

## Modern requirements to the content selection of professional and applied physical education of students studying at technical and technological colleges

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### Abstract

The relevance of the research is substantiated by the fact that a persons' successful learning and vocational training depends on physiological and psychological suitability to labour, i.e. on corresponding inclinations and abilities. In this regard, the article aims to prove the necessity of an appropriate selection of means and methods for professional and applied physical education of students – future engineers and technologists. The leading method of the research was sociological questioning among students of technical and technological colleges; it revealed respondents' intellectual and emotional nervous tension, and preference for passive forms of rest. The article provides a structure of requirements for physical and mental education of the studied groups; tasks for professional and applied physical education of students – future experts; selection of means and methods of professional and applied physical training of future engineers and technologists at higher education institutions. Materials of the article are of practical value for teaching staff of technical and technological colleges when selection and structuring of students' professional and applied physical educations are considered.

Keywords: professional and applied physical education, physical education, on-the-job exercises, physical exercises during the working day

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## 1. Introduction

Continuous technical progress specifies requirements for higher school students in the field of versatile physical fitness. Now, organizing educational process, every higher education institution has a task to train specialists at a high scientific and technical level with application of modern methods of educational process arrangement. However, professional competences can be realized only in case of young specialists' good health and high working capacity that can be acquired due to regular and specially organized physical culture and sports activity. Researches show (Kabachkov, 1996; Polyansky, 1999; Martynova, 2014) that general physical education of specialists cannot solve completely these issues since modern highly skilled work demands a certain profiling of physical training according to peculiarities of a profession. Therefore, students' physical education at higher education institutions has its peculiar features: its specific orientation as a subject of curriculum is defined both by general social tasks, and by requirements imposed by specialty for which the student is trained as well. Hence, students' physical training has to be conducted with conditions and nature of their forthcoming professional activity taking into account; it has to comprise elements of professional and applied training, i.e. to use means of physical culture and sport to develop students' professionally necessary physical qualities, skills, knowledge, and to increase resistance of an organism to impacts of environment.

The program of students' physical education at higher educational institutions provides professional and applied physical training which aims to promote the development of physical qualities and skills necessary for students' successful work in the area of expertise.

However, professional and applied physical training in the system of students' physical education is connected with a number of difficulties; one of them is determined by essential distinctions in conditions and nature of work either in an office or on a production site, and, therefore, various contents of physical education program for students of each faculty are required. That is why departments of physical culture and main chairs of higher education institutions are recommended to work out specific contents of students' professional and applied physical education. Such approach considers peculiar features of students' future professional activity.

Representatives of many specialties deal with a complex problem of personnel training: teachers, psychologists, physiologists, engineering and technical staff, etc. It has been established in some works (Siris, Kabachkov, 1988; Pustova, Skachkov, Tsaryov, 2008; Manzheley, 2010) that success of person's education and training for professional activity within a limited period of time depends to a certain degree on the availability of physiological and psychological suitability to this or that kind of work, i.e. on corresponding inclinations and abilities. Thus, it is necessary to distinguish actual abilities i.e. which have already been shown in a certain activity, and potential, that have not yet been shown, but assumed on the basis of abilities close to the structure of kinds of activity (in the field of sport or others).

The paper covers those scientific, methodical, and organizational provisions which can become a basis for a unified and rational approach to the solution of specific issues of professional and applied physical education of future graduates of technical and technological colleges.

## 2. Literature Review

The quality of training at higher education institutions is connected, to some extent, with the issue of preliminary determination of applicants' professional suitability to certain professions and specialties as there is quite a wide list of professions that impose high requirements for personal qualities.

In this regard, many authors (Aseyev, 1974; Rayevski, 1985; Kuramshin, 2005; Suvorov, Platonova, 2006) propose to single out "key" functions for each profession and specialty which specify

manifestation and development of competences peculiar for this or that profession; i.e. professional suitability has to be defined by the compliance of person's psychophysiological opportunities with requirements of a specific profession.

However, considering the issue of professional and applied physical education of future experts, and understanding the importance of preliminary definition of psychophysiological aspects of applicants' professional suitability, teachers of physical education have to pay attention to the development of physical and specific qualities, to the formation of applied abilities and skills necessary for students.

According to prominent physiologists of labour (Navakatikyan, 1984; Medvedev, 1984; Serkov, 1987; Krushelnitskaya, 2000), determination of psychophysical suitability is a complex and insufficiently developed problem as there are no absolute criteria yet by means of which it would be possible to establish "accurate quantitative distinctions between vocational suitability and maladjustment"; moreover, according to summary data of many researches, suitability to different types of work is characterized by different indicators. Besides, in relation to professions which do not impose exclusive requirements for physiological functions, the question is not about absolute professional suitability, but about forecasting of relative training success in labor skills and mastering a profession. However, in specialized literature (Ilyinich, 1978; Lomov, 1986; Sakun, 2008), there are instructions on economic feasibility to conduct complex researches on scientific development of job descriptions and substantiation of person's potential opportunities, abilities for specific types of work that is definitely connected with theoretical, methodical, and organizational issues of students' professional and applied physical education.

### **3. Results and Discussions**

#### **3.1. Requirements for physical fitness**

Requirements for workers' physical fitness are not the same for all professions. They significantly change in connection with the level of material and technical resources of manufacturing, and ways of separate labor operations. Therefore, physical fitness cannot be limited to a narrow professional orientation. It has to be many-sided and versatile, with various qualities and skills developed.

Transfer of physical qualities of movement skills to production activity makes one of the main and most complex problems having paramount value for theory and practice of physical education in general, and for physical training of future experts, in particular. The following should become the goals of most importance for future leaders' physical education: strengthening of health, improvement of physical development, formation of various movement skills to be used in labor movements later on. Requirements for first-year and second-year students' physical fitness have to be of a double nature: first, versatile physical development with all variety of movement skills, abilities and theoretical knowledge, and, secondly, achievement of particular sport-technical results due to students' inclination to this or that kind of sport. Physical qualities should be specified in compliance with the character of future activity at senior courses, when specialization takes place. Students of Kazan Federal University have on-the-job training at enterprises of the Republic of Tatarstan where they face a set of various specialties demanding a big variety of physical qualities and skills. Students, first of all, are required to have such qualities as force, endurance, speed, and dexterity. It is obvious that students doing sports get accustomed to the rate of work quicker, they get exhausted slower; the period of occupational adaptation is shorter. Therefore, professional and applied physical education should be conducted from the first to the last year of studies.

### **3.2. Contents of students' professional and applied physical education**

The chair of physical education and the chair of theoretical fundamentals of physical culture and health, and life safety have to familiarize students with different kinds of manufacturing they are trained for. Most characteristic movement skills and physical qualities should be developed since the first-year of study; theoretical knowledge of practical application of physical culture in life and at work should be provided. Thus, professional and applied orientation of physical education consists of the following since the very beginning: introductory talk about a general plan of physical education and a place of professional and applied training at the institute; the value of physical exercises in general and applied ones, in particular, is explained; skills of making up complexes of individual exercises are cultivated. Due to the requirements for graduates from technical and technological higher education institutions, the chair solves the following problems of students' professional and applied education.

first year of study – cultivation of necessary theoretical knowledge in the field of professional and applied physical education; development of various movement skills of qualities (force, speed, flexibility), and abilities to breathe correctly, to hold and operate one's body.

second year of study – profound theoretical knowledge, improvement of power qualities, development of endurance, flexibility, dexterity; improvement of comprehensive physical development. The chair of theoretical fundamentals of physical culture and life safety conducts the study of features of manufacturing and labour conditions.

third year of study – during on-the-job practice students check themselves what muscles and systems participate most intensively in labor processes; strengthening of groups of muscles that are subject to exhaustion in the course of work; improvement of versatile physical development with emphasis on strengthening of groups of muscles that intensively participate in labor processes. The same task is solved during the fourth year of study.

The study of labor conditions at enterprises of technical and technological character resulted in the development of following exercises considered most effective from the point of view of professional and applied orientation:

- Machine operators have to do exercises aimed to correct deep breath development and to strengthen muscles of back for correct posture; exercises for shoulder girdle and wrists for free control of levers, handles, and valves; exercises to develop fast reaction to various signals of automatic devices;

- Operators have almost the same working conditions as machine operators, but their movements are more limited. Therefore, necessary physical activity for large groups of muscles are recommended for them: exercises to strengthen muscles of a shoulder girdle and back; exercises to increase resistance of the body to the impact of specific working conditions (gas contamination of rooms, temperature conditions, dust content, noise, penetrating radiation etc.).

At the same time, it is important to consider an unequal structure of extra working and free time of men and women, people of different age, engineers and managers on different days of the week, month, season, and, consequently, various opportunities of physical culture as a means of recreational activities in free time. (Ilyinich, 1978, p. 25)

It should be noted that available recommendations on physical culture for this purpose are insufficient. There is a large number of works (Popov, 1986; Kholodov, Kuznetsov, 2001; Askhamov, 2014) devoted to industrial gymnastics for representatives of various, but not all groups of professions, and there are just few recommendations on applications of these means in free time to maintain professionally important physical qualities and to recover performance capability. Therefore, a complex analysis of working and off-duty time of future experts employed in various spheres has to be conducted to specify the contents of professional-applied physical education as basic labour and human's activity in free time are objectively interconnected.. The mentioned linkage emphasizes that

methodically justified application of physical culture can beneficially affect recovery and increase of professional efficiency of a human in free time. Future engineers should be provided with corresponding knowledge and techniques of these means application even during the years of study in educational institutions.

### **3.3. Forms of students' professional and applied physical education**

Students' professional and applied physical education is conducted through the following forms: studies on gymnastics in which profound foundation of comprehensive physical training are developed; drawing up of individual gymnastics complexes; students are given tasks to make up complexes of industrial gymnastics after acquaintance with manufacturing; track and field athletic exercises to develop necessary qualities of speed and endurance; extra curricula activities - tourism, wide use of natural factors in mass health improvement that is especially valuable for workers of harmful productions; acquisition of instructor's skills necessary for future leaders of manufacturing for introduction of physical culture in labor process and in life of employees.

Therefore, the system providing a professional and applied orientation implies obligatory solution of general and specific problems of physical education. The stated above does not exclude the expediency to use directly applied exercises, techniques and actions including classes in such sections of physical education as swimming, skiing, sports games, etc.

Thus, the essence of special orientation of classes consists in organic combination and most effective use of means and methods of versatile and special physical education to ensure the maximum of future engineer's physical and psychological readiness to perform production-labor tasks and to provide high productivity and labor activity throughout labor life.

In this regard, further scientific substantiation and development of the contents of future experts' professional and applied physical education are of particular importance as it has both social-economic and personal value.

### **3.4. Results of sociological poll**

The main criteria to organize future experts' professional and applied physical education are the volume and character of physical and mental activities of people working in this sphere of expertise. The teaching staff and students studying at the faculty of physical culture conducted a social research to obtain necessary data in 2014. 991 engineers (666 men and 325 women), working at plants and enterprises of the Kamsky manufacturing cluster (JSC Ford Sollers Holding Company, JSC Nizhnekamskneftekhim, JSC "KAMAZ", JSC MA "ELAZ", JSC "TANEKO") participated in it.

Data were processed by the chair of theoretical fundamentals of physical culture and health, and life safety of Elabuga Institute of Kazan Federal University.

All engineers were distributed into three groups according to their positions: common engineers - 452 (45,6%), mid-level engineers (heads of small groups) – 407 (41,1%), and top management (heads and deputy heads of enterprises, chief engineers, chiefs of workshops, chief foremen) – 132 (13,3%).

The majority of those examined had work experience of up to 20 years.

The results showed that 74,3% of specialists in electronics, automatic equipment and electrical engineers spend their working day in enclosed rooms, have little physical activity, work in a sitting position. Experts in radio electronics (29,7%), deal with harmful substances. 41,3% of experts in automatic equipment spend the whole working day at the control panel or computer.

The item of the questionnaire "What physical qualities help to cope with work better?" was answered in the following way: 78,2% of the respondents gave preference to physical endurance, and

23,7% to speed of reaction. As for mental qualities that help engineers more is the ability to concentrate attention (46,5%), and ability to control negative emotions.

The main applied skill that electricians singled out was exact movements of hands; experts in automatic equipment and radio electronics specified exact and fast movements by fingers, and response to light digital signal values.

It appeared that during a working day 50% of engineers feel easy, and 36,9% - strongly expressed fatigue main reasons of which are intellectual and neuro-emotional loadings connected with manufacturing intensity and insufficiently good sanitary-hygienic conditions, noise, in particular. Fatigue is characteristic for all experts of specified categories (85,0%); it is generally expressed in inability to concentrate attention.

Though most of engineers spend their working day in enclosed space in sitting positions, however, 81,1% prefer passive kind of rest to fight fatigue. Only 1.7% does industrial gymnastics

81,5% of examined engineers consider physical exercises necessary, 16% have no specific opinion, and 2,4% believe that physical culture cannot improve their working capacity. Only 34,5% prefer rest with increased physical activity in their free time, others have passive kind of rest. Tourism, hunting and fishing (29%), sports (12,1%) are most popular with engineers having active kind of rest.

28,5% do morning exercises occasionally, only 9,6% do them regularly. Some (24,6%) like physical activity in a garden. The question "Is your usual mode of movement enough for normal functioning of the body?" was responded in the following way: 52,8% answered that they did not have enough movement activity in winter, 32,6% found it difficult to answer.

The obtained results showed that preparation for GTO norms was insufficiently arranged, hence, only 17,3% of engineers passed them.

The question of concern is that 48,6% of examined experts (people of 29 – 39 years old) estimated their health only as satisfactory, and 7,9% - as excellent. There are more health complaints connected with nervous (38,4%) and cardiovascular (27,5%) systems. 50% of engineers were on sick leaves within a year due to illness.

According to researches, future experts need knowledge in physical culture and sport: 39,5% of them had to resolve issues of physical culture and sport arrangement at their working places, and 68,3% felt lack of specific knowledge in this question.

Week budget of time was investigated to determine the place which physical culture and sport take in engineers' free time; questionnaire was used to research week budget of time.

The obtained data showed that 27,1%, had 2 hours of free time on working days, 54% had 3 - 4 hours, others had more. 20% of engineers spend about 30 minutes on physical culture and sport on working days, 7,1% spend about 1 hour, and 5,7% spend up to 2 hours.

An opportunity to increase physical activity due to walking to and from work is used to a little extent. In particular, 38,2% use only transport, 54,8% walk only about 20 minutes. Besides, engineers do not spend enough time on walking to improve health (79,5% do not walk at all).

The number of those exercising physical activity decreases at weekends. Despite the fact that the amount of free time reaches 7 - 8 hours, engineers spend it passively (66,6% do not go in for physical culture at all).

#### 4. Conclusion

The stated above results in the following conclusions:

1. Though the main reason for fatigue of all studied experts is not physical, but intellectual and emotional nervous tension, engineers prefer passive forms of rest in working and free time to fight against exhaustion.

2. The research specified the structure of requirements for physical and mental fitness of the studied groups of engineers; that gives the opportunity to formulate tasks of students' professional and applied physical education:

a) Lessons of theoretical character should reveal methodical principles of physical education, mechanisms of exhaustion processes (intellectual and physical), principles of active recreation, hygienic bases of physical and mental labor organization in more details; they have to teach to make up complexes of industrial and morning exercises for people of mental labor, to report data on physical culture and sports work at working places, and on physiology of scientific labor organization;

b) Lessons of practical training should pay more attention to students' consciousness and activity, to use effective methods and techniques for comprehensive physical preparation; emphasis on the development of general endurance and speed of reaction, coordination of movements of arms should be made;

c) Resistance to atmospheric impacts and adverse factors of production environment should be increased;

d) Ability to focus and distribute attention, to control negative emotions, and to cultivate volitional qualities should be developed;

e) Supplementary home assignments and exercises should be arranged; they have to be connected with specific material of practical and theoretical training. Permanent supervision should be exercised to strengthen skills and abilities to do physical exercises.

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