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TRAINING OF FUTURE CHEMISTRY SPECIALISTS BY MEANS OF INFORMATION AND COMMUNICATION TECHNOLOGIES

The introduction of information and communication technologies (ICTs) in the teaching of chemical disciplines in higher education institutions is restrained by the weak development of the didactic basis for their use in the educational process. A system of principles, including the principles of the balance of cognitive load and the presentation of educational material at three levels of representation (micro, macroscopic and symbolic), has been developed and scientifically substantiated to ensure effective teaching of chemical disciplines using ICT.

A few provisions, which are necessary for organizing efficient learning, have been formulated. They are as follows: preventing the splitting of attention, taking into account the dual effect of an action, and taking into account the level of preliminary schooling of students. Also, the principles of design of dynamic visualizations have been devised: semantic accents, colour coding, segmentation and management of dynamic images, and use of different perception modalities.

The factors influencing the result of training in chemical disciplines using ICT have been determined. Some correlations have been revealed between, on the one hand, learning outcomes and, on the other hand, personality traits of students, such as intellect types and preferred learning styles. The technology of integrating the methods, forms and means of ICT learning with due regard to the personal characteristics of students has been developed.

The content of professional education and methods of training of future chemists have been improved by strengthening the fundamental component by applying computer modelling to study the fundamental chemical concepts. The effectiveness of the use of computer modelling has been proved for correcting the formed misconceptions of chemical knowledge, improving the skills in working with graphics data and enhancing the performance of learning tasks which imply mental transitions between macro-, microscopic and symbolic levels of representation of chemical knowledge.

Methods of pedagogical research have been further developed and implemented in the form of a software product. Such a product is based on the method of the secondary task and is intended for measuring the cognitive load of students in the course of ICT-based learning. Special methods have been developed to reduce the cognitive load when students work with dynamic visualisations.

Teaching and methodological materials, such as teaching aids, methodological recommendations, instructions for computer lab work, applied programs, models, ready for use in the NetLogo programming environment, and lecture, manual and test kits, have been implemented in the educational process of higher educational institutions. The results of the research were used for the development of the higher education standard for the speciality "Chemistry", as well as for the system of continuous pedagogical education.

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