

## Stimulation of Future Specialists' Continuous Professional Training in Northern Educational Complex Conditions

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### ABSTRACT

The urgency of the problem under investigation is conditioned by the need for future specialists continuous professional training implementation in the northern educational complex "college - university" conditions and inadequate elaboration of the theoretical-methodological, content-technological and scientific-methodical managerial aspects of its stimulation process. The paper purpose is to develop a stimulation model for future specialists' continuous professional training in the northern educational complex conditions on the system-activity approach basis and its effectiveness proving in approbation. The study leading methods are the pedagogical experiment and simulation that allow to study the problem of managing the stimulating process of future specialists continuous professional training in the northern educational complex "college - university" conditions in a complex way, to prove the proposed model effectiveness. The paper presents the stimulation dynamic model for future specialists' continuous professional training in the northern educational complex condition, consisting of interconnected units: epistemological, axiological and reflexive ones; their features are revealed, the efficiency according to the selected criteria is determined; an algorithm for implementing this model has been developed. Practical significance: The model is aimed at stimulating of future specialists' continuous professional training and is focused on the scientific and methodological support development of its functioning. The paper materials are of practical value for heads of educational institutions of higher and secondary professional education, as well as for institutions of additional professional education.

**Keywords:** professional training, northern educational complex conditions, stimulation dynamic model, future specialists

### INTRODUCTION

The current stage of Russian society development is characterized by significant changes taking place in the political, economic and socio-cultural spheres. These changes have affected and the sphere of education. Today, education is the subject of a priority national project aimed at modernizing the educational sphere as a unified system. In this regard, the task of rethinking the processes of education management, both at the federal and regional levels, is of particular importance. At the same time, the target milestones for improving and modernizing the education system are the task of the specialist's training quality improving, designed to ensure a high standard for the population living, and to build the capacity for the future development of the country and the region. The

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main strategic goals and objectives of the quality system for training specialists in the Khanty-Mansiysk Autonomous District - Yugra, Russia, are determined by the following: Messages of the Russian Federation President to the Russian Federation Federal Assembly on May 26, 2004 [1], Strategy for Science and Innovations Development in the Russian Federation for the period up to 2015 [2], the economic development Social Program of the District for the perspective up to 2020 [3], as well as the strategic goals and tactical tasks of the Education and Science Ministry of Russia [4, 5, 6].

At present, the education system activity to improve the specialists training quality is mainly focused on activities to provide the state educational standards of new generation, competencies, certified monitoring and evaluation tools and procedures that allow to determine the achieved results compliance with the educational standards requirements [7, 8, 9, 10, 11].

Modernization of the education system management is an important social task, the solution of which provides the necessary improvement of specialists training quality. The educational process management in any educational organization assumes the existence of its own management strategy, oriented to the state task implementation and this process consumers' needs satisfaction. In the Great Soviet Encyclopedia, the notion "management" is represented in the following way: management is an element, the different nature organized systems function (biological, social, technical), ensuring their specific structure preservation, the operation mode maintaining, the implementing of the program and the activity goals [12].

Objective means of managing the training quality:

- managed model of the educational process;
- a scheme for assessing a person's education quality, consistent with the system of subject knowledge and professional tasks in the chosen activity field;
- mechanisms and methods for assessing the education system changing possibility, which improves the education quality provided;
- management system for education services quality;
- information system of education quality management.

Thus, to ensure the specialist training of a "given" quality, that is, corresponding to the consumer requirements, it is necessary to consider a specialists' training management quality "system" [13].

## MATERIALS AND METHODS

### The Study Methods

The study involves the following methods: theoretical analysis of methodological, psychological and pedagogical literature on the research topic, generalization of existing practical experience, pedagogical observation, pedagogical experiment, simulation, questioning, testing, and method of mathematical statistics Chi-square.

Based on the socio-economic forecast for the development of the KhMAD-Yugra region until 2020 [3], the authors emphasized application of the simulation method as a significant method of scientific knowledge based on the existing educational system study and building a dynamic model on the data obtained for managing the stimulation of future specialists continuous professional training in the northern educational complex "college - university" conditions. As the observation result, the situation's study related to the approach implementation to the future specialists' continuous professional training stimulation managing for the leading oil and gas enterprises, the existing pedagogical conditions for implementing the above-described model were studied. Observation, the educational process participants' and consumers' oral questioning, studying the situation on the district territory, made it possible to conclude that to the time of the question study:

- the information space updating processes of specialists continuous professional training do not have sufficient mobility and do not ensure proper updating of resources;
- there is no unambiguous mechanism for implementing the integrative principle of existing future specialists training programs;
- on the District territory the structures for teachers and teaching staff qualification upgrading providing a complex combination of instruction forms and methods quite effectively exist; however, they are focused mainly on the target audience of general education organizations teachers and are not widely disseminated for technical specialists;
- there is a lack of structures in educational institutions for teachers and trainees to assist in the diagnosis, planning and practical implementation of continuous training opportunities [14].

## The Study Experimental Base

The experimental work was carried out on the basis of the Federal State Budget Educational Institution of Higher Professional Education "Yugorsk State University" (FSBEI HPE "UGU") Khanty-Mansiysk, Nefteyugansk Industrial College (filiation) FSBEI HE "USU" among students of the following specialties: "Development and operation of oil and gas fields", "Drilling oil and gas wells" "Installation, adjustment and operation of industrial equipment." At study all stages 525 students and 51 teachers took part. The study was conducted in three stages from 2012 to 2017.

## The Study Stages

During the study implementation, at the first (preparatory) stage (2012-2013) the theoretical development of the stimulation management problem of technical specialists' continuous professional training was carried out, an experimental plan was developed. The purpose of study this stage was: the theoretical sources study on the problem, the determination of students needs at the level of secondary vocational education in continuous professional training with the aim of further implementation within the educational complex "college-university". In order to realize this goal at the experiment preliminary stage, the following tasks were solved: getting acquainted with the scientific literature on the chosen problems and analyzing it, studying the conditions for the realization of pedagogical dynamic model of continuous vocational training's stimulation in the northern educational complex "College-HEI". The set tasks were solved by the following methods: theoretical analysis of scientific literature on the problem of pedagogical stimulation of continuous professional training, observation, oral questioning, written questioning and simulation.

The second (main) stage (2013-2015) consisted of scientific and methodological sources' in-depth study on this subject and in conducting an experiment in which the hypothesis was put forward; the pedagogical conditions and the dynamic model of technical graduates' continuous professional training's pedagogical stimulation were developed, theoretically substantiated and tested. For this purpose, the following tasks were accomplished: a dynamic management model for stimulation of future specialists' continuous professional training in the technical area was developed in the conditions of the "College - Higher Education" educational complex and the pedagogical conditions for its implementation; the students' level for the need to implement this model in the process of continuous training was determined; the experimental verification of the pedagogical conditions for this model implementation was carried out. At experiment this stage, such methods as questioning, testing, simulation, and pedagogical experiment were used.

The third (final) stage was held in 2015-2017. Its purpose was to evaluate the effectiveness of the dynamic model of managing the stimulation of future specialists continuous professional training in the technical field in the conditions of the college-university educational complex on the basis of the identified criteria (epistemological, axiological, moral, psychological, reflexive) and a set of certain principles (age, individual characteristics of the student, its intellectual level, socio-economic situation, personal needs and interests)". At this stage, methodical materials were introduced, the hypothesis effectiveness was tested, conclusions were formulated, and a dissertation was prepared. The main research methods were the results of the previous stage's analysis, a personal generalization of the results obtained, the application of mathematical statistics method Chi-square. At study all stages, the educational services main consumers took part: students of the secondary vocational education level of the northern educational complex FSBEI HE "Yugra State University" and its branch in Nefteyugansk, the employer representatives from a number of leading industrial enterprises of the oil and gas complex KhMAD-Yugra (OOO-RN "Yuganskneftegaz", CJSC "Siberian Service Campaign "LLC" RN-Yugansknefteproburservis", etc.).

## RESULTS

### The Model Description

The model structure of the quality management system for specialists training is represented by three levels of formalization: information-semantic models (a system of logical and semantic descriptions, representation of statistical matrices and other information); mathematical and simulation modeling; object management (management decision making). The model structure allows studying the quality management system of specialists training in three dimensions: structural, institutional and content [4].

The modern educational paradigm puts forwards before the educational organizations the task of training a qualified specialist who is not only proficient in certain professional competencies, but who is able quickly to navigate in a rapidly updated information flow, adapt to the frequent change of technological processes, aimed at systemic updating of his knowledge. Simulating the process of stimulation managing for students' continuous

**Table 1.** The effectiveness level estimation of the stimulation management model of future specialists' continuous professional training on the epistemological criterion basis

Index	Level (Eest)					
	2012	Level	2015	Level	2017	Level
Realization of ways and methods for knowledge acquiring in the educational organization evaluation	0,59	average	0,71	Average	0,86	High

**Table 2.** The effectiveness level estimation of the stimulation management model of future specialists' continuous professional training on the axiological criterion basis

Indicator	Level (Aest)					
	2012	Level	2015	Level	2017	Level
Change in the graduate's value orientations in the direction of developing their abilities, self-education and conscious planning of further training	0,49	low	0,56	Average	0,59	Average
Professional orientation of the educational trajectory construction	0,44	low	0,61	Average	0,66	average
Average assessment of the axiological criterion	0,57	average	0,59	Average	0,67	average

**Table 3.** The effectiveness level estimation of the stimulation management model of future specialists' continuous professional training on the reflexive criterion basis

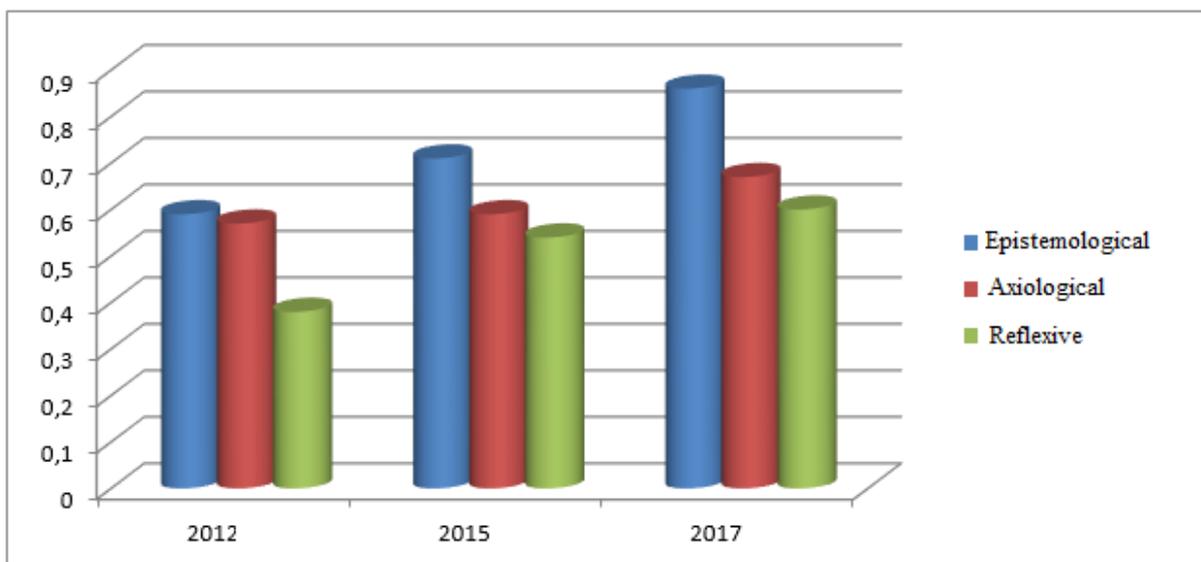
Index	Level (Rest.)					
	2012	Level	2015	Level	2017	Level
The indicator of the ability to assess their actions, their effectiveness and quality	0,39	low	0,44	Low	0,61	Average
Indicator of the ability to make decisions and correct them	0,37	low	0,35	Low	0,39	Low
The reflexive criterion average estimation	0,38	low	0,54	Average	0,60	Average

professional training, we preferred a dynamic model. This is due to the fact that it allows us to design the component processes in such a way as to take into account the changes in the components of continuous professional training multi-level system, depending on the effect of current external and internal factors, the features of the educational complex in the northern region conditions. The model dynamism also determines the ability to design an individual educational trajectory for the future specialists training, taking into account personal characteristics, personal abilities and goals of the learner. In the definition of V.M. Ananishv (5) dynamic model of the educational process is a model that takes into account the time factor, considers the process in a time dimension, operates under the influence of certain dynamic variables that represent the phases (stages) of the educational process, its duration, intensity, pace, rhythm, state, reversibility, direction [12, 16, 17].

The concept "educational service" and "educational result" have entered the professional and official turnover, which is absolutely true in a market economy, and accordingly education should be viewed as a commodity that must be improved and meet the needs of every member of modern society [18, 15]. Specifying the concept of the proposed dynamic management model for future technical specialists' continuous professional training stimulation, we will determine the main properties of this model, the criteria and levels of specialists continuous professional training effectiveness in the context of education modernization and the pedagogical conditions for its implementation. The model for stimulation managing of future specialists' continuous professional training is understood by us as a theoretical and practical variativ design of the process that ensures the integration the society needs and the educational organization's mobile capabilities through efficiently organized interaction of its constituent entities and structures that provide multi-level education and the integrative nature of educational curricula. The proposed model can be characterized as a mobile, dynamic educational system operating in the district. It is impossible to regulate the ideal model of training specialists, especially in the conditions of modern rapid changes, both in Russia and in its separate regions, including KhMAD-Yugra. Nevertheless, the dynamic model proposed by us tends to generalize the notions necessary for its effective functioning and the pedagogical conditions for its implementation. The most important indicator of this management model effective functioning of future specialists' continuous training pedagogical stimulation is the competent management of internal and external relationships and processes. Requirements for the management system, its competence and viability are increased. The complication of modern vocational schools' function in the context of education modernization necessitated the scientific substantiation of vocational training management in general on the basis of innovative approaches to the management system [19, 20, 21].

### The Model Implementation Results

Based on the study results generalization and the criteria singled out, their achievements assessment was made. The results are shown in **Tables 1-3**.



**Figure 1.** The stimulation management model effectiveness level of future specialists' continuous professional training on the criteria basis

Where  $E_{est}$  is the total average indicator of the epistemological criterion estimate determined by the educational institution according to the results of graduates' final state certification and was determined by the formula:

$$E_{est} = \sum (q_1 + q_2 + q_3)/100,$$

where  $q_1, q_2, q_3$  are qualitative indicators of the final state certification (%) in control specialties, respectively, at the beginning, middle and end of the experiment.

The epistemological component is based on knowledge, ideas about the features and conditions of future professional activity. The dynamics of the model efficiency level can be seen from the data table.

The effective implementation's indicator of methods and methods for acquiring knowledge on the educational organization estimation for the period of the experiment, determined by the results of graduates' final state certification, qualitatively increased to an index of 86%. Knowledge, abilities and professional skills, evaluated in the course of the experiment based on the results of laboratory and practical work, changed the qualitative component to 80%.

Where  $A_{est}$  is the total average indicator of the axiological criterion: determined by the results of technical specialty's graduates questioning and determined by the formula

$$A_{est} = \sum (X_1 + X_2 + X_3)/100,$$

where  $x_1, x_2, x_3$  is the exponent of the respondents' criterion (in%), respectively, at the experiment beginning, middle and end.

In general, the data obtained indicate that most graduates have an incentive to continue vocational education, the axiological criterion assessment has an average level, but there is a tendency to increase it.

A reflexion was determined in the experimental work. Reflexion always means that the future specialist has the ability to self-analyze, make decisions to correct his or her own educational activities.

Where  $R_{est}$  is the total average indicator of the reflexive criterion assessment, determined by the results of technical specialty's graduates survey.

$$R_{est} = \frac{\sum_1^n (c)}{100};$$

where  $n$  is the number of surveyed graduates,

$c$  is the percentage value of the criterion severity.

In general, the obtained data indicate that the respondents' majority at the experiment beginning had a reflexive criterion at a low level. Nevertheless, the insignificant range makes it possible to note the tendency to increase the reflection efficiency as a result of the model introduction (**Figure 1**).

The effectiveness level estimation of the stimulation management model of future specialists' continuous professional training based on the gnoseological criterion at the experiment end is 0.8, which indicates a high level. The evaluation of the model efficiency level based on the axiological criterion at the time of the experiment

completion is 0.63, which indicates an average level. The reflexive criterion level at the experiment completion also has a positive tendency. The effectiveness of the stimulation management model of continuous professional training is confirmed by the criteria characteristics' positive dynamics.

## DISCUSSIONS

One of the model's first definitions was the definition of the German scientist W. Leibniz, who presented the model as "a convenient form of knowledge about the surrounding world, as an information equivalent of an object constructed for certain practical purposes" [21]. A. M. Novikov [22] considered the model as "an auxiliary object selected or transformed for cognitive purposes, giving new information about the object under study" [23]. Simulation in pedagogical science is used as a process of model's constructing, studying and applying, it provides "the creation of knowledgeable and activity constructs (systems) for educational systems' functioning and development." "In pedagogical science, the pedagogical systems' modeling was studied by D. A. Abramova [24], N. P. Buslenko [25], V. A. Venikov [26] and others. Relying on research in the field of cognition simulation and models, we are in solidarity with V. A. Shtoff and D. A. Abramova [27, 24], which offer the following models classifications: *on the degree of cyclic nature* of the action - continuous and discrete; by structure - single- and multilevel ones; by the construction method - ideal (abstract) and material (physical); by the stability degree: deterministic (tending to the initial state in the yield case) and probabilistic (with increasing perturbation in the system). *In relation to external factors*, models can be divided into open (related to the outside world) and closed ones (working without communication with the outside world). By the action in time, the models are divided into static (in the absence of time parameters that determine its action) and dynamic (among the parameters reflecting the model action, there is a time parameter that displays the model action and change over time. In the previously adopted traditional education model, citizens were given the opportunity to receive in a clearly defined time frame, using the adopted set of educational methods, facilities and opportunities, an education that met the requirements of society at that stage. In rapid changes conditions in recent years, it became obvious that this model no longer possessed sufficient flexibility and could not fully take into account the changes taking place in all sectors [16, 17].

This is a global problem. Many scientists from different countries have repeatedly spoken about this. For example, Swedish scientist Stefan Nilsson [28], in his monograph noted that one of the reasons for the discrepancy between technical and humanitarian education in the requirements of professional activity is the rapid development of technology. Educational curricula do not have time to change in accordance with modern requirements. In this connection, Nilsson proposes as a solution to the problem - to meet the need for students to form more general competences (interpersonal skills, adaptability, self-education, etc.). When acquiring these qualities, students, faced with professional activities, will be able to navigate much faster at the workplace, and be trained in accordance with the requirements imposed on them. If we take a broader look at the essence of this problem and the proposed solution, we can understand that it is a necessity to introduce and develop a dynamic model for managing the pedagogical stimulation of specialists' continuous professional training [29, 30].

Thus, there is a need for a theoretically grounded and developed, dynamic, mobile management model's implementation to stimulate future specialists' continuous professional training.

## CONCLUSION

1. In study's experimental work organization, the result was predicted by the management stimulation of specialists' continuous professional training, as well as the identification, theoretical justification and experimental verification of the model effectiveness.

2. The use of monitoring and the obtained data analysis was carried out with the objective of obtaining objective information on the stimulation management model effectiveness of future specialists' continuous professional training, the possibilities for prompt correction, the identified criteria integration (epistemological, axiological, moral and psychological, reflexive) and a set of certain principles ( age, individual characteristics of the student, his intellectual level, social and economic situation, personal needs and interest). The components selected interact, forming a unified system that correlates with the main manifestations of future professional activity. There is a tendency to increase the model effectiveness values during the experiment, which contributed to the construction of different-level individual educational routes during the entire period of future specialists' educational activity "at the request of the employer". The effectiveness indicator of the stimulation management model implementation of specialists' continuous professional training obtained by calculation, according to the adopted technique, reaches values in the field of efficiency high level.

In conclusion, the study results are summarized and the main conclusions are formulated. Generalizing analysis and statistical processing of all the data obtained in the experimental work course made it possible to reveal a stable positive dynamics in qualitative indicators change. The tendency was noted towards the practical orientation of the educational organization activity, the creative activity growth, future specialists' self-realization, which ultimately

contributed to the potential opportunities achievement, personal resources use for professional growth and the participants' improvement in the educational process (both teachers and students). The developed pedagogical conditions contributed to the model implementation, different-level individual educational routes construction during the study entire period, in accordance with the work activity "on demand", which allows maximally to correlate the graduate vocational training with the employers' needs. The future growth points in management stimulation of future specialists' continuous professional training in the "college - university" northern educational complex conditions were also identified.

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