciences, and students of Princess Alia College.
- Temporal limitations: The study was conducted at the end of the second semester of the academic year 2020/2021.
- Locative limitations: Al-Balqa Applied University Center, Al-Salt City-The Hashemite Kingdom of Jordan.

1.1. Research definitions

Curriculum: It is a set of educational experiences provided by the educational institution to students, inside or outside the institution, with the aim of achieving comprehensive and balanced growth for the student.

Knowledge Outcome: The knowledge outcome is defined as what the student possesses of certain sciences and knowledge acquired during the educational process in a specific curriculum and in the field of his/her academic specialization.

The Sports Training Principles Curriculum (Operational definition): It is a curriculum established within the study plan for the intermediate university degree stage in the field of physical and health education. It includes many topics and methods of sports training.

The Nutrition Curriculum for Athletes (operational definition): It is a curriculum established within the study plan for the intermediate university degree stage, specializing in physical and health education, and it includes many methods and methods of proper nutrition for athletes.

The sports Anatomy Curriculum (operational definition): It is a curriculum established within the study plan for the intermediate university degree stage, specializing in physical and health education. It includes physiological topics and the mechanism of action of the functional organs of the human body.

Corona pandemic "COVID-19": A global pandemic caused by a respiratory virus that has spread widely in the world and caused many injuries and deaths in the world, amounting to millions of deaths and damages in all sectors and various aspects of life, especially the educational process.

1.2. Previous studies

[Keeley and Fox \(2009\)](#) conducted a study that aimed to identify the impact of physical and sports education on the academic achievement of fourth-year middle school students, where the researcher used the descriptive approach to suit it and the objectives of the study. For students, the researcher recommended the necessity of taking care of the physical education professor in all respects and holding training workshops for physical education classes.

[Ayers \(2004\)](#) conducted a study aimed at measuring the cognitive outcome in the physiological aspects, physical effort, and biomechanics of physical education teachers in the Riyadh Educational City. The researchers used the descriptive cross-sectional to suit the objectives of the study. The sample of the study comprised 32 teachers holding bachelor's degrees in the city of Riyadh. The study found a weakness in the scientific level of the study sample. The researchers recommended the need to develop the educational level in these two areas among teachers.

Also, [Backman and Larsson \(2016\)](#) conducted a study aimed at identifying the cognitive outcomes of physical education teachers in the management of the physical education lesson. The study sample consisted of 20 teachers of physical education, all of whom were males. The researcher used the descriptive approach and data was collected using face-to-face interviews. The results indicated that the university in which these teachers studied is the most source from which teachers learned to manage the lesson and that there is a variation in the teachers' knowledge output. The researcher

recommended the necessity of providing different sources of information and the number of training courses for teachers in the field of class management.

Moreover, [Houston and Williamson \(1993\)](#) performed a study on whether teachers feel that they have been adequately prepared to conduct a physical education lesson, whether while they are in the bachelor's stage or current teachers. The results indicated that teachers stated that they did not receive sufficient preparation to conduct the lesson and how to deal with various behavioral problems, whether at the university or in training programs.

[Williams and Kendall \(2007\)](#) conducted a study that aimed to investigate the scientific knowledge outcome of each of the athletics players and coaches in Jordan and to identify the differences in the players' scientific knowledge outcome according to the variable of gender and academic qualification. The study adopted the descriptive cross-sectional research approach, where a sample of 121 players and coaches were recruited in this study. The results of the study concluded that the cognitive outcome was within the moderate level for the players and above the average for the coaches. It also found that there are differences in the cognitive scientific outcome between the players and coaches. The researchers recommended increasing the interest in players and coaches and increasing their cognitive abilities through holding training courses.

In addition, [Fedewa and Ahn \(2011\)](#) conducted a study aimed at identifying the cognitive outcome in the physiology of physical effort and physical fitness among physical education teachers in the city of Riyadh and then identifying the differences in the cognitive outcome among teachers according to the variable number of years of teaching experience. The study sample consisted of 40 teachers, and the researcher used the cognitive test as a tool for data collection. The results of the study concluded that the cognitive outcome of physical education teachers is at a moderate level. In addition, it was found that the physical level was at the weakest level, and in the field of physical fitness, it was at the moderate level. The researcher recommended the need to focus on training courses for physical education teachers and see what is new in sports sciences.

[Grant et al. \(2009\)](#) also conducted a study aimed at identifying the extent to which students of the Faculty of Physical Education at the University of Jordan possess knowledge about nutritional culture and their level of aerobic fitness as they perceive. It also aimed to know the correlation between students' cognitive achievement about nutritional culture and the level of aerobic fitness among students.

The researcher used the descriptive approach by conducting a survey that included four domains. The results of the study showed a lack of nutritional knowledge in general among the students of the Faculty of Physical Education at the University of Jordan and also a weakness in the level of aerobic fitness. The study recommended the need to pay

attention to the issue of nutritional culture and work to include it within the curricula education in universities.

1.3. Commenting on the previous studies

First: Some studies aimed to identify the cognitive outcome of some school and training curricula, such as the study of [Backman and Larsson \(2016\)](#) and the study of [Ayers \(2004\)](#).

Second: Some studies used the descriptive cross-sectional approach, while others used face-to-face interviews, such as the study of [Backman and Larsson \(2016\)](#).

Third: Most of the studies were applied to the basic and secondary school stages, clubs, and sports teams, while the current study was conducted on the curricula of the intermediate university degree (intermediate diploma).

This study is characterized by the following points:

1. This study aims to provide information on the knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University at the diploma level.
2. This study differs from most studies in terms of the objectives that this study seeks to achieve.
3. The current study is unique from previous studies in that it identifies the knowledge outcome of the physical and health education curricula, which were taught remotely due to the COVID-19 pandemic for the year 2021.
4. Within the limits of the researchers' knowledge, there is a dearth of studies that study the reality of higher education curricula during the COVID-19 pandemic.
5. This study differs from the rest of the studies in the curricula that were chosen in the current study and the study population.

The researchers benefited from previous studies in formulating the problem of the study, its objectives and significance, and in preparing the data collection tool. The researcher also benefited from the procedure of analyzing, interpreting, and discussing the results of the study.

2. Methodology

Research Design: The descriptive analytical method was used for its suitability to the nature of the study.

2.1. Research population

The study population consisted of all students studying for the physical and health education major at Al-Salt College for Humanitarian Sciences and Princess Alia College at the diploma level, during the second semester of the academic year 2020/2021.

2.2. Research sample

The sample of the study consisted of 135 male and female students studying the curricula under investigation in the Colleges of Salt for Humanitarian Sciences and Princess Alia College. The purposive sampling was used to recruit the study participants. [Table 1](#) shows the distribution of the study sample participants according to the variable of gender and college.

Table 1: Demographic characteristics of the study participants

College	Male		Female		Total	
	N	%	N	%	N	%
Al-Salt college of Humanitarian sciences	51	51.5	48	48.5	99	73.3
Princess Alia college	0	0.0	36	100.0	36	26.7

2.3. Data collection tool

After reviewing the literature, scientific references, and previous studies on the subject of the study, the researcher used a scale of knowledge outcome prepared by the researcher. This scale, in its final form, consisted of 45 multiple-choice questions that measure students' knowledge outcomes, distributed over three curricula taught to

students: (The curriculum for nutrition for athletes and the curriculum for the principles of sports training and the curriculum for sports anatomy). The students were given two marks for each correct answer and zero points for the wrong answer, and the test time was set for 60 minutes.

2.4. Psychometric properties of data collection tools

2.4.1. Validity

The validity of the study tool was ensured to achieve the goal for which the content was prepared by submitting it to a number of jury members and experts in the field of physical education curricula, measurement, and evaluation, in order to reach the best opinions about the study tool and to make amendments to the content of the questions and produce the data collection tool in its final form.

2.4.2. Difficulty index

The researchers measured the index of difficulty and discrimination for the test questions, the knowledge outcome of all the test questions, and domains [Table 2](#).

Table 2: Difficulty Index and Discrimination Index values of the knowledge outcome test questions for the physical health and education majoring students in Al-Balqa Applied University during COVID-19 Pandemic (n=17)

Question number	Nutrition for athletes		Sports training		Sports Anatomy	
	Difficulty	Discrimination	Difficulty	Discrimination	Difficulty	Discrimination
1	0.478	0.876	0.532	0.782	0.618	0.796
2	0.440	0.789	0.459	0.771	0.414	0.540
3	0.463	0.871	0.616	0.858	0.659	0.849
4	0.518	0.529	0.577	0.780	0.569	0.539
5	0.555	0.786	0.398	0.855	0.402	0.809
6	0.427	0.750	0.692	0.850	0.567	0.651
7	0.679	0.542	0.447	0.791	0.510	0.539
8	0.661	0.520	0.386	0.541	0.553	0.650
9	0.514	0.784	0.466	0.753	0.532	0.647
10	0.677	0.783	0.675	0.780	0.550	0.538
11	0.400	0.871	0.620	0.654	0.478	0.642
12	0.623	0.879	0.587	0.780	0.691	0.776
13	0.554	0.749	0.672	0.779	0.331	0.807
14	0.460	0.783	0.606	0.540	0.669	0.538
15	0.422	0.868	0.496	0.851	0.549	0.868

The results shown in [Table 2](#) show that the values of the difficulty index were ranked between 0.331 for the 13th question in the domain of anatomy (Question number 43 according to the sequence of questions from the domain of anatomy), and the value 0.692 for the 6th question from the domain of sports training (Question number 22 according to the sequence of questions in sports training domain). These values fall within the acceptable range of difficulty index that ranges between 0.30-0.70, which reflects the validity of the test questions in estimating the value of the knowledge outcome for students of physical and health education at Al-Balqa Applied University during the COVID-19 pandemic.

The results also showed that the discrimination validity coefficients of the test questions ranged between 0.529 for the 4th question from the domain of nutrition and 0.879 for the 12th question from the

domain of nutrition. It is noted that these values also fall within the acceptable range of discrimination coefficients, which are usually accepted between 0.30-0.90, which reflects the validity of the test questions in the ability to distinguish between students.

2.4.3. Reliability

The results shown in [Table 3](#) indicate that the reliability value of the knowledge outcome test for students majoring in physical and health education at Al-Balqa Applied University during the COVID-19 pandemic, using the Kuder-Richardson method was 0.936 for the nutrition domain, 0.925 for the sports training domain, 0.884 for the anatomy domain, and for the reliability value of the test questions as a whole, it reached 0.878. These values are considered

high and reflect sufficient and acceptable reliability values, as reliability values are usually accepted if they are greater than or equal to 0.60 as a minimum internal consistency between the responses of the sample members. Therefore, it could be concluded that the cognitive test used in this study is valid and reliable.

The researchers also used the test-retest method in order to ensure the reliability of the knowledge outcome test among students of physical and health education majors at Al-Balqa Applied University during the COVID-19 pandemic (Table 4).

Table 3: Results of the reliability test of the knowledge outcome among students of physical and health education majors at Al-Balqa Applied University during the COVID-19 pandemic by Kuder-Richardson method (n=17)

Variables	Number of questions	Mean	Standard deviation	Reliability coefficient
Nutrition	15	14.118	2.595	0.936
Sports training	15	13.529	3.124	0.925
Anatomy	15	12.235	3.597	0.884
Total knowledge outcome test	45	39.882	5.678	0.878

Table 4: The reliability of the knowledge outcome test among students of physical and health education majors at Al-Balqa Applied University during the COVID-19 pandemic (test-retest method)

Domain	Test		Retest		Correlation coefficient	Sig
	M	SD	M	SD		
Nutrition	14.12	2.60	14.00	2.21	0.878	0.000
Sports training	13.53	3.12	13.41	2.79	0.853	0.000
Anatomy	12.24	3.60	11.65	2.96	0.835	0.000
Total knowledge outcome test	39.88	5.68	39.06	5.01	0.924	0.000

The results shown in Table 4 indicate that the reliability of the knowledge outcome test for students of physical and health education specialization at Al-Balqa Applied University during the COVID-19 pandemic by the test-retest method. For the domain of sports training, the reliability coefficient value was 0.835, while it was 0.853 for the sports training domain and 0.878 for the nutrition domain. As for the reliability value of the test questions as a whole, it reached 0.924, and these values are considered high and reflect sufficient and acceptable stability values, as reliability values are usually accepted if they are greater than or equal to 0.70 as a minimum.

This value also shows that the subjects of the study sample had close answers in two separate periods of test progression, where the obtained values are considered high, and the significance level values show that the correlation values that were obtained are statistically significant because they are less than 0.05, which indicates the existence of a strong correlational relationship between the two results of the test administration. Thus, it can be considered that the questions of the cognitive outcome test are reliable and appropriate for the administration.

3. Results and discussion

3.1. Results related to the first research question

What is the level of the knowledge outcome for students majoring in physical and health education at Al-Balqa Applied University studying the principles of sports training, nutrition, and sports anatomy during the COVID-19 pandemic?

In order to answer this question, the researchers calculated the frequencies and percentages for the correct answers to the test of students specializing in physical and health education at Al-Balqa Applied

University-studying the principles of sports training, nutrition, and sports anatomy. A three-level classification scale was used to describe the levels of percentages according to Table 5.

Table 5: A three-level classification scale describing the levels of percentages

Level	Result
Low	0.00-60.00
Moderate	60.0-80.00
High	80.01-100

Table 6 shows the frequencies and percentages of the knowledge outcome test questions for students majoring in physical and health education at Al-Balqa Applied University during the COVID-19 pandemic. The highest percentage of the knowledge outcome was related to the nutrition domain, where the percentage value was 64.0, followed by the sports training domain 60.6%, while the lowest percentage of correct answers was observed in the sports anatomy domain, which amounted to 58.8%.

On the other hand, the scientific outcome related to the domain of nutrition was the largest, as it came with a moderate rating of 64.0, and the second rank came in the domain of sports training principles, and the third rank came to the domain of sports anatomy with a percentage of 58.8% and at a low level.

In addition, it was found through the results that the total knowledge outcome came to a moderate degree, as the percentage reached 61.1%, and this gives an indication that the distance learning was actually at a moderate level of the knowledge outcome of the students, and this result is consistent with the study of Williams and Kendall (2007), which reported that knowledge is within the moderate level for players and above moderate for coaches.

The researchers attribute these results to the fact that distance education during the COVID-19 pandemic was somewhat effective compared to

similar scientific studies in face-to-face education, and this is due to the training and recovery courses for teachers and students organized by Al-Balqa

Applied University in distance learning and the commitment of students and teachers to the educational process.

Table 6: The frequencies and percentages of the knowledge outcome test questions for students majoring in physical and health education at Al-Balqa Applied University during the Corona COVID-19 pandemic (n=135)

Domain	Total correct answers	Correct answers	% correct answers	Level of knowledge outcome
Nutrition	2025	1296	64.0	Moderate
Sports training	2025	1227	60.6	Moderate
Anatomy	2025	1191	58.8	Low
Total knowledge outcome	6075	3714	61.1	Moderate

It is noted from Table 7 that the level of the knowledge outcome of students majoring in physical and health education at Al-Balqa' Applied University during the COVID-19 pandemic in the nutrition domain was moderate, as the value of the percentage of correct answers to the questions of this test was 64.0%, and this result represents an average level of the knowledge outcome according to the scale used, where the level of correct answers to each of the test questions varied between low and high, as the percentage values ranged between 42.2%-93.3%. In addition, the results showed that the most knowledgeable students of physical education and

the health department at Al-Balqa' Applied University in the field of nutrition was represented by answering the question that states "It is very high in bone formation", where the percentage of correct answers to this question was 93.3%. While the results showed that the knowledge of physical and health education students at Al-Balqa Applied University in the nutrition domain was low, represented by the answer to the question which states, "The relationship between muscle and increases the proportion of water in the body is.....?" The percentage of correct answers was 42.2%.

Table 7: Frequencies and percentages of the knowledge outcome test questions for nutrition domain for students majoring in physical and health education at Al-Balqa Applied University during the COVID-19 pandemic

No	Question	Correct answers	% of correct answers	Level
1	The relationship between the amounts of water lost with exercise is	99	73.3	Moderate
2	The relationship between muscle and increase the proportion of water in the body is.....	57	42.2	Low
3	The relationship between water and body fat is	63	46.7	Low
4	What are the most important factors that contribute to increased blood loss?	63	46.7	Low
5	The lack of water in the body leads to	72	53.3	Low
6	Carbohydrates are chemically composed of	87	64.4	Moderate
7	.... is one of the main and basic sources of energy...	93	68.9	Moderate
8	Vitamin..... is an important vitamin for the formation of bones, muscles, cartilage and blood vessels	60	44.4	Low
9	What are the vital functions of water?	111	82.2	High
10	Is it one of the factors that lead to a decline in the level of athletic performance?	117	86.7	High
11	The human body needs about (...) of protein per kilogram of body weight.	84	62.2	Moderate
12	It is very high in bone formation	126	93.3	High
13	..... is considered very important for the transmission of nerve signals.	63	46.7	Low
14	Athletes prefer to use .....oils	117	86.7	High
15	At medium intensity, it is recommended that the player drink fluids	84	62.2	Moderate
	Total knowledge outcome for nutrition domain	1296	64.0	Moderate

The researchers attribute the nutrition axis, which achieved the highest percentage among the domains of the study, reaching 64.0, with an average level, this indicates the students' interest in the nutritional aspect and the importance of lunch for sports activity to maintain public health and indicates that there is a societal culture in the importance of lunch. This result is in agreement with the study of Grant et al. (2009). In addition, the results showed that there was a discrepancy in answering the questions of this domain, where the highest knowledge outcome was in answering the question that states "It is very high in bone formation" where the percentage of correct answers of this question was 93.3%, which is a high percentage and a high rating according to the scale used. The reason for this is that the students care about nutrition and their health status, and the curriculum focuses on the importance of nutrition

and energy production systems in the body whose fuel is food.

It is noted from Table 8 that the level of the knowledge outcome for students majoring in physical and health education at Al-Balqa Applied University during the COVID-19 pandemic in the domain of sports training was average, as the value of the percentage of correct answers to the questions of this test was 60.6%, and this result represents a moderate level of the knowledge outcome according to the scale used. The level of the correct answers to each of the test questions varied between low and high, as the percentage values ranged between 17.8%-84.4%. In addition, the results showed that the most knowledgeable students of physical education specialization and health at Al-Balqa Applied University in the domain of sports training were represented by answering the question "The components of the sports training load are the following except for one which is...," where the

percentage of correct answers to this question was 84.4%, while the results showed that the knowledge of physical and health education students in Al-Balqa Applied University, in the domain of sports training,

was represented by answering the question “The rest period between one exercise and another in the same training dose is called....” The percentage of correct answers was 17.8%.

Table 8: Frequencies and percentages of the knowledge outcome test questions for sports training domain for students majoring in physical and health education at Al-Balqa Applied University during the Corona COVID-19 pandemic

No	Item	Correct answers (N)	Correct answers (%)	Level
16	Item	93	68.9	Moderate
17	The "Gilgamesh" games are in relation to the hero of a legend named Gilgamesh. These games appeared in the.... Civilization.	78	57.8	Low
18	Sports were characterized by strength and confrontation with predators in .....civilization	114	84.4	High
19	It is the individual's ability to perform daily tasks without excessive fatigue while retaining a reserve part of this ability to face emergencies and enjoy recreational activity. This is concept...	60	44.4	Low
20	Among the types of power according to the division of the scientist (Hara) are the following except for one which is.	60	44.4	Low
21	The structural properties of muscle fibers determine the nature of the sport in which the player excels, and white muscle fibers are characterized by the following:	108	80.0	High
22	..... is defined as the individual's ability to perform movement over a wide range	69	51.1	Low
23	It is the physical and nervous burden or effort placed on the various organs of the body, this is the concept of...	24	17.8	Low
24	The duration of the exercise and the number of its repetitions, this is the concept of....	30	22.2	Low
25	The rest period between one exercise and another in the same training dose is called....	99	73.3	Moderate
26	To calculate the intensity of the training load we use the pulse, the text of the formula for calculating the maximum heartbeat is	105	77.8	Moderate
27	Preparation that aims to develop volitional and moral qualities and overcome external influences for the player is called .....preparation	105	77.8	Moderate
28	An increase in the number of heartbeats and the number of breaths during exercise is called condition	69	51.1	Low
29	An increase in the size of the heart muscle and the size of the muscles and lungs as a result of sports training is called condition	114	84.4	High
30	The components of an athletic training load are the following except for one:	99	73.3	Moderate
	Total knowledge outcome for sports training domain	1227	60.6	Low

Exploring the results related to the second domain, the principles of sports training, revealed that it was at the second rank among the domains of the study with a percentage of 60.6, which is at a moderate level.

The researchers attribute this result to the fact that the curricula of sports training rely heavily on the practical aspect and that the students during the distance learning period were not able to practical application and understand the training units and methods of acquiring physical fitness for players and students. In addition, it could be attributed to that the female students are not following the methods of sports training and its importance, and this affected the percentage of educational achievement in this subject, as it obtained an average rating.

Moreover, the result of highest in this domain was for the question that states “The components of an athletic training load are the following except for one:...” Where the percentage reached, which is a high percentage compared to the answer to the question that states “The rest period between one exercise and another in the same training dose is called...”. This percentage is very weak, as it obtained a low result 17.8%, and the researchers believe that the reason is the absence of the practical side, as the practice of training unit was not able to identify the parts of the training. This result is consistent with the findings reported by Fedewa and Ahn (2011),

which showed that the cognitive outcome of physical education teachers in sports physiology was average.

It is noted from Table 9 that the level of the knowledge outcome for students majoring in physical and health education at Al-Balqa’ Applied University during the COVID-19 pandemic in the anatomy domain was low, as the value of the percentage of correct answers to the questions of this test was 58.8%, and this result represents a low level of the knowledge outcome according to the scale used. The level of correct answers to each of the test questions varied between low and high, as the percentage values ranged between 35.6%-86.7%, and the results showed that the least knowledge of students specializing in physical and health education at the University of Al-Balqa’ applied in the domain of anatomy was represented by answering the two questions: “A muscular cartilaginous tube with a length of 10-20 cm and a width of about 2.5 cm. This tube begins in the neck and continues in the larynx until the sixth vertebra” and the question “The pancreas is one of the ... glands”. The correct answers to these two questions were 35.6%, while the results showed that the knowledge of physical and health education students at Al-Balqa Applied University in the anatomy domain was high, represented by answering the question “The number of cervical vertebrae...” as the percentage of correct answers was 86.7%.

The results related to the sports anatomy domain show that the level of knowledge outcome was low,

as the percentage of correct answers to the questions of this test was 58.8%.

Table 9: Frequencies and percentages of the knowledge outcome test questions for sports anatomy domain for students majoring in physical and health education at Al-Balqa Applied University during the COVID-19 pandemic

No.	Item	Correct answers	% of correct answers	Level
31	It is considered one of the cartilaginous bones of origin	57	42.2	Low
32	The number of superficial abdominal regions	60	44.4	Low
33	The following are considered to be cell shapes except for	69	51.1	Low
34	It is called the energy house of the body	96	71.1	Moderate
35	Small RNA granules are composed of iron + energy storage is present in the nerve cell only	72	53.3	Low
36	The most extensive parts of the digestive system are in the form of (,). A muscular cartilaginous tube with a length of 10-20 cm and a width of about 2.5 cm. This tube begins in the neck and continues in the larynx until the sixth vertebra.	93	68.9	Moderate
37	The most types of glands in the human body and weighs about (1-3 kg) is	48	35.6	Low
38	The vessel through which oxygenated blood is transported is	84	62.2	Moderate
39	The outer layer that protects the heart muscle from the outside is called the	87	64.4	Moderate
40	It is called the catabolic because it increases the use of energy and prepares the body for emergency situations and works by increasing the pulse, constriction of blood vessels and high blood pressure called...	105	77.8	Moderate
41	The number of cervical vertebrae...	87	64.4	Moderate
42	The number of lumbar vertebrae in the spine is	117	86.7	High
43	The pancreas is one of the .....glands	108	80.0	High
44	Muscles that move by human will are called .....muscles	48	35.6	Low
45	Total knowledge outcome for sports anatomy domain	60	44.4	Low
		1191	58.8	Low

The researchers attribute the reason for this to the fact that the subject of anatomy depends on the scientific aspect, and there are many functional systems, and it also depends on the science of chemistry and biology. There is a percentage of students studying the taught course whose majors are in the secondary stage of literature and did not study these subjects. This, according to the researchers' conviction, constitutes a challenge and difficulty in understanding the scientific material in sports anatomy.

The highest percentage in the questions of this domain was in answering the question that states, "The number of cervical vertebrae are..." as the response rate was 86.7%, and this scientific percentage is high compared to the scale used, while the knowledge outcome was low in answering the two questions: A muscular cartilaginous tube with a length of 10-20 cm and a width of about 2.5 cm. This tube begins in the neck and continues in the larynx until the sixth vertebra, and the question "The pancreas is one of the ... glands". The correct answer to these two questions is 35.6%.

This result is due to the momentum of the scientific material, as it includes many scientific topics and is studied in one semester, while it is taught in medical colleges for two years and each system alone, whereas in the plan of specializing in physical and health education, one subject is allocated for three hours, and this indicates that the momentum of information in this subject was the main reason for achieving the low result. The researchers attribute that result to the fact that the scientific level of the teaching subject is not commensurate with the level of the diploma students, and this result is consistent with the study

of Ayers (2004), which showed that there is a weakness in the scientific level of the study sample.

3.2. The results related to the second research questions

Are there statistically significant differences at the level 0.05 in the knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University studying nutrition, sports training, and sports anatomy during the COVID-19 pandemic referred to the gender variable?

Table 10 shows the results of the independent samples t-test for the knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University during the COVID-19 pandemic according to the gender variable. By reviewing the values of the level of significance for the differences between the averages of males and females in the nutrition domain reveals that it reached 0.556, and it was 0.022 for the domain of sports training, and the differences between the averages of males and females in the knowledge outcome in the domain of anatomy was 0.404. As for the value of the significance level calculated between the average males and females in the knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University during the COVID-19 pandemic, it reached 0.870.

When comparing the values of the significance level shown with the value 0.05, it turns out that only one value was less than 0.05, which is related to the sports training domain 0.040. Males whose average achievement 18.71 was greater than the average achievement of females 16.76, while for the rest of the significance level values were greater than 0.05. It was found that only one value was less than

0.05, which is related to the sports training domain 0.040. This result indicates that the average of males differs from the average of females in the knowledge outcome in this domain so that the significant difference was in favor of males whose average achievement 19.57 was greater than the average

achievement of females 17.33. As for the rest of the significance level values were greater than 0.05, which indicates that there are no statistically significant differences between males and females in the domains of nutrition, anatomy and the knowledge outcome as a whole.

Table 10: Independent samples t-test for the differences in knowledge outcome among students majoring in physical and health education at Al-Balqa Applied University during COVID-19 pandemic referred to gender variable

Domain	Gender	N	M	SD	T	Sig
Nutrition	Male	51	18.82	5.76	0.59	0.556
	Female	84	19.43	5.79		
Sports training	Male	51	19.57	4.92	2.32	0.022
	Female	84	17.33	5.70		
Sports anatomy	Male	51	16.94	6.32	0.83	0.404
	Female	84	18.07	8.29		
Total Knowledge outcome	Male	51	55.33	15.27	0.164	0.870
	Female	84	54.83	18.26		

The results show that there are no statistically significant differences between males and females in the domain of nutrition and sports anatomy, while there were statistically significant differences in favor of males in the domain of sports training principles, where the mean score of this domain was 0.040. And the researchers attributed the reason to that the male students are the most practice of sports training and participate in sports competitions, unlike females, which we notice in our societies. They do not practice sports except at a narrow level, unlike males who are interested in sports exercises, which was reflected in the results of the knowledge assessment of students in the field of sports training, but in the field of nutrition and sports anatomy, There were no statistically significant differences between males and females for the knowledge outcome, and the researchers attribute the reason for this to the fact that the nutrition and sports anatomy curricula depends on the theoretical side more than the practical and does not require application and practice as in the curricula of sports training, and this result contradicts the study of Williams and Kendall (2007), which showed that there are differences in the knowledge outcome between coaches and players.

3.3. The results related to the third research question

Are there statistically significant differences at the level 0.05 in the knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University studying nutrition, sports training, and sports anatomy during the COVID-19 pandemic referred to the college variable (females only)?

Table 11 shows the results of an independent samples t-test for the differences in the knowledge outcome of students majoring in physical and health education at Al-Balqa Applied University during the COVID-19 pandemic, according to the college variable (females only). In the sports training domain, the differences between the averages of the students of the two colleges in the knowledge outcome in the anatomy domain were 0.000, as for the value of the level of significance calculated between the averages of the students of the two colleges in the knowledge outcome of students specializing in physical and health education at Al-Balqa Applied University during the COVID-19 was 0.000.

Table 11: Independent samples t-test for the differences in knowledge outcome among students majoring in physical and health education at Al-Balqa Applied University during COVID-19 pandemic referred to college variable (females only)

Domain	College	N	M	SD	T	Sig
Nutrition	Al-Salt for humanitarian sciences	48	18.25	4.73	2.20	0.030
	Princess Alia College	36	21.00	6.70		
Sports training	Al-Salt for humanitarian sciences	48	15.00	5.09	4.89	0.000
	Princess Alia College	36	20.44	4.99		
Anatomy	Al-Salt for humanitarian sciences	48	14.25	6.81	5.74	0.000
	Princess Alia College	36	23.17	7.33		
Total knowledge outcome	Al-Salt for humanitarian sciences	48	47.50	14.89	4.77	0.000
	Princess Alia College	36	64.61	17.59		

When comparing the values of the significance level shown with the value 0.05, it turns out that all the values of the significance level were less than 0.05, as this result indicates that the average of the students of Salt College for Human Sciences differs from the average of the students of Princess Alia College in the knowledge outcome, so that the significance of the differences was in favor of the

students of the Princess Alia College whose average achievement was greater than that of the female students of Salt College for Human Sciences, which indicates that there are statistically significant differences between the female students of the two colleges in the areas of nutrition, sports training, anatomy, and the knowledge outcome as a whole.

The results showed that there were statistically significant differences at the level of significance 0.05 in favor of the students of Princess Alia College, whose average achievement was greater than the average achievement of the female students of Salt College for Human Sciences, which indicates that there are statistically significant differences between the students of the two colleges in the domains of nutrition and sports training and the anatomy and the knowledge outcome as a whole. The researchers believe that it is natural that there are differences in the knowledge outcome between the two colleges for several reasons, including the difference of subject teachers because the teacher plays a major role in explaining the material and discussing it with students, and this requires decision-makers in the university to provide all teachers with courses in the field of curricula and teaching methods to overcome differences in the educational process. The results of this study agree with the study of Williams and Kendall (2007), which confirmed that there are differences in the cognitive outcome between coaches and players.

4. Recommendations

In light of the study results, the researchers recommend the following:

First: The necessity of keeping pace with the scientific and technological development taking place in all curricula so that they can be taught remotely.

Second: Focusing on blended education in all circumstances and training students and teachers to use modern technology in teaching and learning.

Third: The necessity of constantly reviewing the curricula and working to develop and update them in line with the scientific development taking place.

Fourth: Conducting many relevant scientific studies and new approaches.

5. Conclusion

1. The knowledge outcome of the students of physical and health education was within the average level.
2. The highest knowledge outcome was in the domain of nutrition for athletes, and the lowest knowledge outcome was in the principles of athletic training.
3. E-learning was somewhat successful in being an alternative during the COVID-19 pandemic.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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