Vlasiuk Roman. Experimental verification of the effectiveness of implementing a differentiated approach in training future physical education teachers. Journal of Education, Health and Sport. 2023;13(1):351-364. eISSN 2391-8306. DOI http://dx.doi.org/10.12775/JEHS.2023.13.01.050
https://apcz.umk.pl/JEHS/article/view/44701
https://zenodo.org/record/8077028

The journal has had 40 points in Ministry of Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of December 1, 2021. No. 32343. Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical Culture Sciences (Field of Medical sciences and health sciences); Health Sciences (Field of Medical Sciences and Health Sciences).

Punkty Ministerialne z 2019 - aktualny rok 40 punktów. Załącznik do komunikatu Ministra Edukacji i Nauki z dnia 1 grudnia 2021 r. Lp. 32343. Posiada Unikatowy Identyfikator Czasopisma: 201159. Przypisane dyscypliny naukowe:Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu).

Received: 09.01.2023. Revised: 23.01.2023. Accepted: 31.01.2023.

UDK: 378:796.071.4

EXPERIMENTAL VERIFICATION OF THE EFFECTIVENESS OF IMPLEMENTING A DIFFERENTIATED APPROACH IN TRAINING FUTURE PHYSICAL EDUCATION TEACHERS

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Abstract

The effective training of future specialists in physical culture and sports necessitates a comprehensive system of specialized knowledge, which forms a crucial part of a teacher's competence. This research aims to enhance the theoretical training level of students enrolled in the Faculty of Physical Education. The experiment involved 36 first-year students from TNPU. Initially, the collected data revealed an average score of 55% across all sections of theoretical training, indicating a low level of knowledge. However, after the experiment, significant improvements were observed in the areas of general development (4.22±0.12), drill exercises (4.11±0.10), injury prevention in gymnastics classes (4.17±0.12), and gymnastics in the system of physical education of Ukraine (4.03±0.15).

Keywords: professional training; physical education; theoretical training; students; sports and pedagogical disciplines; differentiated approach; pedagogical conditions.

ЕКСПЕРИМЕНТАЛЬНА ПЕРЕВІРКА ЕФЕКТИВНОСТІ ВПРОВАДЖЕННЯ ДИФЕРЕНЦІЙОВАНОГО ПІДХОДУ ДО ПІДГОТОВКИ МАЙБУТНЬОГО ВЧИТЕЛЯ ФІЗИЧНОЇ КУЛЬТУРИ

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Анотація

Ефективна підготовка майбутнього фахівця з фізичної культури і спорту повинна опиратись на цілісну систему спеціальних знань, які є важливою складовою компетентності вчителя. Мета дослідження – покращити рівень теоретичної підготовки студентів факультету фізичного виховання. В експерименті взяли участь 36 студентів І курсу ТНПУ ім. Гнатюка. На початку експерименту отримано дані, середнє значення яких з усіх розділів теоретичної підготовки становить 55 % і відповідає низькому рівню знань. В результаті експерименту відбулось достовірне покращення знань з загальнорозвиваючих – 4,22±0,12, стройових вправ – 4,11±0,10, попередження травматизму на заняттях з гімнастики – 4,17±0,12, гімнастика в системі фізичного виховання України – 4,03±0,15.

Ключові слова: професійна підготовка; фізичне виховання; теоретична підготовка; студенти; спортивно-педагогічні дисципліни; диференційований підхід; професійна підготовка; педагогічні умови.

Problem statement. The pressing challenge of our time is to establish suitable pedagogical conditions that facilitate the successful implementation of professional training programs for future specialists in the realm of physical education and sports. These conditions are essential to ensure an effective training process and enable students to acquire competencies that align with the contemporary demands of society and higher education standards.

Analysis of recent research and publications concerning the professional training of future physical education specialists within higher educational institutions reveals a substantial focus from scholars. Notably, the following aspects have been addressed: theoretical and methodological principles of professional training for future experts in physical education and sports [1, 4, 11]; development of professional skills among future physical education teachers [6]; and the organization and implementation of pedagogical practice for students pursuing physical education degrees [5].

Specialized knowledge serves as a vital component of a teacher's competence and encompasses cognitive and practical activities within the field of physical education. Mastery of an appropriate breadth of theoretical material is indispensable for conducting highly productive professional endeavours [3].

In the training of students studying sports and pedagogical disciplines, such as gymnastics, their knowledge is closely intertwined with practical application. As the acquisition of any skill begins with a comprehensive understanding of the exercise technique, the future physical education teacher's proficiency in the requisite theoretical information becomes a critical phase in their ability to engage in successful and effective professional practice [1, 2, 4].

Correlation of research with scientific programs, plans, and topics. The conducted research aligns with the scientific plan of Ternopil Volodymyr Hnatiuk National Pedagogical University, specifically within the scope of the topic "Theory and practice of training teachers to work on the physical education of students" (state registration number 0113U005924).

The objective of this research is to experimentally verify the effectiveness of implementing pedagogical conditions based on the principles of a differentiated approach in the training process of future physical education specialists.

The tasks of the study are the following:

1. To establish evaluation criteria and assess the level of knowledge in gymnastics among first-year students at the Faculty of Physical Education, Ternopil Volodymyr Hnatiuk National Pedagogical University.

2. Experimentally examine the effectiveness of the training program and evaluate the state of the cognitive component's development in future teachers prior to teaching gymnastics in school.

In order to accomplish the stated tasks, a variety of **research methods** were employed. The theoretical research was employed to synthesize and compare different perspectives of researchers on the problem at hand by studying and analysing pedagogical, psychological, and specialized sports scientific literature. It also sought to establish the theoretical foundations and clarify fundamental concepts relevant to the research topic.

Comparison, classification, systematization, theoretical forecasting, design, and computer modelling were employed to substantiate the pedagogical conditions essential for the successful implementation of the program on the development of Faculty of Physical education students' theoretical readiness.

Testing was conducted to gather information about the participants' level of knowledge in the theoretical preparation section of school programs.

Mathematical and statistical data processing provided for quantitative data analysis.

The following statistical measures were utilized:

(Mx) – arithmetic mean;

(Sx) – standard deviation of the arithmetic mean;

(Sms) – standard error of the sample mean;

(G) – mean square deviation;

(Xmin – Xmax) - range of variation;

(P) – reliability index.

Data processing was performed using the Microsoft Office 2010 package and the Excel add-in.

Presentation of the main research material:

The methodology of pedagogical research encompasses a combination of theoretical and empirical methods, allowing for the investigation of the complex and multifunctional object that is the educational process with the highest level of certainty [92]. An **experiment**, derived from the Latin term *exsperimentum* meaning "to try", serves as a means to acquire knowledge about objective reality and represents one of the primary methods for scientific research on pedagogical phenomena [93]. Although the term "pedagogical experiment" may hold different interpretations among various authors, all definitions agree that it is a scientifically justified system for organizing the pedagogical process, utilized to assess the effectiveness of teaching and educational methods and means [99, p. 155]. Our experimental

research aims to verify a scientific hypothesis based on the assumption that the successful training of future physical education teachers for professional activities can be achieved under the following organizational and pedagogical conditions:

- ensuring students' motivation for classes through the implementation of a differentiated approach in SPD (Sports and Pedagogical Disciplines) classes;
- enhancing the content of SPD classes based on the principle of a differentiated approach;
- utilizing modern information technologies to support the implementation of a differentiated approach in SPD classes;
- incorporating interactive forms and methods of learning in the educational process to facilitate a broader application of a differentiated approach in the study of SPD.

Throughout the definition of tasks, content, and the methodology of our research and experimental work, we have endeavored to construct a pedagogical process that adheres to the principles of consciousness and activity, systematicity, accessibility and individualization, visibility, and the integration of theory with practice.

The tasks of our research were addressed through several stages:

During **the first stage**, we conducted a comprehensive literature review on the topic to examine the viewpoints of specialists regarding the training of professionals in the field of physical education and sports. To identify the factors influencing the preparation of future physical education specialists, we administered a questionnaire involving teachers from higher education institutions, physical education teachers, and students. Additionally, we assessed the level of acquisition of professionally essential knowledge, abilities, and skills among future physical education teachers. To achieve our research goal, we formulated appropriate tasks aligned with the requirements of the school program and established criteria for their evaluation. Based on the results of this stage, we identified the pedagogical conditions that contribute to higher-quality training and a more successful learning process.

The second stage of the research involved conducting a pedagogical experiment to implement the identified pedagogical conditions, based on a differentiated approach, into the educational process of SPD. We aimed to assess the effectiveness of these conditions.

During **the third stage** of the research, we analysed and synthesized the research findings, allowing for generalization of the results and the formulation of conclusions. This stage also involved the design of our work.

The pedagogical experiment took place at Ternopil Volodymyr Hnatiuk National Pedagogical University, Kremenets Taras Shevchenko Regional Academy of Humanities and Pedagogy, Vasyl Stefanyk Precarpathian National University, and Lviv State University of Physical Education and Sports. Prior to the formative experiment, we determined the initial level of preparation among first-year students who had recently enrolled in higher education institutions, with a total of 362 first-year students participating in the assessment.

During the process of addressing the research tasks, we analysed the sections of theoretical, practical, and physical training within the school program [7, 8, 9]. We focused on determining the initial level of theoretical competencies required for a secondary school graduate, as outlined in the program modules. To assess students' initial knowledge, we developed evaluation criteria on a five-point scale, where 0 points represented no knowledge, and 5 points indicated a high level of knowledge. The criteria were as follows: 0 points – no knowledge, 1 point – low level of knowledge, 2 points – below average level of knowledge, 3 points – average level of knowledge, 4 points – above average level of knowledge, 5 points – high level of knowledge.

The ascertainment stage of the experiment involved assessing the initial level of preparedness of students who had recently enrolled in their first year of study. Throughout the study, we compared key indicators crucial for successful professional training, namely, the level of theoretical knowledge, practical skills, and physical fitness. The average results of testing the initial readiness level of the students are presented in Table 1.

Table 1

Results of Testing the Initial Level of Readiness 1st-year students (n = 362)

No	**Levels**	None ”0”.	Low level ”1”.	Below average ”2”.	Average level ”3”.	Above average ”4”.	High level ”5”.
1	Theoretical training	35,9%	17,9%	25,1%	19,8%	1,3%	0%
2	Practical training	27,9%	22%	22%	24%	3%	1%
3	Physical training	0%	7%	11,4%	12,6%	30,9%	38,1%,

Analysing the results of the theoretical training, it is evident that more than a third of the students entering faculties of physical education (35.9%) possess no knowledge and were unable to answer the questions. Additionally, (17.9%) of respondents demonstrated a low level of knowledge. Students with knowledge levels categorized as below average and

average accounted for (25.1%) and (19.8%) respectively. Only 1.3% of respondents exhibited knowledge above the average level, and no students reached a high level of knowledge. This suggests that in the process of teaching general development exercises, drill exercises and other instructional methods, physical education teachers may not place sufficient emphasis on the formation of students' knowledge systems. This could mean limited involvement in performing comprehensive general development exercises, poor demonstration of drill exercises and applied exercises, and insufficient practice in learning specialized exercise terminology.

At the initial stage of education, the level of students' practical mastery of educational material in SPD classes relies on the training received in general educational institutions. Therefore, when considering the training system for future specialists, it is essential to begin with school education. This education should not only prepare students for social life but also fulfil society's needs by cultivating the necessary skills and abilities that will serve as a foundation for their professional growth.

In addressing our research tasks, we analyzed the school program and determined the initial level of competence that first-year students should possess. To assess the initial formation of special skills and abilities, we evaluated the motor training of students, including the performance of general development exercises, drill exercises, applied exercises, balance exercises, and other specific skills within SPD.

According to the table, the assessment of students' practical skills is as follows: (27.9%) of students did not demonstrate any of the proposed skills. Two groups of students, who displayed low or below-average levels of skills accounted for (22%) each. Among the respondents, (24%) showed average skill levels with noticeable technical flaws in exercise performance. There were also students who completed the tasks with minor errors in exercise technique or without any errors. Thus, (3%) of students performed above the average level, and (1%) demonstrated a high level of skill.

The assessment of physical fitness during the ascertainment stage of the experiment was conducted in the first week of training. We used the standards outlined in the fifth-year program modules of sports disciplines in the school curriculum for evaluation purposes. The findings revealed that (38.1%) of respondents demonstrated a high level of physical fitness, (30.9%) displayed above average fitness levels, (12.6%) achieved an average level of fitness, (11.4%) reached a below-average level, and (7%) exhibited a low level of physical fitness.

Based on the results of the ascertainment experiment, it is evident that the initial level of knowledge among first-year students is insufficient and can be assessed as low. In order to

ensure a high-quality educational process, we have developed an experimental program for this stage of the study. The program includes:

- setting the research purpose;
- selection of methods and methodology for the formative experiment;
- determination of the experimental base;
- substantiation of criteria and levels for the formation of components;
- determination of organizational and pedagogical conditions for the research;
- development of a structural and functional model for training future physical education teachers;
- prediction of positive results and identification of potential negative consequences, with plans for their correction.

Based on the analysis of the data regarding the initial level of training for future physical education teachers, we have identified pedagogical conditions for the formation of their readiness for professional activity based on a differentiated approach. We have also scientifically substantiated the methods for implementing these conditions.

For the experiment, we have formed a control group consisting of 67 students and an experimental group consisting of 63 students.

In the **formative experiment** of our study, the control group of students followed the regular program, while the experimental group underwent an educational process based on the implementation of specific pedagogical conditions. The effectiveness of these conditions was evaluated by comparing the control and experimental groups, specifically by testing the students' level of readiness for professional activities according to various components of their training.

The table below presents the results of the content component, which indicates the level of theoretical training among students at the beginning of the experiment (input control IC) and at its conclusion (final control FC). The data is shown as the sum of individual variable modules in percentages.

Based on the testing results, it can be concluded that positive and significant changes occurred in each topic of theoretical training during the experimental period. These changes were attributed to the implementation of advanced educational information technologies and electronic manuals, which were integrated with lectures and practical classes during the study of SPD.

Table 2

Distribution of students in the Control Group (CG) and Experimental Group (EG) by levels of readiness for professional activity according to the content component

Groups	Number of students	Levels of readiness for professional activity							
		High		Above average		Average		Low	
		Number	%	Number	%	Number	%	Number	%
CG(IC)	64	0	0	0	0	9	14,06	55	85,93
CG(FC)	64	2	3,13	22	34,38	39	60,94	1	1,56
EG(IC)	63	0	0	0	0	9	14,28	54	85,7
EG(FC)	63	8	12,70	28	44,44	27	42,86	0	0

In order to determine the level of formation of each component of the readiness of future physical education teachers for professional activity in SPD, the average evaluation of the indicators for each component is calculated. The overall level of readiness is then determined by taking the average value of the component evaluations.

Table 3 presents the summarized results of students' readiness for professional activity in SPD in the activity component.

Table 3

Distribution of students in the Control Group (CG) and Experimental Group (EG) by levels of readiness for professional activity according to the activity component

Groups	Number of students	Levels of readiness for professional activity							
		High		Above average		Average		Low	
		Number	%	Number	%	Number	%	Number	%
CG(IC)	64	0	0	0	0	9	14,06	55	85,93
CG(FC)	64	6	9,38	24	37,50	26	40,94	8	12,50
EG(IC)	63	0	0	0	0	9	14,28	54	85,7
EG(FC)	63	11	17,5	30	47,6	18	28,6	4	6,3

Table 4 presents the dynamics of the motivational component of readiness for students in the control and experimental groups, both at the beginning and at the end of the experiment.

According to Table 4, the initial level of motivation among students in both the control and experimental groups is presented in the numerator. The table shows that both groups have similar characteristics in terms of initial motivation levels. Both students in the experimental group (39%) and in the control group (38%) shows the biggest number of low level of motivation. In terms of an average level of readiness, 34% of students in the control group fell into this category, compared to 36% in the experimental group. The smallest number of first-

year students from both groups achieved a high level of development, with 28% in the control group and 25% in the experimental group.

Table 4

Dynamics of the motivational component of readiness for students in the Control Group and Experimental Group at the beginning and at the end of the experiment (in %)

Number of students	Control Group				Number of students	Experimental Group			
	high	**above average**	**average**	**low**		**high**	**above average**	**average**	**low**
n=64	28/17	16/15	29/39	27/29	**n=64**	25/51	18/4	31/34	26/11
n=64					**n=64**				

Notes:
1. Numerator – data at the beginning of the first course;
2. Denominator – data at the end of the third course.

The analysis of expert assessment, which was repeated at the end of the third year, reveals significant changes in students' attitudes towards their future professional activities. In the control group, the number of students with a high level of motivation decreased. Among (40%) of the subjects in this group, a low level of motivation was observed, while the largest percentage (43%) had an average level of motivation. However, the changes implemented in the educational process for students in the experimental group had a positive impact on the development of the motivational component. The majority of students (51%) demonstrated a high level of motivation, slightly fewer (38%) fell into the intermediate group, and only (11%) exhibited a low level of motivation to pursue a career as a primary school teacher.

At the end of the study, we calculated an integrated indicator of readiness for future physical education teachers based on three components (Table 5).

The table provide evidence to support the claim that the readiness of students who followed the experimental program turned out to be significantly better than those who received traditional training.

In terms of the motivational component, a majority (46%) of EG students demonstrated a high level, while (9%) achieved an above-average level. Within this group, 34% of future specialists were assigned to an average level, and only (11%) fell into the low level category. On the other hand, the highest number of students of Faculty of Physical Education from the CG were at the average (39%) and low (29%) levels, with (15%) at the above-average level and (17%) at the high level.

Table 5

Integrated Indicator of Readiness for Professional Activity

Levels of readiness	Group	Preparation components			**Integrated Indicator**
		Motivational	Content	Activity	
High (%)	**CG (n=64)**	17	3,13	9,3	**5,6**
	EG (n=63)	46	12,7	17,5	**25,4**
Above average (%)	**CG (n=64)**	15	34,3	37,5	**28,9**
	EG (n=63)	9	44,4	47,6	**33,6**
Average (%)	**CG (n=64)**	39	60,9	40,9	**46,9**
	EG (n=63)	34	42,8	28,6	**35,1**
Low (%)	**CG (n=64)**	29	1,56	12,5	**14,3**
	EG (n=63)	11	0	0	**3,6**

Regarding theoretical readiness, a high level was achieved by (12.7%) of EG students, with the majority focusing on above-average (44.4%) and average (42.8%) levels. No students in this group scored low in the content component. In contrast, CG had only (3.13%) of future teachers attaining a high level of theoretical readiness, while (1.56%) scored low, and the majority (60.9%) and (34.3%) were at average and above-average levels of readiness.

Among students who followed our experimental program, only (28.6%) had an average level of methodological readiness, while the remaining (47.6%) and (17.5%) achieved above-average and high levels of the activity component, respectively. In CG, the majority (40.9%) and (37.5%) were at average and above-average levels, (12.5%) were at the low level, and the fewest number of future primary school teachers achieved a high level of practical and methodological readiness.

Regarding the average indicator, which demonstrates the level of integrated readiness for future physical education teachers, there was a significant advantage for EG over the control group. Thus, after the conclusion of the pedagogical experiment, (25.4%) of EG students were at a high level, (33.6%) were at an above-average level, (35.1%) at an average level, and (3.6%) at low levels. The situation in the group that received traditional training was somewhat different. Only (5.6%) of students in this group achieved a high level, while (28.9%) and (46.9%) were at above-average and average levels, respectively.

Conclusions:

The formative pedagogical experiment revealed that:

1. The initial level of student motivation formation had similar characteristics. A majority (46%) of EG students were at a high level, (9%) achieved an above-average level, (34%) were assigned to an average level, and only (11%) fell into the low level category. In contrast, the largest number of students of Faculty of Physical Education from the CG were at the average (39%) and low (29%) levels, with (15%) at the above-average level and (17%) at the high level.

2. The results of the questionnaire conducted at the beginning of the university studies indicated that social, cognitive, and moral motives were the primary factors influencing the choice of a physical education teaching profession. Secondary motives included aesthetic, creative, and those related to the content of the chosen profession, while motives such as prestige, utility, and morality had the least influence on students' career choice. Re-questioning the same students at the end of the third year revealed that the ranking of motives remained largely unchanged in both groups.

3. The integrated indicator of readiness for future physical education teachers demonstrates the superior readiness of students in the experimental groups compared to the control groups. Specifically, the majority (68%) of future teachers in the experimental group were at a high level, while the control group (68.7%) was at an average level.

4. The changes observed as a result of the experimental methodology indicate the effectiveness of introducing our experimental program into the educational process for training future physical education teachers.

References

1. Dolbysheva N.H. Teoretyko-metodychni osnovy formuvannia znan pro fizychne zdorovia v systemi fizychnoho vykhovannia u starshoklasnykiv [Theoretical and methodological foundations of the formation of knowledge about physical health in the system of physical education among high school students]: Avtoref. dys... kand. nauk z fiz. vykhovannia i sportu: 24.00.02 / N.H. Dolbysheva; Nats. un-t fiz. vykhovannia i sportu Ukrainy. — K., 2006. — 21 s. [in Ukrainian]

2. Karpiuk I. Formuvannia znan studentiv na zaniattiakh fizychnym vykhovanniam [Formation of students' knowledge in physical education classes] / Inna Karpiuk // Sportyvnyi visnyk Prydniprovia. – Dnipropetrovsk, 2004. – № 7. – S. 115–116. [in Ukrainian]

3. Stepanko A.V. Pidhotovka maibutnikh uchyteliv pochatkovykh klasiv do fizychnoho vykhovannia uchniv [Preparation of future primary school teachers for physical education of students] : avtoref. dys... kand. ped. nauk: 13.00.04 / A.V. Stepanko / Ternop. nats. ped. un-t im. V.Hnatiuka. — T., 2009. — 23 s. [in Ukrainian]

4. Sushchenko L.P. Teoretyko-metodolohichni zasady profesiinoi pidhotovky maibutnikh fakhivtsiv fizychnoho vykhovannia ta sportu u vyshchykh navchalnykh zakladakh [Theoretical and methodological principles of professional training of future specialists in physical education and sports in higher educational institutions] : Avtoref. dys. d-ra ped. nauk: 13.00.04 / L.P. Sushchenko; In-t pedahohiky i psykholohii prof. osvity APN Ukrainy. — K., 2003. — 45 s. [in Ukrainian]

5. Tvelina A. A. Kryterii sformovanosti spetsialnykh rukhovykh navychok u maibutnikh uchyteliv fizychnoi kultury [Criteria for the formation of special motor skills in future teachers of physical education] / A. A. Tvelina. // 7. Fizychne vykhovannia, sport i kultura zdorovia u suchasnomu suspilstvi : zb. nauk. pr. Skhidnoievrop. nats. un-tu im. Lesi Ukrainky. – 2013. – №1. – S. 75–79. [in Ukrainian]

6. Tymoshenko Oleksii Valeriiovych. Optymizatsiia profesiinoi pidhotovky maibutnikh vchyteliv fizychnoi kultury [Optimizing the professional training of future teachers of physical education] : monohrafiia / Oleksii Valeriiovych Tymoshenko; V.o. Nats. ped. un-t im. M. P. Drahomanova.– K. : NPU im. M. P. Drahomanova, 2008.– 421 s. [in Ukrainian]

7. Fizychna kultura 1–4 klasy. Fizychna kultura dlia zahalnoosvitnikh navchalnykh zakladiv. 1–4 klasy [Physical education 1–4 grades. Physical education for general educational institutions. Grades 1–4] / T. Yu. Krutsevych, V. M. Yermolova, L. I. Ivanova, O. D. Kryvchykova, H. H. Smolius. — K. : Litera LTD, 2013 [in Ukrainian]

8. Fizychna kultura [Physical education] [Tekst] : prohr. dlia 10-11 kl. zahalnoosvit. navch. zakl. : prof. riven : riven standartu / [T. Yu. Krutsevych ta in.] ; M-vo osvity i nauky Ukrainy. - K. : [Polihrafknyha], 2010. - 127 s. [in Ukrainian]

9. Fizychna kultura v shkoli: navch. prohr. dlia 1–4, 5–9 klasiv zahalnoosvitnikh navchalnykh zakladiv [Physical education at school: education. program for grades 1–4, 5–9 of general educational institutions]/ za red. T. Yu. Krutsevych – K. : Litera LTD, 2013. – 352 s. [in Ukrainian]

10. Tsentr dystantsiinoho navchannia TNPU [Elektronnyi resurs] Himnastyka ta metodyka yii vykladannia [Distance learning center of TNPU [Electronic resource]

Gymnastics and its teaching methods] // – Rezhym dostupu do resursu: http://elr.tnpu.edu.ua/course/index.php?categoryid=34 [in Ukrainian]

11. Shyian B. M. Teoretychno-metodychni osnovy pidhotovky vchyteliv fizychnoho vykhovannia v pedahohichnykh navchalnykh zakladakh [Theoretical and methodological basis of training of physical education teachers in pedagogic educational institutions] : avtoref. dys. ... na zdobuttia nauk. stupenia dokt. ped. nauk : spets. 13.00.04 „Teoriia i metodyka profesiinoi osvity" / B. M. Shyian. – K., 1997. – 50 s. [in Ukrainian]