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Development of Scientific and Natural Competence of Technology Teachers in the System of Postgraduate Education by Means of Information and Communication Support

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Abstract

The research deals with the analysis of the results of experimental work on the problem of development of technology teachers' scientific and natural competence in the postgraduate education system in the conditions of modern processes of education informatization. It describes the main results of the technology teachers' scientific and natural training study in the postgraduate education system by means of information and technological support. On this basis it is concluded that the effective knowledge and skill mastering is provided due to the usage of information and technological support in the postgraduate pedagogical education system.

Keywords: science-natural training, technology teacher, postgraduate education, information and communication support

Introduction

The most distinctive feature of the modern civilization is the presence of rapid, inclusive changes, the quality of which must be ensured by education. And the pedagogical worker is both an object and a driver of positive changes. The priority is to train the teacher, whose activity is not limited to the teaching of his own subject, but a specialist being capable of interdisciplinary communication

and being aware of the professional knowledge importance in the context of socio-cultural space. At the new school, it is important for the teacher to be able to organize the educational process as a pedagogical interaction aimed at the development of the child's personality, to prepare him or her to solve the life tasks. All of this requires dramatic changes in the teacher's postgraduate professional education.

The problem of educators' professional development, in general, and the problem of technology teachers' professional development (work training) in postgraduate education, in particular, is revealed in psychology and pedagogical science. The search for these problems' solutions helps to solve a wide range of theoretical and practical issues related to the competency approach implementation. And this improvement becomes possible at the expense of the teachers' continuing education process in order to expand their intellectual awareness, to update the acquired psychological and pedagogical knowledge, to learn some new technologies of the pedagogical process organization, to generalize and to introduce the perspective pedagogical experience.

However, the full understanding of the role of science training in the holistic process of technology teacher's professional development is not yet clearly formed. Besides, the professional competence issues are mostly dealt with indirectly. It's partly revealed that there are some problems to form the cognitive autonomy, to inspire the willingness to use computer tools and to define some methodological bases for using ICT in the teacher training process.

Main part

Experimental verification of the science teacher training technology effectiveness in the system of postgraduate education by means of information and technological support was carried out with the use of various methods, including observation, discussion, study and generalization of pedagogical experience, pedagogical experiment (an experiment organized to test the developed theoretical assumptions, in particular, to prove the hypotheses proposed in the beginning of the study), testing (a corpus of tests used to check the level of knowledge mastering, skills and the degree of personal quality development, etc.), survey (a popular method of sociological research, which provides a massive material collection with the usage of specially designed questionnaires), expert assessment, statistical methods (a number of methods dealing with the data analysis, implemented through MS Excel and MOODLE).

The first stage of the pedagogical experiment (analytical) is considered to deal with the diagnostics of the main system components of the science teacher training technology in the graduate education institutions by means of information-technological software in order to determine the level of technology effectiveness (high, sufficient, medium, low).

This stage requires applying two questionnaire surveys to teachers. The first one is applied to technology teachers to determine the leading experts' position in the field of educational activities through the usage of the multimedia platform for postgraduate education. And the second one is applied to the career education teachers after the training and retraining programs are finished to check the basic component completeness of the science teacher training technology. This stage also requires providing an expert evaluation of the questionnaire and test results in order to check the data accuracy.

The survey indicated rather high respondents' interest to the usage of information and technological support in their professional activities, but it revealed rather low awareness of the available ICT products in education process. The analysis of 27 technology teachers' test results showed an overall low level of ICT knowledge, including programs for multimedia content processing, distance learning platforms, electronic educational resources, children's educational games, etc. The overwhelming number of respondents (92%) showed a low level of information-cognitive component in the system of professional competence formation.

The purpose of the experimental stage was to update the system of technology teachers' advanced training, to determine a set of educational and methodological tools used in the process of the technology teachers' scientific and natural training, to study and implement the existing multimedia educational resources and to develop the new ones. Therefore, some new teaching resources were introduced in the process of technology teachers' professional development in the postgraduate education system, for example, the educational website "Technology teacher's methodical office", as well as other open educational resources (information help, training, game resources, simulators, etc.). A special course "Modern Information and Communication Technologies in Education" was introduced to the Master's Degree Curriculum in the specialty 014.10 Secondary education (Labor training. Technology).

Thus, the information technology introduction into the postgraduate education system took place in three main directions: 1) an intensive usage of information technology support as the means of training with the aim to develop all the system components of the technology teachers' scientific and natural training in the postgraduate education system; 2) the usage of information technology support as the means of activity in the teachers' and trainees' practical work in order to develop some practical skills; 3) the mastering of the information technology as the object of the cognitive process studies.

The end of the formation phase requires evaluating the implementation effectiveness of each system component of the technology teachers' scientific and natural training in the postgraduate education system by means of information and technological support. At this stage, the trainees from the control groups,

who worked in the traditional method and typical training courses, were involved in the work (the number of credits allocated for the study of disciplines was the same in all cases).

The information and cognitive component was defined by the results of the audience responses during the graduation final work presentation, and by the knowledge tests, which examined the knowledge amount in the professionally oriented courses such as “Theory and methods of teaching technology” and “Higher school pedagogy and psychology”. The skill formation degree of the professional work in the open educational pedagogical environment (operational and activity system component) is similar to the tested search-for-problem tasks such as to develop an online course for the lesson of practical training.

Development assessment and reflective component are both determined in the process of the analytical task performance. The first task is to analyze the proposed open educational resources and educational programs for children on certain indicators. The other task is to determine the design and creative usage ability degree of information and technological support in the professional activities (creative process component of the system). The students were offered to do a creative task to design a lesson in school and prepare some multimedia software or distance learning course for it (the original problems, visual material, virtual lab, etc.). This assignment allowed developing some criteria in order to assess the levels of each component formation.

Conclusions

Therefore, we proved in practice the information and technological support efficiency of the science teacher training technology in the postgraduate education system. It applies to both original courses, tailored to the requirements of modern electronic open educational resources, as well as to the vision of the scientific teaching and to the existing open educational resources of various types.

Taking part in the experimental work, the students demonstrated the high level of interest in the usage of the proposed tools in their own teaching and professional activities. Besides at the end of the experiment their motivation for professional self-improvement and self-development has increased significantly.

The development indicators of the science teacher training technology by means of information and technological support in the postgraduate education system are defined with sufficient probability, confirmed by calculation of the difference between the average values of diagnostic indicators in the experimental and control groups.

In the course of system pilot testing of the technology teachers' scientific and natural training in the postgraduate education system by means of information and technological support, the system effectiveness was proved and confirmed

by the statistical methods of the obtained results' analysis and by the expert evaluation method.

Therefore, the systematic application of the means of information and technological support in the process of technology teachers' scientific and natural training in the postgraduate education system effectively influences the technology teachers' professional competence formation and development.

The study outlines the further scientific research prospects in the chosen direction, including an intensive complex update of the scientific and natural training facilities based on the widespread usage of information and communication technologies, as well as on the usage of distance learning and other vocationally oriented courses.

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