International Journal of Pedagogics
(ISSN – 2771-2281)
VOLUME 04 ISSUE 10 PAGES: 205-211
OCLC – 1121105677

Publisher: Oscar Publishing Services

Journal Website: https://theusajournals.com/index.php/ijp

Research Article

THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF PREPARING INFORMATICS TEACHERS FOR ERGONOMIC ACTIVITIES

Submission Date: October 15, 2024, **Accepted Date:** October 20, 2024,
Published Date: October 25, 2024
Crossref doi: https://doi.org/10.37547/ijp/Volume04Issue10-36

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ABSTRACT

Teachers of general educational institutions should act rationally based on the requirements of pedagogical ergonomics in order to increase the effectiveness of training and education, they should be fluent in all aspects of organizing a safe and comfortable educational process in an educational institution, they should be extremely responsible for their duties, they should have the qualities capable of ensuring the safety and comfort of the educational process.

KEYWORDS

Ergonomics, pedagogical ergonomics, informatics, ergonomic competence, student and educational tools.

INTRODUCTION

Today, the modernization of the education system, its structural reorganization, and updating of educational programs, taking into account the latest global achievements in education, science, technology, economy, and culture, are being prioritized.

The widespread adoption of advanced technologies, positive changes in the economy, the expansion of foreign investments, the development of entrepreneurship, small and private businesses, as well as the integration of lifelong learning with science and production, and the introduction of ergonomic approaches to education in accordance with learners' abilities and opportunities serve as a basis for the creation of advanced pedagogical technologies, modern educational-methodological complexes, and the improvement of the organization and management of pedagogical processes in line with the requirements of pedagogical ergonomics.

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This, in turn, imposes new tasks regarding the improvement of ergonomic competence among teachers in general secondary education institutions by organizing education based on the achievements of education, science, technology, and innovation on a global scale, in line with the requirements of pedagogical ergonomics, as well as solving the existing problems of ensuring the efficiency of pedagogical processes.

Training Informatics Teachers in Ergonomic Activities

In the process of higher education, the training of future informatics teachers for ergonomic activities necessitates improving the content of education, the readiness and knowledge level of teachers, as well as the general qualification requirements imposed on graduates of higher education institutions. This also requires enhancing the teaching content and methods and applying advanced pedagogical technology and the most effective technologies of innovative education. It is becoming increasingly necessary to develop essential knowledge, skills, and competencies related to pedagogical ergonomics among informatics teachers.

Several authors believe that the principles and recommendations of ergonomics can be transferred from the production process to the pedagogical process. Notably, V.P. Zinchenko correctly points out that "there is a need to create pedagogical ergonomics" [4]. Even though "ergonomics" studies the human-machine system, many of its conclusions and recommendations can be used to improve the educational process.

"By synthesizing the achievements of a number of disciplines on human activity and technical sciences, ergonomics can help establish relevant interdisciplinary links and better organize the learning process itself" [4]. "One of the methods to solve the problems of working with complex modern technologies comprehensively is the use of an ergonomic approach" [3].

"Taking ergonomic requirements into account, using the recommendations of this science in designing school equipment, visual aids, and creating the necessary comfort in the classroom will undoubtedly have a positive impact on the acquisition of knowledge, abilities, and skills by students, thereby improving the overall learning system" [3].

Currently, providing high-quality education and rationally organizing the educational process are essential. In this process, the following participating subjects can be distinguished: just like producers and consumers in any production process, the first group includes the creators of resources for the knowledge acquisition process (professors, teachers, scientists); the second group includes the consumers of these prepared resources (students, advanced learners, researchers), as well as those who organize and manage the educational process (teachers and administrative staff).

The educational and training process in higher education includes the following aspects: education, upbringing, formation, and development of qualified personnel. All of these are aimed at training highly qualified competitive specialists and are achieved through the activities of students and professors, the social environment among students and professors and its healthiness, the material-technical supply of the educational institution, established partnerships, and a number of other factors.

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In organizing the modern educational process, the following factors should be taken into account:

- The evolving methods of acquiring knowledge;

- The introduction of modern educational technologies, revealing the opportunities for changes in teaching methods and content;

- The changing role of the teacher in the learning process;

- The opening of wider opportunities for distance education and learning.

With the increase in sources of knowledge, a new concept of learning has emerged: lifelong learning, continuous education, and others. In this regard, one of the modern requirements is the radical improvement of the quality and efficiency of the learning process, studying the ergonomic aspects of the educational process, and adopting an integrative approach to issues of increasing the quality and efficiency of the activities of educational institutions and subjects of the educational process. As a result, the sciences in the "Pedagogy" category are evidently studied in close connection with ergonomics (creating a safe and comfortable learning environment), economics (determining economic needs and resources in the process of planning educational development), psychology (considering students' mental states), sociology (determining social needs in education), medicine (examining students' health status and creating special conditions for students with physical development and health issues), physiology (considering students' physiological and age characteristics), philosophy (using national approaches and philosophical concepts), mathematics (applying mathematical calculation methods in pedagogical diagnostics and research), history (studying and applying historical experiences of education), and anthropology (a comprehensive approach to the human being as an object of upbringing).

The curricula of some pedagogical sciences have partially taken these aspects into account, and their interrelations are presented when describing their goals and objectives.

In our opinion, the interdisciplinary relationships planned in the teaching of these sciences and foreseen in the education of students in the pedagogical field of higher education for the course "Theory and History of Pedagogy" do not include a specific section to provide students with concepts of educational ergonomics, nor is it planned to teach the psychological-pedagogical foundations of solving problems in the education system in this section for bachelor's students. Moreover, it has not been foreseen to organize classes on "Pedagogical Ergonomics."

"Pedagogical Ergonomics" is a scientific field that comprehensively studies the teaching aids, didactic means, pedagogical technologies, and the environment of education and upbringing at school, as well as the activities of teachers and students [5].

Pedagogical ergonomics aims to create, implement, determine, and solve the teaching and learning processes considering the capabilities and interactions of human beings and technology to establish a safe and comfortable learning environment, ease the workload of teachers and students, reduce mental stress, and eliminate problems in the educational system [2]

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In our opinion, in the teaching of pedagogical ergonomics, it is crucial to plan issues related to the ergonomics of the educational and training environment, the biomechanical, physiological, anthropometric, and anatomical characteristics of human labor related to the educational and training process. Pedagogical ergonomics has particular significance in preparing informatics teachers for activities aimed at rationally eliminating problems in the educational system.

Furthermore, in teaching the "Theory and History of Pedagogy" course, which includes the purpose, tasks, and content of upbringing, intellectual, civic, moral-ethical, physical, labor, economic, ecological, and aesthetic upbringing, it is advisable to provide concepts of ergonomic upbringing and its characteristics; during the explanation of requirements for checking and evaluating learning outcomes, the psychological-pedagogical conditions of control and evaluation effectiveness, ergonomic planning, organizational-executive, and control-diagnostic functions should be explained, as well as the characteristics of ergonomic competences, competencies, and culture in relation to the teacher's personal and professional qualities.

As we mentioned above, ensuring interdisciplinary relations in the process of teaching "Theory and History of Pedagogy" and "Pedagogical Ergonomics" sciences, i.e., teaching concepts related to solving problems in the education system, has significant importance in preparing informatics teachers for such activities.

This, in turn, determines the necessity of ensuring an integrative and andragogic approach in the educational process of teaching "Theory and History of Pedagogy" and "Pedagogical Ergonomics," giving concepts in the direction of rationally eliminating problems in the educational system, ensuring the interrelationship and relevance of the topics to improve the ergonomic competence of informatics teachers.

The directions for improving the ergonomic competence of informatics teachers, based on the above-mentioned ideas, include developing work programs in ergonomic and andragogical approaches for different disciplines, distributing teaching hours according to the content of the topics, and ensuring the interrelationship and alignment of topics when planning and organizing the educational process. This, in turn, is intended to make effective use of the teaching hours allocated for each subject in the curriculum, expand the importance of the topics, broaden teachers' worldviews and understanding of subjects, and improve the quality and efficiency of the educational process in preparing them for practical activities.

The improvement of ergonomic competence in informatics teachers is directly related to ergonomic competencies achieved through educational and cognitive activities, considering a number of characteristics such as the interrelationship and interdependence of the components that make up the technology and system.

In the process of improving the ergonomic competence of informatics teachers, it is essential to monitor the formation level of components such as ergonomic knowledge, skills, thinking, and orientation. If various types of control, ergonomic knowledge, and skill presentations are conducted in the educational process, and any gaps in teachers' knowledge are

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identified and addressed in a timely manner, we believe that the ergonomic competence of informatics teachers will be enhanced. This, in turn, will contribute to creating a safe, comfortable, and effective learning process that supports the health of school students and teachers, and enhances their knowledge and skills.

If we establish the practice of creating a comfortable learning environment for acquiring ergonomic knowledge, skills, and competencies during the professional development process of informatics teachers, then ergonomic education will become the leading condition for developing a minimally established ergonomic culture for the teacher in the future. In this context, it is necessary to define the essence of the "ergonomic competence" phenomenon, which is an integral part of the professional and pedagogical competence of the modern school teacher, and identify the components needed to create a new ergonomic learning environment.

The conceptual position of improving ergonomic competence involves forming a culture of comfort, efficiency, and safety between teachers and students, directing the learning process to ensure the integrity and consistency of the ergonomic competence improvement process of teachers; creating a new ergonomic educational environment at school and utilizing its pedagogical capabilities. Our conceptual idea justifies that ergonomic competence in teachers consists of components such as ergonomic knowledge, skills, thinking, and orientation, which are leading components in improving ergonomic competence in modern school teachers. The methodological foundations of ergonomics and mental labor psychology have been presented in the scientific works of A.A. Krylov, E.A. Klimov, B.F. Lomov, V.S. Merlin, V.M. Munipov, and V.D. Parondjanov. Certain ergonomic aspects in the education system have been presented in the works of A.A. Belova, E.V. Voronina, P.C. Gershunskaia, and L.P. Okulova. The physiological and ergonomic factors of school students' activities are presented in the works of N.V. Alishev, M.V. Antropova, A.C. Yegorova, and V.I. Rozhdestvenskaia [1].

Studying the problem of improving ergonomic competence among the subjects of the learning process requires studying the teacher's ergonomic competence as the integration of the student's personal characteristics, the educational tool, and the environment. The teacher understands the need for ergonomic knowledge and therefore acts in accordance with relevant ergonomic requirements and the recommended rules and guidelines for occupational safety during the learning process.

The teacher's ability to create a comfortable and safe learning environment for students, use the development of the student's personality as a means of ergonomic study, and organize an ergonomic educational environment are developed through methods of organizing the ergonomic learning environment. Ergonomic knowledge is particularly important for the teacher in mental labor activities and innovative research conditions. Successfully addressing these problems primarily depends on the teacher's understanding of the specific features of the scientific direction of pedagogical ergonomics—mastering educational ergonomics—and the improvement of their ergonomic competence, leaving no doubt in this regard.

The improvement of ergonomic competence in informatics teachers can occur only if teachers have a

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minimal level of ergonomic competence and have undergone appropriate preparation in pedagogical ergonomics. Ergonomic competence in a teacher can be understood as the integration of ergonomic knowledge, skills, and competencies, as well as the directed activity manifested in the teacher's actions based on the ergonomic system of "teacher-student-learning environment-learning tool."

The information aspect of a teacher manifests in how they acquire, analyze, and process information (sensory organs, symbols, images, sounds, etc.). In the conditions of fully technologically planning the educational and cognitive environment and gradually improving ergonomic competence, the requirements for safety, comfort, activity optimization, and the efficiency of intellectual work highlight the necessity of ergonomic competence.

From the perspective of adjusting the professional training of informatics teachers to ergonomic requirements, we can state that addressing ergonomic issues and improving the learning process is important. The activities of an informatics teacher are carried out under the complex interaction of various ergonomic factors. In this context, one of the conditions for the success of a teacher's professional activity is ergonomic activity, acquiring ergonomic knowledge and skills, which contributes to improving the efficiency, safety, and comfort of the learning process. Insufficient ergonomic competence of an informatics teacher leads to a significant gap between the goals and outcomes of educational activities. Its consequences are manifested in reduced efficiency, safety, and comfort of the learning process, considerable expenditure of human, technical, and intellectual resources, and a lack of ergonomic knowledge, skills, and competencies.

The analysis of professional standards for teachers, as well as the introduction of e-learning and distance learning technologies in the modern learning environment, have shown the necessity of improving the ergonomic competence of informatics teachers.

CONCLUSIONS

Classes on "Pedagogical Ergonomics" are not planned for students in the pedagogical field of higher education. The ergonomic competence of informatics teachers is directly related to the ergonomic competence provided through educational and cognitive activities.

Ergonomic literacy encompasses the role and importance of schools, including the subject of informatics, in society; the study and design of computer-assisted teaching programs for pedagogy for future informatics teachers; the study and design of the system of relationships among teachers and students within and outside the school; and knowledge of organizing work in a comfortable and safe manner, as well as the ability to effectively apply this knowledge and these tools in their own activities.

The principles, criteria, stages, approaches, aspects, methodological conditions, and expected outcome components of ergonomic competence are formed.

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(ISSN – 2771-2281)
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Bassin 71504, Mauritius 2020. – 121 b. ISBN:978-620-0-60756-0.

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