



Ergonomic Features of Training and Retraining of Teachers

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Abstract: The article provides a theoretical justification of the content of pedagogical ergonomics, theoretically justified organizational and pedagogical conditions for the implementation of the ergonomic approach in the educational process.

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1. Introduction

Today, the education system is characterized by the following trends: a sharp increase in demand for education, which significantly exceeds the capabilities of educational institutions; maintaining the quality of education with an increasing volume and complexity of knowledge; the trend to increase computer jobs changes not only the functions of the teacher, but the entire educational process.

The analysis of scientific research shows an increased attention to the consideration of ergonomic problems of education. The need for scientific analysis and solutions regarding the creation of an ergonomic educational conditions determined by the contradiction between the need for scientific ergonomic justification of the educational process and a lack of understanding of the holistic theory of pedagogical ergonomics, and the contradiction between the expectations of consumers of educational services and imposed regulations on the one hand and the present state of the educational institutions are not always able to provide comfortable conditions for realization of the functions of education, on the other.

One of the new directions in pedagogical theory and practice has become pedagogical ergonomics. The prerequisite for the emergence and development of pedagogical ergonomics was the objective need for an ergonomic approach to the study of the educational process as a complex system object.

The expansion of the scientific sphere of pedagogy was achieved as a result of the synthesis of three areas of science and practice – pedagogy, psychology and ergonomics. This synthesis served as a starting point for identifying a new understanding of pedagogical activity, the design of educational space

in accordance with ergonomic indicators and appropriate educational technologies. The emergence of pedagogical ergonomics should not be seen as an attempt to replace the functions of pedagogy, psychology and physiology, but as a natural process of the emergence of a new field of knowledge.

In order to study the concept and essence of ergonomics as a science, based on the analysis of scientific works by B. F. Lomov, A. N. Leontiev, V. p. Zinchenko, V. M. Munipov, O. A. Krylov, G. M. Zarakovsky, K. Marrell, V. singleton, and others, it is concluded that pedagogy and ergonomics have common goals – improving the effectiveness of educational activities, preserving health (safety), personal development (comfort, satisfaction with the content, forms, results of activities).

2. Material and Methods

Ergonomics as a comprehensive science studies the capabilities and characteristics of a person while working in a specific work environment to create such conditions, methods and forms of work that contribute to productive, reliable and safe work and at the same time comprehensive personal development.

We interpret this concept as follows: pedagogical ergonomics is an applied branch of pedagogy that considers the pedagogical process as an ergonomic system "teacher-student – learning tools-environment", setting out the conditions and developing requirements for the organization of the educational process [1].

The object of study of pedagogical ergonomics is the functional structure of the system "teacher-student – learning tools – educational subject environment". The subject of pedagogical ergonomics as a branch of

pedagogy is the educational and educational activity of the teacher and the cognitive activity of the student in the process of interaction with learning tools and in conditions of significant influence of environmental factors. Thus, the most important feature of pedagogical ergonomics is the continuity of the human factor and the factors of the educational environment, and the identification of features of this synthesis determines the essence of pedagogical ergonomics as a branch of pedagogical science.

Complex criteria of optimality in pedagogical ergonomics take into account its essence, reflect the degree of system efficiency (accuracy, reliability, performance) and compliance with human psychophysiology (safety for the health of the teacher and the student, the level of tension and fatigue, emotional impact on the process of activity of the teacher and the student). In other words, the criteria take into account the interrelated influence of psychophysiological, physiological, anthropometric and hygienic factors on the subjects of the educational process, which are determined by the corresponding parameters of the educational environment [2, p. 251].

The ergonomic approach is the implementation of ergonomics requirements for the organization of the educational process. An ergonomic approach is to target the "human factor" is full of fitness information-subject environment, learning tools to activity of subjects of pedagogical process. Ensuring the functioning of the system "teacher-student – learning tools – educational subject environment" is the essence of the ergonomic approach.

To achieve the integrity of the system, identified its main features and functions: the goals and objectives of the functional system; the participants of the pedagogical process, the channels of their interaction; qualitative characteristics of educational process participants; the quality of social influences on the system; the distribution of functions between the participants of educational process; the quality and quantity of media activities and information flows in the system; the conditions of the learning environment (jobs, TSO, manuals, etc.); the main indicators and criteria of quality of activity; organization and management of the system, control; dynamics of system development [3].

3. Results

The process of successful teaching is accompanied by the creation of ergonomic conditions for the main components of the educational environment, which determine the dependence of the effectiveness of the teacher's activity on the ergonomic organization of the workplace designed to perform professional tasks. By conditions we mean the totality of objects, processes, and relationships

necessary for the emergence, existence, or change of a pedagogical system.

An ergonomic approach to the educational process of a modern school can be implemented using a number of pedagogical and organizational conditions. The pedagogical group includes the following conditions: compliance of the didactic system with the goals and problems of education, reliance on pedagogical and ergonomic principles, selection of the content of the pedagogical process taking into account ergonomic requirements, the use of health-saving pedagogical technologies that reduce the level of fatigue, a sufficient level of performance of the subjects of the pedagogical process, the availability of human resources that can implement an ergonomic approach.

The organizational group includes the following conditions: the need to build and modernize school buildings taking into account the features of the modern educational process, equipping schools with equipment, training tools, their kits, creating and using rational systems for placing and storing equipment, rational use of technical training tools, new information technologies, physiologically and psychologically justified schedule of classes, rational equipment of workplaces, creating an ergonomic learning environment, ergonomic interior design [1]. We believe that these conditions will sufficiently help to implement an ergonomic approach.

The expectations of most consumers of educational services are related to the availability of comfortable school environment, providing intellectual, emotional and physical comfort, where the child's dignity, life and health are protected. It is clear that attractive can be considered a school, in order which declared the creation of an ergonomic environment and conditions for child development, experience in obtaining knowledge of relevant state educational standards, reflected the installation on formation of qualities of the graduate school, necessary in modern life. The use of pedagogical ideas of ergonomics and implementation of ergonomic approach in the educational process allows to solve a number of problems: define the requirements for quality performance and efficiency ways of achieving the objectives subject to optimality of the effort, resources, time; establish requirements to the organization of the information-subject environment of the school; determine the conditions for the design, creation, use of learning tools and their complexes; determine the quantity and quality of information and its main sources from the standpoint of optimality conditions; determine measures to prevent adverse functional conditions and preserve the health of subjects of the educational process.

4. Discussions

Thus, pedagogical ergonomics is designed to help improve the educational process. This follows from the main tasks of pedagogical ergonomics as an applied science. It studies the physiological and psychological labor opportunities of the teacher and the student, in order to create optimal conditions for their activities – conditions that would preserve human health, make their activities effective with the possible expenditure of biological resources, nervous energy, time and material resources. Such conditions are designed to provide optimal opportunities for spiritual and physical improvement of the younger generation and teachers.

In the context of growing automation, technization and Informatization of education there is a need for ergonomic research within the requirements improving the educational process.

Initially, ergonomics was understood as the science that studies systems, laws of work. In 2010, the international Ergonomics Association defines ergonomics as a scientific discipline that studies the interaction of humans and other elements of the system with to ensure human well-being and optimize overall productivity the system. Science deals with the problems of training, education, and human upbringing pedagogy. In the process of learning, there is a transfer and assimilation of educational information, and also methods of cognitive activity. Consider the learning process from the perspective of three forms of cognitive activity of students: material, speech and mental.

Mental activity is leading in learning. Speech activity is a means of expressing thoughts. Material activity is used only in limited cases, when practical training of students during the period of industrial practice. Thus, we see that between the three forms of cognitive activity there are "direct" and "reverse" relationships. So when learning significantly new knowledge and methods of activity the materialized form gives rise to the speech form, which, folding, is transformed into mental, after assimilation, mental actions precede speech, and determine efficiency of practical activity. Today, all these forms are widely used in however, the question of their optimal ratio and optimization productivity of the learning process within the framework of ergonomic requirements improvement of the educational process has not yet been studied. Practical solution to this problem this can be done empirically, based on the accumulated pedagogical experience.

Study of the possibility of human functioning in systems for the purpose of optimization the productivity of the learning process expresses the integrative nature of the modern stage of scientific knowledge. Thus, we can talk about inter

disciplinarily ergonomics and pedagogy. In this regard, the emergence of science-pedagogical ergonomics-a synthetic discipline that reveals the "problem-oriented" the scope of activities for improving the learning process.

Pedagogical ergonomics is a synthesis of human interaction in the learning process to ensure human well-being and optimize overall productivity educational system. Applying a systematic approach allows us to consider the process training and the content of education as a whole [1].

Justification of the content, methods and organizational forms of training at the theoretical level is determined by the science of didactics, which studies pedagogical theory training, practical activities of participants in the educational process. Promotion the theoretical level of the system of relations in training leads to a more effective impact on practice, improvement, transformation and optimization productivity of the integrity of the educational process. The learning process takes place in unity content, procedural and motivational aspects of didactics. Today any the educational process is impossible without the appropriate educational material. For forming positive sustainable motivation for learning activities requires awareness of the role of content of educational material, rational organization of educational activities, development educational interest of the student. In this regard, the problem of creating a qualitatively new educational material. Relationship system "student-learning material» provides educational results from the point of view of ergonomics efficient-productive. Thus, improving the ergonomic characteristics educational material acts as a factor in the intensification of the learning process.

Ergonomics explores the human-machine system (HCM) in the environment as the ergatic system. In pedagogy, the study of learning phenomena requires consideration dependencies between three objects: the teacher, the student, and the training material. With the training process should be considered as a system of "teacher - student-computer " in the learning environment. Thus, the computer becomes a tool training for the teacher and the student when they are included in the learning process. Computer as a means of learning, it reflects the nature of the modernization of the traditional learning system.

The computer it is possible to use technology for activation and intensification educational activity of students, technologies based on didactic reconstruction training material. In the ergonomic system "teacher-student-computer" there is a connection between teaching (professional activity of a teacher) and teaching (cognitive activity of the student) and their interaction in the learning environment. In the system" teacher - student –

computer " teacher organizes educational and cognitive activities the student's activity using a computer and thus intensifies the process effective work of the student. If the learning process is built correctly, then you have the student has a strong interest in learning, independent learning activities, this helps to increase the effectiveness of the learning process.

Pedagogical ergonomics sets a number of goals for didactics and pedagogy in General problems. There is a question about qualitatively new forms of knowledge representation by teachers in educational process. Ergonomic forms of presentation of educational information they determine the search for means of their representation in the didactic process, educational and cognitive operations, methods of teaching. The problem of quality is being updated using the five human senses in the learning process. Research we have proved that the educational information presented graphically is mastered by the students faster than text. It is pedagogical ergonomics that has to work with signs and sign systems, diagrams, graphs that are actively used in the process training. Use of automated training systems in the educational process and this leads to a revision of methods and forms of learning, analysis and new understanding the learning process from the point of view of ergonomics. This requires the development of training software the learning process based on new ergonomic learning technologies, norms and requirements [3].

The penetration of new information technologies into education forces look at the pedagogical process as an informational process in the learning environment.

Informatization of education should be considered not just as a use computer, and as a new ergonomic approach to the organization of training in the system " teacher "the student is a computer." Technologies of programmed, computer, distance learning is possible using a computer. Programmed learning takes place through individual learning of the training program on special equipment. Computers equipped with special training tools programs that make it possible to solve almost all didactic tasks. Efficiency computer-based learning technology is determined by the quality of training programs and quality of computer equipment. Distance learning technologies with ergonomics they take into account the needs, temperament, employment of the student, allow you to learn deaf, blind. Use of information technologies of the programmed, computer-based, distance learning facilitate the learning process taking into account an ergonomic approach [2].

In the 21st century, the learner's brain does not have time to absorb the increasing amount of

information, the learner, in the process of learning, has an increasingly low mental performance however, the effectiveness of training is falling. It is established that the effectiveness of training depends on the degree of involvement in the perception of all the senses of the student [3]. Efficiency the training system will be higher at the minimum cost of the student associated with educational process, in relation to the achievement of qualitatively acquired knowledge.

To get this knowledge with minimal effort, you need to improve quality of educational materials, increase their understanding. Understandability of the educational process material is the ability of educational material to minimize intellectual effort, necessary for understanding it. To make learning information easier to understand it is necessary to use methods of cognitive-ergonomic formalization of knowledge. In didactics knows the oldest principle of teaching - clarity. This principle is fully implemented measure implements an ergonomic approach to learning through increasing efficiency learning, which depends on the rational involvement of the senses to perception, processing of educational material. The dragon is based on technical symbols and signs, built on the principle of algorithmization flowcharts that can clearly formalize and present educational information, visualize it. Visual algorithmic (ergonomics) training material allows the learner to enhance intellectual abilities. Ergonomic algorithms language facilitate the understanding of educational material using casting, substitution, vertical and horizontal integration, visualization of diagrams, formulas, information it becomes as accessible and easy to learn as possible. This language eliminates possible barriers to misunderstanding educational information due to their humanity (ergonomics) interdisciplinary knowledge. The student independently converts, formalizes educational information, acquires skills of auto-formalization of knowledge, demanded by life [4].

Thus, pedagogical ergonomics leads to a change in the essential aspects of the educational process. The activity of the teacher and the student changes.

Professional activity of a teacher becomes more adapted, comfortable, educational activity of the student-more productive, more efficient, satisfied ergonomic and didactic requirements.

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