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## Innovative Components for Preparing Graduates and Master's Degree Holders of Natural Sciences, for Education at the University Level

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### Abstract

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Professional and pedagogical activities in the new socio-economic conditions, based on accepted science view of expert activities, and professional development of individuals have been investigated. The distribution model of graduates and teachers of natural science in the conditions of a Federal University has been shown. The main content of this paper is the preparation of future teachers in the elegant institutes of the university. The advantages of this model are indicated in the example of the preparation of future teachers of chemistry (bachelor). Innovative components for preparing graduates and master's degree holders in natural science education is linked with the following possibilities: modern laboratory facilities (Innovative Chemical Corps); the construction of the educational process through the integration of new information (computer, internet technology, electronic portfolio and etc.) and traditional technologies of natural sciences; implementation of a continuous pedagogical practice in the lyceums of Universities; and the intensification of practice-oriented training of students and their theses, taking into account the educational needs of the Republic of Tatarstan and Volga region of Russia as a whole.

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**Keywords:** Graduates and master's degree holders, the training of teachers of natural sciences, innovative scientific and educational activities.

### 1. Introduction

Education as well as natural sciences should not be isolated from the fundamental changes that has been occurring in the society and the economy. Here are few events that have influenced structural changes in the economy, and consequently, transformed graduates requirements: the growth of the role and active usefulness of knowledge (Schratz, 2016; Mesquita, 2016), a huge breakthrough in information and communication technologies (Abasov & Abdullayev 2011), the formation of the

intellectual labor market (McMahon, 2016), and political changes in the world community (Mutton, 2016; Sakhieva, Gilmanshina et al, 2015.). As a result, the main focus of universities is becoming the satisfaction of individual knowledge, to enable it compete and adapt successfully in the modern world (Gafurov, 2016), through the implementation of an innovative component of the bachelor's and master's degrees.

Research problem: The innovative components of scientific-pedagogical maintenance, and the process of preparation of graduates, masters and teachers of natural sciences, for education at the university level.

Objective: to develop innovative components of the scientific-pedagogical maintenance and the processes of preparing graduates, master's degree holders and teachers for university science education.

## **2. Metodological framework**

The leading approach to the study of this problem is the competence and activity approach that contributes to the practical orientation of training, related to the acquisition of skills and competences, necessary for future professional activities of students in modern social and economic conditions. This set of competences is provided by the introduction of remote and design technologies, and other technology portfolio in the educational processes, of graduates and master's degree holders.

## **3. Results**

### *3.1. Professional and pedagogical activities in the new socio-economic conditions*

Today, in the global concept of sustainable development, the work of a teacher of natural sciences requires an emphasis on energy conservation and energy efficiency. It is possible through relevant project activities (Gilmanshina & Gilmanshin, 2015), an a high level of professional thinking of the teacher (Gilmanshina, Sagitova et al, 2015; Samigullina et al, 2015.). There is a need for a new way to consider the specifics of professional-pedagogical activities of teachers of natural sciences. This will be based on the generally accepted science view of professional activities (Rubinstein, 1989; Zimnyaya, 1997), and professionalism of the person (Klimov, 2004; Zeer, 2006).

Activity according to Zimnyaya (1997), is a form of active, purposeful interaction with the outside world (including other people). The main characteristics of activity are the following: objectivity, task orientation, mediation, motivation and productivity. The goal of the professional-pedagogical activities of a teacher of natural sciences, is the organization of learning activities of students, aimed at developing their socio-cultural experience, as the basis and conditions of their own development. A structural shift causes a change in purpose of the teacher's activities, since the new creative structure of education implies that the purpose of activities is the spiritual and creative development of students. Activity is a system of actions, combined into a single unit including the motive prompting one to achieve this goal. The meaning of the activities, determines the motive. The motif is associated with the satisfaction of the needs of teachers. The products of pedagogical activities are formed by students individual experiences in it's totality. The result of educational activities becomes the establishment and development of the student as a person.

Pedagogical activity is the specific labour activity of a teacher. This civic ethics and teacher determine the direction of this labour. The peculiarity of a teacher's activity is that it is structurally complex, and it consists of several interrelated species. Depending on the purpose of work, the teacher carries out the following activities: teaching, activities in the field of subject specialization, communicative, managerial, administrative, economic, and social activities.

The leading activity of a teacher is the pedagogical activity, which is crucial in the formation of his personality. Pedagogical activity which is carried out at the reproductive level, imposes certain requirements for the individual – research and creative requirements. The transition from one level of implementation of pedagogical activity to another, as rightly pointed by Zeer (2006), is accompanied by a restructuring of the personality.

Consequently, in the current socio-economic conditions, it is required that the orientation training of teachers of natural sciences should not generally focus on the acquisition of knowledge and skills, but on the formation of the ability to creatively solve problems arising in professional pedagogical situations and activities. In this case, the main task of training a natural sciences teacher becomes humanistic, mastering the methodology of the creative transformation of the world, harmonizing the relationship between the system of «man – nature – society», and not just studying of laws of nature and society.

Research and introduction of new forms and ways of transmitting contents of higher education today, are considered necessary for the development of key competences in future graduates and masters degree holders, that ensure the productivity of social and professional activities. With the rapid aging of knowledge, development of certain personal qualities becomes the basis of professional mobility.

An extensive list of new requirements for graduates and master's degree holders, which should be reflected in the curricula of education and training institutions, was highlighted by Shadrikov (Shadrikov, 2004). It drew attention to the differences in the requirements for knowledge and skills, depending on the level of education (Bachelor, Master). General requirements for the curriculum are: flexibility, availability of premises for training in accordance with the changing needs of the labour market; availability of knowledge demanded in the market of educational services and the labour market, with its demand for skilled workers; preparation of bachelors and masters in accordance with today's needs and future strategic directions; and a combination of fundamental and innovative training.

As it is known, a factor for the selection of educational content and forms, for the implementation of educational processes is the Model Bachelors (Master). Model Bachelor (Master) can be a description of functions, preparations, and qualities required. The adequacy of the model is manifested in the fact that the requirements in the description of the models are made to the extent that is sufficient to achieve the goal.

The purpose of higher education today is not only to teach a person to do something, or seek a profession, but also to enable him or her to cope with a variety of business and life situations, and work in a group. Therefore, for many years, the qualification model was demanded, strictly due to the object and the subject of the labour markets, it is now superseded by the model professional appearance of graduates and master's degree holders, on the basis of competence.

Thus, the feature of the natural science education of future teachers in the new socio-economic conditions is mainly the need to master modern methods of teaching subjects, for the purpose of the formation of core competencies and readiness, for the implementation of independent cognitive activities (educational competence, involving the accumulation of integrated knowledge and then applying in practice).

### *3.2. The innovative distributed model of graduates-teachers and master's degree holders of natural sciences in education*

The distributed model of training future teachers of chemistry and physics has been implemented in Kazan (Volga region) Federal University since 2011, at the Chemical Institute named after A.M. Butlerov, and in the Institute of Physics.

Let's consider the advantages of this model on the example of preparation of future teachers of chemistry (bachelor's degree). This model allows, firstly, for the possible use of modern laboratory facilities (Innovative Chemical Corps), which was presented to the Kazan (Volga region) Federal University by the President of the Republic of Tatarstan (R.N. Minnikhanov). Secondly, it becomes possible to build a learning process by integrating new information (computer, Internet technology, electronic portfolio, etc.), and traditional learning technologies of natural sciences. Thirdly, it makes it possible to implement a continuous teaching practice, beginning with the 1st year students from KFU (IT-lyceum, Lobachevsky Lyceum), which in turn increases the motivation and practice-oriented training of students. Fourthly, it makes it possible to increase the motivation for the choice of a teaching profession, through the active work with gifted children, and the implementation of innovative projects such as; «Small Chemical Institute», «Festival of Chemistry», «KidsSpace» (Kazan), the Houses of Children and Youth (Kazan, Ulyanovsk), and «Innovations in teaching».

The training of master's degree teachers of natural science education (chemistry education, physical education, biology education, etc.) commences in September, 2016 in Kazan (Volga region) Federal University. An innovative component of the training is associated with the use of new laboratories of Chemical Corps KFU, the implementation of continuous student teaching of undergraduates in the best schools of Kazan, practice-orientation of their theses taking into account the educational needs of Republic of Tatarstan and Kazan Federal University.

## **4. Conclusion**

The innovation components of the scientific-pedagogical maintenance of processes in the preparation of bachelor's and master's degree-teachers in the system of university science education, with the example of preparation of future teachers of chemistry was illustrated. It has been established that its role lies in the creative development of students, formation of their scientific outlook, professional thinking, culture, informational activities, and competitiveness in the new environment of developmental education.

## **5. Recommendations**

The content of the article has practical values for university teachers of natural sciences, for future teachers and young teachers of natural science disciplines, and students of refresher courses.

In view of the results of this study, we can identify a number of scientific problems and promising areas for further consideration: the deepening and extension of certain provisions contained in the article related to the formation and accumulation of scientific and pedagogical potentials of the innovative training of future teachers of natural sciences.

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