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Information technologies as a means of realization of level differentiation of teaching physics in College

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doi: 10.18411/gdsn-28-02-2019-11

idsp: scienceconf-28-02-2019-11

Abstract

This article aims to substantiate and develop a methodology for the use of electronic educational resources for the implementation of level differentiation in the process of teaching physics in College. The implementation of the level differentiation of teaching physics in College will be effective if the learning process is organized using electronic educational resources that will help students to choose an individual educational trajectory. To analyze the effectiveness of the experimental work was carried out in the College, the experiment proved the effectiveness of the level differentiation of training.

Keywords: level differentiation, information technologies, electronic educational resource, teaching physics, College, knowledge assessment, teaching methods.

In the last two decades, education has undergone major changes associated primarily with the introduction in the educational process of the ideas of personality-oriented education. This, in turn, necessitates the creation of the most favorable conditions for the successful education, upbringing and development of students by taking into account their individual characteristics in the educational process, which is achieved by using a variety of technologies of differentiated education. Therefore, there is an increased interest in the problem of implementation of differentiated teaching physics by teachers, parents and scientists-teachers, psychologists, methodologists [1,2]. This is not surprising, because until now, in most cases, education is conducted under the old system with the use of traditional approaches focused on the "average" student, in which all are taught the same way. Many teachers, parents and students consider physics to be one of the most difficult subjects. At the same time, there are almost always students for whom the usual level of presentation of educational material is insufficient. Thus, in practice, there is always a gap in the development of the content of educational material in physics students with different levels of training. One of the forms of implementation of the differentiated training in physics is the level differentiation-the technology of training based on the maximum account of the most significant in training of individual features of students in one group. At the same time, students study physics in one program and one textbook, but at different, pre-planned levels of training, corresponding to their cognitive abilities and needs, resulting in different results. The following works are devoted to the essence of the concept of level differentiation in the process of teaching physics, its importance in improving the efficiency of training [3,4]. The construction of methods of teaching physics in terms of level differentiation is complicated by the fact that this form of differentiated training in both theoretical and practical terms is the least developed in our country, because it is the most difficult in organizational and diagnostic terms. However, to date, scientists-methodologists solved a number of problems related to the teaching of physics (and mainly for non-core classes of high school) in terms of level differentiation: defined the concept of "level of education", developed criteria for the division of students into typological groups in accordance with the selected level of education, identified the objectives of teaching physics students at different levels, determined the theoretical basis for the selection of the content of the course of physics and its structuring taking into account the level differentiation, justified three-level model of teaching physics, the approaches to the implementation of level teaching physics, in particular, the technology of teaching students of small classes to solve physical problems with level

differentiation [5]. Most of the existing studies are devoted to the implementation of differentiated level learning in high school. But it is for the College that level differentiation should become the leading form of differentiated education, as students with different levels of training and motivation of training study in colleges. Currently, there are teaching kits in physics for primary school, the content of which is implemented the idea of level differentiation [5]. However there is a problem of the organization of training in the conditions of level differentiation in colleges as at collective character of training within traditional class-lesson system it is difficult to organize training according to individual features of pupils. Therefore, research and development of methods of differentiated education in colleges are necessary.

The development of the procedural component of the content of physical education in the context of level differentiation requires the search for new approaches and methodological solutions. And we believe that one of the most promising is an approach that allows you to implement level differentiation using information technology (it). Research is devoted to the theory and methodology of it use in physical education [5]. In these works it is convincingly proved that computer technologies allow to individualize the learning process (especially due to interactivity and the use of multimedia), because the student, communicating with the computer on-line, has the opportunity to choose his own learning path when working with various electronic educational resources (EER). Thus, EER are very effective means of implementation of level training. However, as the results of the ascertaining experiment and other studies show, these resources are practically not used by teachers, only in some cases they use test software for multi-level control. In addition, the analysis of scientific and methodological literature shows that the question of the use of it in the level of differentiated training in physics has not been considered so far in pedagogical and methodological science and there are no special studies on the use of EER for the organization of level differentiation. Also note that most of the existing software products designed for the study of physics, not specifically focused on the application in terms of level differentiation in College.

Informatization of the society ensures the active use of ever-expanding intellectual potential of the society, promotes intellectualization of all human activities, contributes to the accelerating scientific and technical progress, and integrates it with scientific and industrial technology that leads to the development of all spheres of modern production, realizes the high level of information services, the availability of any member of society to sources of reliable information, the visualization of the information provided, allows to improve the mechanisms of management of social device, and also contributes to the creation of a qualitatively new information environment of society, ensuring the development of the creative potential of the individual, and also contributes to the humanization and democratization of society.

All of the above leads to the conclusion about the existence of contradictions: between the task of taking into account the individual characteristics of students in teaching physics and in connection with the need to implement level differentiation and the existing methodology of its implementation, which does not effectively solve this problem and, accordingly, between the possibilities of it for individualization and differentiation of the learning process and existing EE, which do not take into account the specifics of their use for the implementation of level differentiation in teaching physics, and, respectively, , the existing methodology for the use of EE, which does not provide for the solution of the problem of implementation of level differentiation.

These contradictions determine the relevance of the study, the problem of which was the search for an answer to the question: "What should be the method of using it tools for effective implementation of level differentiation in teaching physics in College?"

As a means of implementing level differentiation, we propose to use EER as a component of it.

The subject of the study is the method of application of EER for the implementation of level differentiation in teaching physics in 1 year of College.

The aim of the study was to substantiate and develop a methodology for the use of EER for the implementation of level differentiation in the process of teaching physics in College.

The study is based on the following working hypothesis: the implementation of the level differentiation of teaching physics in College will be effective if the educational process is organized using electronic educational resources that will help students to choose an individual educational trajectory (IET).

In this case, under the efficiency we understand: increasing the level of knowledge and skills of students, the strength of knowledge, the impact of EE on students' independent choice of individual educational trajectory and as a consequence of the dynamics of the filling of typological groups.

To solve the problems and test the hypothesis of the study, the following research methods were used: theoretical analysis of the problem of using it in physics lessons in College in the context of level differentiation based on the study and analysis of scientific, methodological, pedagogical, psychological and educational literature on the topic of research; obtaining and analyzing information on the problem of research on the Internet (including demonstration and working versions of EE intended for teaching physics); simulation of physics lessons using EE in the conditions of level differentiation; organization and conduct of experimental work aimed at verifying the correctness of the hypothesis of the study; experienced teaching in order to identify the effectiveness of the developed methodology; statistical methods of processing the results of the pedagogical experiment.

Approbation of the research results was carried out in the process of experimental work in Karaganda technical and construction College.

Physics lessons were held in two classes: control and experimental. In the control class we used EE without differentiation of training, and in the experimental with differentiation. Assessment of students' knowledge was carried out as a result of testing on a 12-point system. The developed tests were the same for both classes. The results of the experiment are given in table 1.

Table 1

The results of the experiment in the 1st semester of 2017-2018 academic year

The Results of the Experiment in the 1st Semester of 2017-2018 Academic Year				
Points	Control class		Experimental class	
	20 student			
0-5	6	30%	4	20%
6-8	8	40%	5	25%
9-10	4	20%	6	30%
11-12	2	10%	5	25%

As can be seen from the table, the students of the experimental class showed a slightly better result, although initially a class with a slightly higher average level of performance in physics was chosen as a control group. The results of this and other verification work, and control sections have allowed us to assume that the systematic application in practice, we have developed a technique will give a good result. As criteria of efficiency of the applied methods were the following: increasing knowledge and skills of students, strength of knowledge, the impact of e-learning resources on self-selection by students of BCI, the dynamics of filling of the typological groups. The training experiment confirmed the hypothesis of the study, which consists in the assumption that the implementation of the level differentiation of teaching physics in College will be effective if the learning process is organized using EE, which will facilitate the choice of students IET. The analysis of the results of the training experiment shows the effectiveness of the method of using it tools for the implementation of the level differentiation of teaching physics in College.

The conducted pedagogical experiment showed the effectiveness of the developed method. The results confirm the hypothesis at the level of significance of 95 % and indicate that the use of EER in physics lessons in College contributes to the choice of students' individual educational trajectory and the transition from compulsory to advanced level, while students achieve higher learning outcomes. The effectiveness of the developed method of using it tools in the conditions of level differentiation was tested during the pedagogical experiment.

The position about the feasibility and effectiveness of using e-learning resources at the organization level differentiation in physics classes in College. Theoretical bases are defined and the model of a technique of use of electronic educational resources in level training in physics is developed.

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