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The Influence of Sports Disciplines on the Development of Key Competencies of Future Physical Education Teachers

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Abstract--The reform of primary school education caused significant changes in the trajectories of the physical education. This study was aimed at identifying the ways of forming professional competencies among students as an indicator of the quality of knowledge. During the research, the following methods were used: the analysis of literature sources, laws and regulations, normative documentation, analysis, design, modeling, survey, observation, generalisation of pedagogical experience of specialists. The authors developed scientific and methodological material regarding the problem of the formation of professional competencies among students. The ways of formation of professional competencies among students were revealed. The effectiveness of the proposed approaches to the formation of professional competencies as an indicator of the quality of students' knowledge was checked. Methodical materials and practical tasks that contain recommendations which will help teachers to create an educational environment, provide various forms of integrated learning, involve families of children in pedagogical interaction, evaluate their own practice, monitor student development were developed.

Keywords---educational innovations, learning outcomes, school education, students' needs, unsystematic knowledge.

Introduction

Active changes in activities in the life of each person leads to the idea that health and a healthy lifestyle are the source of an active search self-search in society, a balanced attitude to changes in the environment and in activities. All these challenges gave reason to share their ways to implement physical education. The difficulty in finding an approach to students of secondary educational institutions indicates a decrease in the importance of physical exercises and physical activity in the life of every child. A physical education teacher is a carrier of social skills that form a culture and a healthy lifestyle (Rabat et al., 2018; Shandruk et al., 2019).

The trajectories of the physical education have undergone significant changes during the reform of primary school education. The changes that have taken place in the school environment provide an opportunity to reconsider the ways of providing educational services to future physical education teachers (Rau et al., 2008; Papastergiou, 2009). The requirements of the "Physical Education" curriculum for secondary schools make it possible to understand that physical education as a subject should form the experience of educational, cognitive, practical and social activities in students. The importance of the "Physical Education" subject has many approaches to solving the tasks set by the curriculum (Eurydice Report..., 2013).

The physical education teacher should be multifunctional, as he should support and develop the educational environment of students. The system of teacher training is gaining new momentum and aims to link theoretical learning with the consistent consolidation of the acquired material in the school environment (Werdistira & Purnama, 2020; Susanty et al., 2021). Successful professional activity of specialists in physical education and sports is determined by competence, which provides understanding of students' needs, selection of modules, optimal variety of tools and correction of the educational process in physical culture (Mykhalevskiy & Kychak, 2019).

The purpose of this study is to identify ways of forming professional competencies among students as an indicator of the quality of knowledge. The authors searched for an explanation and proof of the logical relationships and coordination, visually observed, theoretically analysed and experimentally substantiated facts, phenomena, processes, as a result of which new knowledge about the object of study, methods and means of their influence on the physical development of a person are revealed. Research objectives: to develop scientific and methodological material regarding the problem of the formation of professional competencies among students; to reveal ways of formation of professional competencies among students; check the effectiveness of the proposed approaches to the formation of professional competencies as an indicator of the quality of students' knowledge.

The training of specialists in physical education and sports as an object, which should use different approaches to spark the interest in physical exercises, allows to determine the optimal socio-psychological approaches to the training of students. It is worth noting that to date, many researchers have devoted their research to physical education in primary school, namely: [Ilyina \(2018\)](#); [Melnyk \(2015\)](#); [Kondratska \(2017\)](#). It is known that scientists [Karasevich \(2018\)](#); [Ogienko & Lysenko \(2016\)](#), studied the formation of readiness for professional activity of a physical education teacher. Theoretical and methodological principles of professional training optimisation for physical education specialists are considered in the studies of [Maksymchuk \(2016\)](#), [Kondratska \(2017\)](#), [Protsenko \(2018\)](#), [Samsutina \(2017\)](#), [Chepelyuk \(2017\)](#). Competence is a standard of experience, actions, knowledge, skills, abilities, creativity, emotional and value activities, and competence involves the level of achievement of personal competencies ([Mikhailov et al., 2018](#)). Researchers [Maksymchuk \(2016\)](#); [Chepelyuk \(2017\)](#), demonstrate excellent approaches to determining the internal structure of professional competence of a teacher.

[Pometun & Sushchenko \(2017\)](#), placed great importance on key competencies, characterising them as a requirement inherent in all members of society regardless of gender, class, race, culture, marital status, language and to be consistent not only with ethnic, economic and cultural values of society. [Ovcharuk & Bykov \(2017\)](#), considers competence to be the result of acquiring competencies, and that the concept of competence covers not only cognitive and operational-technological components, but also motivational, ethical, social and behavioral.

It should be noted, that the analysts of professional competencies are [Nicholas \(2004\)](#); [Goldman \(2004\)](#); [Weizsaecker & Wijkman \(2018\)](#), analyse and investigate the issues of forecasting and justification of competencies that will ensure the success of professional activities in the future. Note that a number of scientists, such as [Bibik \(2018\)](#); [Kondratska \(2017\)](#); [Stepanchenko \(2015\)](#); [Chepelyuk \(2017\)](#), have developed valuable guidelines that will help teachers to create an educational environment, provide various forms of integrated learning, involvement of children's families and other partners to pedagogical interaction, to evaluate own practice in the context of educational innovations, to monitor students' development.

Materials and Methods

The analysis of literature sources, laws and regulations, normative documentation, analysis, design, modeling, survey, observation, generalisation of pedagogical experience of specialists was used as a methodological apparatus for conducting the research ([Stevens, 2004](#); [Savina, 2015](#); [Goroizidis & Papaioannou, 2016](#)). According to this goal, the authors proposed an experimental method of teaching – to obtain and process information. Practical methods: explanation, demonstration, study in parts and in general, error correction, performance analysis, uniform, repeated, variable, competitive, playing. Methods of psychological training: persuasion, explanation, example, praise, self-suggestion.

The study was conducted from 2019 to 2020. The study involved 210 students of 1st and 2nd courses enrolled in the educational-professional program “014 Secondary Education (Physical Education)”. In studies in the field of physical education and sports, statistical dependence is used. Study of statistical dependence makes it possible to establish certain patterns between the studied values, which is important in the practice of teachers, trainers, etc.

A statistical method, correlation analysis, is used to analyse the relationships between quantities. The correlation is that in statistical dependencies, the average value of one quantity varies depending on the average value of another. The main tasks of correlation analysis are: determining the form of the relationship; determining the closeness of the relationship; determining the direction of the relationship. Knowledge of the form of dependence is important for the subsequent choice of the formula for calculating the correlation coefficient.

Determining the closeness of the relationship. The closeness of the relationship between the measurement results is characterised by a special indicator called the correlation coefficient (r , ρ , R , r_{xy} , $r_{xy,z}$). To determine the relevance of the problem, the authors used methods of mathematical data processing by Pearson, which made it possible to conduct a correlation analysis and verify the relation of quality indicators of students' knowledge of sports and their success.

Table 1
Correlation analysis of students' quality of knowledge and performance indicators
(according to Brave-Pearson)

No.	X	Y	$(x_i - x_c)^2$	$(y_i - y_c)^2$	Average coefficient of variation
1	101	73	729	2.777778	0.037431784
2	120	70	64	21.77778	0.039036003
3	115	77	169	5.444444	0.035487275
4	135	75	49	0.111111	0.036433603
5	142	76	196	1.777778	0.035954213
6	155	77	729	5.444444	0.035487275
Average value	128	74.66666667	322.6667	7.466667	-
Standard deviation			17.96292	2.73252	-
Brave-Pearson correlation coefficient				0.505869	-

To determine the correlation coefficients, there are certain mathematical formulas, the use of which is determined by the following conditions: the scale in which the values are measured; the number of measured results; compliance of the sample with the normal distribution. If the measurement is performed on a scale of relations or intervals, then the linear relationship to calculate the correlation coefficient using the Brave-Pearson formula (Table 1):

$$r = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{n\sigma_x\sigma_y} \quad (1)$$

where \bar{x} , \bar{y} – arithmetic mean of the considered values; n – sample size,

$$\sigma_x = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}} \quad (2)$$

$$\sigma_y = \sqrt{\frac{\sum_{i=1}^n (y_i - \bar{y})^2}{n-1}} \quad (3)$$

(2) and (3) are standard deviations.

To check the meaningful relationship between the evaluation of the quality of students' knowledge and performance, a Spearman's rank correlation was calculated. Measurement in the order scale determines the use of Spearman's rank correlation coefficient (Table 2):

$$\rho = 1 - \frac{6 \sum d^2}{n(n-1)(n+1)} \quad (4)$$

where

$$d = d_{x_i} - d_{y_i} \quad (5)$$

the difference of ranks of this pair of indicators x and y; n is the sample rate.

Table 2
Rank coefficient of correlation of indicators of students' quality of knowledge and performance (according to Spearman)

Average value		Ranks		Rank difference	Square of rank difference	Total d ²
x _i	y _i	x	y	d	d ²	d ²
101	73	6	5	1	1	1
120	70	4	6	-2	4	4
115	77	5	2	3	9	9
135	75	3	4	-1	1	1
142	76	2	3	-1	1	1
155	77	1	1	0	0	0
Spearman's rank correlation coefficient						0.542857

The results obtained by calculating the statistical dependence are presented and analysed below

Results and Discussion

The educational process of training future specialists in physical education and sports consists of the formation of knowledge, skills, and learning outcomes. Therefore, the formation of key competencies, namely: educational, organisational, informational, communicative, instrumental, research depends on the content of disciplines and its content. The obligatory component of education is the choice of criteria of success in our case it is information-cognitive, dual-adaptive, evaluative-effective (Rasch & Schnotz, 2009; Aziz et al., 2012).

One of the approaches to the formation of key competencies of students is a multifunctional approach. We have developed criteria for evaluation of students' knowledge of sports and pedagogical disciplines: "Gymnastics and methods of its teaching", "Athletics and methods of its teaching", "Sports games and methods of their teaching", "Swimming and methods of its teaching", "Health-improving types of physical activity", as well as theoretical courses "Introduction to the specialty", "Professional skills", "General theory of training athletes".

One of the tasks is to determine how students develop flexible knowledge to teach physical education. Note that the content of each discipline consisted of theoretical and practical classes. The authors identified six indicators that needed to be formed in students to determine the quality of their knowledge (Figure 1).

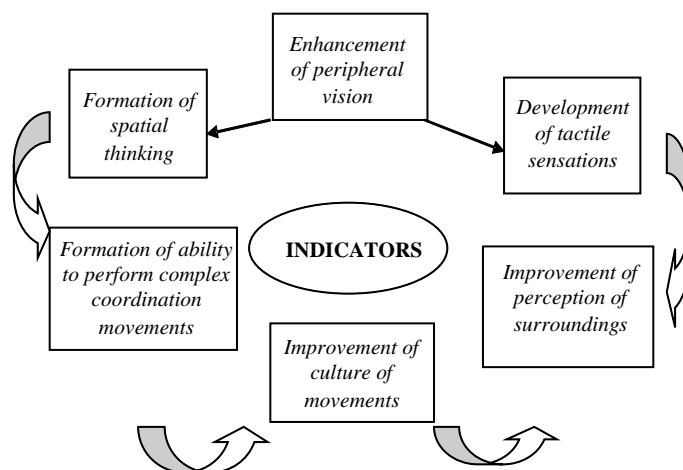


Figure 1. Indicators of the formation of the knowledge quality in students

The results of empirical studies indicate a low level of use of acquired competencies by students in pedagogical practice, namely: modern students required a wide spatial thinking, also suitable for students exercises to strengthen peripheral vision, tactile sensation, the ability to master complex coordination movements. Students also needed the ability to perceive and evaluate the environment (Vapniarchuk et al., 2019; Tsyenko et al., 2019).

The largest total low performance rates were observed in students from the level of formation of spatial thinking and peripheral vision; many students have problems with spatial thinking, which requires correction in relation to the needs of students in physical education classes; among students there was a high frequency of unmotivated use of exercises that were not very interesting to students, the implementation of these exercises, on the one hand, were interesting only to boys, and on the other – girls had to be offered other sets of exercises. The results of the average values of the formation of the quality of knowledge in students and their performance are shown in Table 3.

Pearson's correlation analysis included data on six variables, as well as expert performance evaluations. The average linear relationship ($r = 0.50$) was found

between the indicators of knowledge quality and the evaluation of students' performance in sports. It turns out that it cannot be said that student performance evaluations depend only on the quality of knowledge of sports disciplines. And it would also be wrong to say that the quality of knowledge in sports is associated with low student performance (Figure 2).

Table 3

The results of the average values of the formation of students' knowledge quality and performance

Indicators of the formation of knowledge quality in students	Number of agreed grade points	Grade point summary
Spatial thinking	101	73
Peripheral vision	120	70
Complex coordination movements	115	77
Tactile sensation	142	75
Surroundings	135	76
Culture of movements	155	77
Average value	128	74.7

To test the hypothesis, Spearman's rank correlation was calculated, which showed no significant relationship between the evaluation of student performance and the quality of knowledge in sports disciplines. The correlation coefficient in the sample of 210 students is $r = 0.54$. Thus, the hypothesis is confirmed. There is a link between student academic performance and the quality of sports performance. A student with a low level of academic performance can perform exercises at a high level, underestimating the importance of indicators of the quality of knowledge in sports.

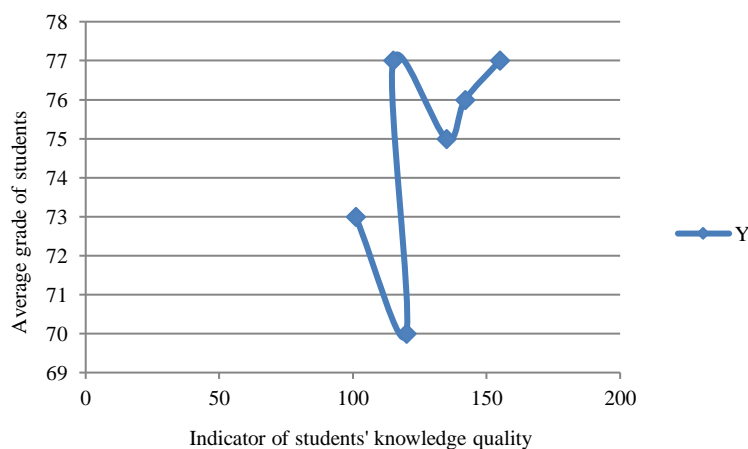


Figure 2. Correlation analysis of indicators of quality of students' knowledge and their performance

The results of the analysis of students' performance gave grounds to claim that a survey conducted in higher education institutions showed students' understanding of the need to have flexible skills in sports. The authors suggested

that if at the first information and cognitive stage of evaluation to issue a monitoring card for each student for the process of evaluating the quality of knowledge in sports disciplines, it would improve the level of students' performance.

Then, in the second dual-adaptive stage, students during practical classes will have the desire and need to realise their potential to master the technique of physical exercise and improve and consolidate motor actions. Personality-oriented approach of the student to the future professional activity created a number of motivations: interest, insight into the inner world of the child, comparison of the acquired skills with the needs of the child's life.

At the third stage, students mastered the theoretical disciplines, which gave them the opportunity to deepen the acquired knowledge and skills and develop soft skills. According to the results of measurements of the formation of the proposed indicators – the functional dependence of the indicators has been proven. Analysis of the learning outcomes in sports has shown that trainees have mainly unsystematic knowledge to meet the needs of their future students, the so-called superficial level of understanding of students' needs in physical education and sports, respectively, there is a need to develop flexible (soft) skills, and so it is necessary to expand the content of competencies necessary for an undergraduate to effectively conduct classes in physical education and sports (Liu et al., 2011; Chia et al., 1999).

Conclusion

Therefore, the analysis of the educational process of training future specialists in physical education and sports confirmed the hypothesis of the need to clearly define ways of forming professional competencies in students as an indicator of the quality of student education. Information-cognitive, dual-adaptive and evaluative-effective stages of forming the quality of students' knowledge have a positive effect on the consolidation of professional competencies in students and reveals the linear relationship between the quality of students' knowledge and their academic performance. The average linear relationship ($r = 0.50$) was found between the indicators of knowledge quality and the assessment of students' performance in sports. A student with a low level of success can perform exercises at a high level, underestimating the importance of indicators of the quality of knowledge in sports disciplines.

Analysis of learning outcomes in sports showed that undergraduates have mainly unsystematic knowledge to meet the needs of their future students, the so-called superficial level of understanding of students' needs in physical education and sports, respectively, there is a need to develop soft skills, so it is necessary to expand the content of competencies necessary for the student to effectively conduct classes in physical education and sports (Liao, 2003; Malterud, 2001). Methodical materials and practical tasks developed by the author contain recommendations that will help teachers to create an educational environment, provide various forms of integrated learning, involve families of children and other partners in pedagogical interaction, evaluate their own practice in the context of educational innovations, monitor student development.

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