LOOK ACADEMIC PUBLISHERS
OPEN ACCESS

INTERNATIONAL JOURNAL OF ENVIRONMENTAL & SCIENCE EDUCATION
2016, VOL. 11, NO. 14, 7045-7065

Vocational Pedagogical Competencies of a Professor in the Secondary Vocational Education System: Approbation of Monitoring Model

Lyudmila M. Andryukhina[a], Sergey A. Dneprov[a], Tatyana G. Sumina[a], Elena Yu. Zimina[a], Svetlana N. Utkina[a] and Valentina V. Mantulenko[b]

[a]Russian State Vocational Pedagogical University, Ekaterinburg, RUSSIA; [b]Samara State University of Economics, Samara, RUSSIA

ABSTRACT

The relevance of the researched issue is preconditioned by the strategic changes in the secondary vocational education system taking place not only in Russia, but also in majority of industrially developed countries. Provision of the system with qualified pedagogical staff is the leading strategic objective of development of the secondary vocational educational system. Its solution must be based on the justified monitoring system, which objectively represents the condition as well as quantitative and qualitative changes taking place in the educational sphere. The article is aimed at approbating the model of monitoring of vocational pedagogical competences of professors in secondary vocational education. Integration of the competence, functional and general pedagogical analysis became the leading approach to research into this problem, which has enabled substantiating the model of monitoring of vocational pedagogical competences of professors in the secondary vocational education system. The competence model of a professor of secondary vocational education has been developed and substantiated as a monitoring basis. Results of model approbation and monitoring tools have been presented. The article may be useful to improve the quality of the human resource potential in the secondary vocational education system in Russia, to define current and long-range objectives of its development.

KEYWORDS

Competence model of a professor, monitoring model,approbation of Monitoring Model

ARTICLE HISTORY

Received 11 June 2016
Revised 29 July 2016
Accepted 06 August 2016

Introduction

Implementation of strategic objectives of human resourcing of the secondary vocational education system must be based on the substantiated monitoring system representing the condition as well as qualitative and quantitative changes taking place in the sphere of education. Introduction of indicators complying with international requirements is of critical importance. Taking into account provisions of the strategy, human resourcing of the secondary vocational

CORRESPONDENCE Lyudmila M. Andryukhina ✉ andrLM@yandex.ru

education system must be monitored so that the range and level of competences of pedagogical staff, knowledge needed by the economy both at the current development level in Russian and in the longer term until 2020 can be identified (The Strategy for Developing…, 2013).

Works of many researchers, including Russian ones, are dedicated to vocational training of a professor in the secondary vocational education system, competence modelling and methodology of competence assessment, including: F.F. Dudyrev (2016), E.F. Zeer (2013), Zeer, E. F & Streltsov, A. V. (2016), G.M. Romantsev (2007), N.N. Davydova et al. (2016), V.A. Fedorov & F. T. Khamatnurov (2010), P.G. Shchedrovitsky (2016), etc.

The goal of the proposed research is to approbate the model of monitoring of vocational pedagogical competences of a professor in the secondary vocational education system, which was developed by the authors and presented in earlier publications (Andryukhina et al., 2016).

The significance of the research is that implementation of its results will enable developing a substantiated approach to setting urgent and long-term objectives of human resource potential development of the secondary vocational education system, forming optimum forms of psychological pedagogical support of pedagogical staff in the secondary vocational education system.

Materials and methods

Research methods

The following methods were used in the research: theoretical methods (comparative analysis, generalization, pedagogical interpretation etc.); diagnostic methods (diagnostic condition and cause analysis, survey, correlation approach, expert evaluation, qualitative analysis methods); empiric methods (fact description, measures and generalization of research results, grouping, selection); modelling methods (model and questionnaire development etc.); statistical methods of research results processing.

Research Facilities

The experimental research facilities were the following vocational education establishments of the City of Yekaterinburg and Region of Sverdlovsk of the Russian Federation: State Independent Vocational Educational Establishment of the Region of Sverdlovsk “Ural A. S. Popov Radio Technical College” (City of Yekaterinburg), the State Independent Vocational Educational Establishment of the Region of Sverdlovsk “Ural Railway Technical College” (City of Yekaterinburg), the State Budget Vocational Educational Establishment of the Region of Sverdlovsk “Krasnotyryinsk Polytechnic College” (City of Krasnotyryinsk), the State Budget Vocational Educational Establishment of the Region of Sverdlovsk “Kamensk-Uralsky Agroindustrial College” (City of Kamensk-Uralsky).

Research Stages

The research has been conducted in three stages:

— the first stage: research into the theoretical and methodological framework of monitoring of the human resourcing of the secondary vocational education system in the Russian Federation;

— the second stage: development and substantiation of the model of and procedures for monitoring of human resourcing of the secondary vocational education system with pedagogical staff;

— the third stage: approbation of the model of and procedures for monitoring of human resourcing of the secondary vocational education system with pedagogical staff.

Results

Theoretical and Methodological Framework of Monitoring of Human Resourcing of the Secondary Vocational Education System in the Russian Federation

When it comes to the research objectives, monitoring is considered as an organizational and analytical method of studying the condition of human resourcing in vocational educational establishments of the same level (secondary vocational education). Monitoring structure and scope: data collection within the framework of human resourcing monitoring is object-focused and directed at professors of specials disciplines (Set of Measures..., 2014).

The combination of terms "human resourcing monitoring" shall be considered as a regulatory mechanism of formation and improvement of use of the potential of heads and specialists of vocational educational establishments. In this research, the following restriction was introduced: professors of special disciplines are the monitoring object (which may also be a monitoring subject).

In the proposed research monitoring is perceived as a research based on priority of the pedagogical approach. The monitoring idea is based on pedagogical goal-setting and includes pedagogical interpretation of the data received. The critical objective of this research is to determine conformance detected in the course of the research to the actual professional readiness of pedagogical staff of the basic model of vocational pedagogical competences developed on the basis of the federal state educational standards of secondary vocational education, the occupational standard "Pedagogue of Vocational Training, Vocational Education and Supplementary Vocational Education"(Professional Standard…, 2015), and international standards (Skills USA Framework,2016).

The comparative, statistical and correlation approaches, expert evaluation and qualitative analysis methods are used in monitoring. The comparative approach compares comparable indicators of the researched object with the standard indicators (requirements of the Occupational Standard, federal state educational standards). Expert evaluation (Venkov & Dneprov, 2016; Dorozhkin et al., 2016) constitutes application of expert opinions from different categories of staff and students of secondary vocational educational establishments as a comparison basis. The statistical approach is based on application of statistical evaluation methods in the human resourcing area. The correlation method is used to detect non-conformances of the professor's competences to the standards of necessary labour functions, key and emerging competences.

Pedagogical interpretation of the research results will enable developing an integral picture of the kinds of vocational personal and competence professor's profile typical of the secondary vocational education system.

Description of the monitoring procedure:

— Monitoring is of selective nature as it is directed at evaluating competences of a certain category of pedagogues, i.e. professors (professors of special disciplines), The administration of the secondary vocational education and resource specialists choose two out of them: the most competent professor and the professor which needs advanced training most of all;

— Monitoring is conducted by specialists of the establishment itself (head, another professor) and graduates, i.e. external and internal experts work together.

The object is the condition of human resourcing of the secondary vocational education system with pedagogical staff.

The subject is development of human resourcing analysis and monitoring of human resourcing in the secondary vocational education.

Controversies:

Firstly, there is the controversy between the very high staffing level of vocational educational establishments with professors having higher education (97%) and insufficient quantities of professors having vocational pedagogical education (24%), which leads to such drawbacks as:

— Difficulties in development of learning kits with account of particular characteristics of secondary vocational education;

— Lack of objectivity and fragmentary nature of assessment tools;

— Lack of consistency in development of the didactic, methodological and motivational structures of lessons;

— Difficulties and even conflicts in establishment of training and production interaction with employers;

Secondly, there is the controversy between demand for secondary vocational education for professors with production experience and the prevailing quantity of professors with no such experience who fill up the vocational education system: only 34.5% of professors have this experience, which prevents performance of vocational pedagogical functions.

Therefore, human resourcing monitoring in secondary vocational education designated for research into formedness of vocational pedagogical competences of a professor in a secondary vocational education is pressing.

The goal is to develop and approbate the monitoring model of and procedures capable of identifying the level of pedagogical staff's readiness for implementation of a wide range of pedagogical objective, and to determine optimum forms of psychological and pedagogical support of their activities. The legal framework is Federal Law No. 273-ФЗ dated 29.12.2012 (as amended on 02.03.2016) "On the Education in the Russian Federation"; Resolution of the Government of the Russian Federation No. 349-p dated March 3, 2015.)

The following objectives have been set to achieve the goal:

— To establish theoretical and methodological framework for development of the model of and procedures for monitoring of human resourcing of the secondary vocational education system with pedagogical staff in the Russian Federation;

— To develop and substantiate the model of and procedures for monitoring of human resourcing of the secondary vocational education system with pedagogical staff;

— To approbate the model of and perform practical implementation of the procedures for monitoring of human resourcing of the secondary vocational education system with pedagogical staff.

Non-conformance of training results, i.e. competences, which have been actually obtained by graduates, to demands to the contemporary fast-changing labour market is the most pressing problem of vocational education. This problem is found not only in Russia. Most industrially developed European countries lack qualified regular labour force, mainly due to imperfection of existing vocational education systems which undergo permanent reformation (Kutepov, 2015).

Efficiency of solution of human resource training objectives for the developing economy by the vocational education system is defined by the ability of its own human resource to improve its competences: to study advanced equipment and new production technologies, to create and use contemporary educational technologies, and to be flexible on the educational services market (Ashmarina et al., 2016).

The monitoring is based on the competence model of a professor of the secondary vocational educational establishment (Andryukhina et al.,2016).

Approbation of the Model of and Procedures for Monitoring of Human Resourcing of the Secondary Vocational Education System with Pedagogical Staff

The goal of the propaedeutic research is to approbate the model of and procedures for monitoring to identify monitoring capabilities for checking the hypothesis of the human resource potential in secondary vocational education.

The objectives of the propaedeutic research are the following:

- To confirm substantiation of controversies in operation of the vocational education system;
- To confirm adequacy of the theoretical grounds and the competence model selected for development of monitoring procedures as for the objectives set (by the example of evaluation of basic (key) competences in terms of achievement of objectives of social vocational education and vocational training);
- To determine objectives of further improvement of monitoring procedures;
- To determine the general profile of needs for re-training of professors in vocational educational establishments;
- To obtain data which enable preliminary selection of forms of psychological pedagogical support of pedagogical staff to improve human resource potential of secondary vocational education.

For the purpose of the propaedeutic research, pedagogical staff of secondary vocational education has been surveyed. Monitoring was performed by heads of vocational educational establishments and resource specialists as experts. The survey offered to the experts included indicators of the professor's readiness for solving professional tasks. The expert was supposed to give expert opinion concerning readiness of each indicator:

- "YES, the professor demonstrates *readiness* for solving educational tasks (training tasks, new tasks set by the present-day economy)";
- "YES rather than NO";

– "NO rather than YES";

– "NO, the professor does not demonstrate *readiness* for solving educational tasks (training tasks, new tasks set by the present-day economy)".

Expert evaluation was made in accordance with the actual evidences of pedagogical activities of the professor who had been working in that vocational educational establishment from five to fifteen years.

The total quantity of respondents was twenty people.

Experts were asked to evaluate the criteria of key competence readiness of the professor of secondary vocational education for solving tasks of social vocational education and vocational training. Emerging competences of the professors were not evaluated in the course of the propaedeutic research. The summarised analysis of the survey results as to both units demonstrates that the propaedeutic research data fully confirm the controversies considered to describe the scientific basic vocabulary of the research into the human resource potential of secondary vocational education.

Let's consider how it is represented in the results obtained.

Controversy between the very high staffing level of vocational educational establishments with professors having higher education (97%) and insufficient quantities of professors having vocational pedagogical education (24%) is the key controversy in activities of secondary vocational education.

Lack of vocational pedagogical education of the professor predetermines low quality of organisation of all elements of the training and production process. Despite the fact that 63% of the respondents evaluate readiness of the professors of secondary vocational education for using pedagogical technologies in the educational process as "YES" (Figure 1), when asked the question "Monitors competence formation", only 32% of the respondents evaluated it as "YES" (Figure 2).

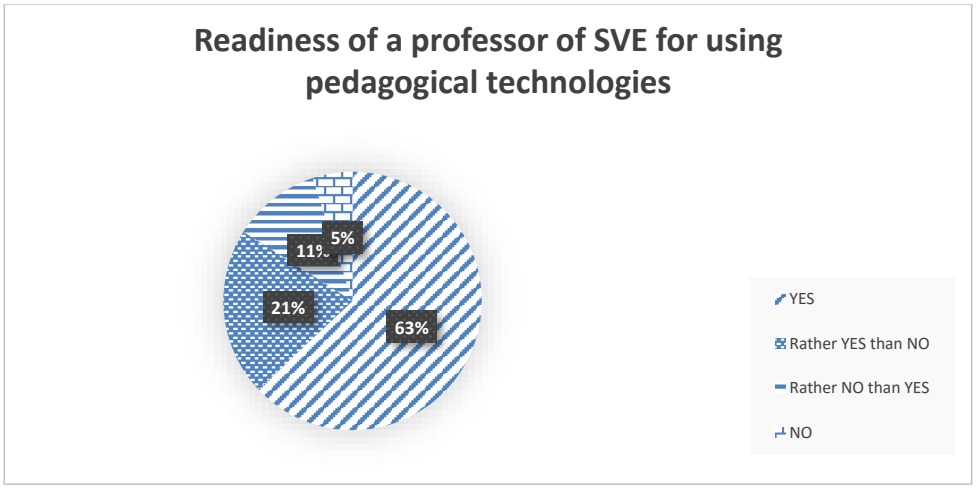

Figure 1. Diagram "Readiness of a professor of secondary vocational education (SVE) forusing pedagogical technologies"

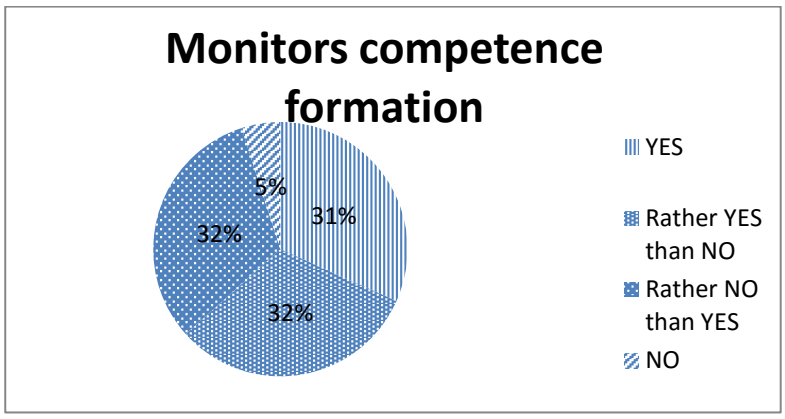

Figure 2. Diagram "Monitors competence formation"

When asked the same questions, 32% of the respondents said "Rather YES than NO", 32% of the total number of participants answered "Rather NO than YES", and 5% of the respondents gave expert opinion "NO".

If a professor uses pedagogical technologies, but doubts the need for monitoring of competence formedness (or has no idea it is necessary), it means that he doubts that his own learning kits are able to take into account specific aspects of the federal state educational standards of the new generation in the vocational educational establishment.

Provision of the personal activity nature of training predetermines introduction of the new forms of training and educational results, which are not considered in the standards of the previous generation: general cultural, general professional and professional competences. Confirmation of the training and educational results in the form of "Competence" (as opposed to the training results in the form of "Knowledge", "Abilities", "Skills") cannot be obtained without monitoring of its formation.

The fact that 5% of the respondents give a negative answer to the question on monitoring of competence formation whereas 32% of the respondents answer "Rather NO than YES" demonstrates the low level of understanding of the essence of the personal activity nature of training and education and, therefore, significant difficulties in development of the comprehensive training and methodological support of the educational process.

In addition, if a professor of the theoretical and practical discipline has not mastered (is bad at) competence formation monitoring technologies, it demonstrates difficulties in development and implementation of the evaluation tools funds although 47% of the respondents believe that the evaluation tools funds has been used efficiently (Figure 3).

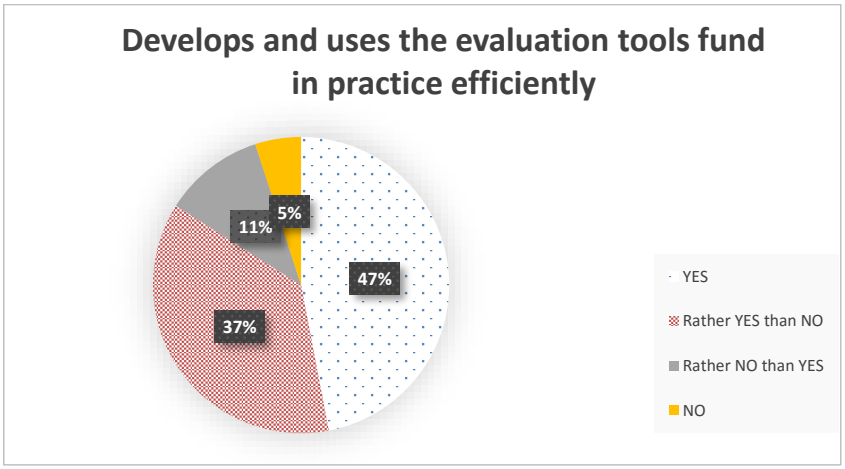

Figure 3. Diagram "Develops and uses the evaluation tools fund in practice efficiently"

However, 37% of the respondents are not quite sure that the evaluation tools funds are developed and used in practice (rather YES than NO). And 11% tend to think that this process is not really applied in practice (rather NO than YES). Therefore, pedagogical efficiency of training results measurement is doubtful.

Finally, when asked to assess the indicator "Monitors dynamics of students' motivation for theoretical and practical studies" (Figure 4), only 26% of the respondents answered "YES".

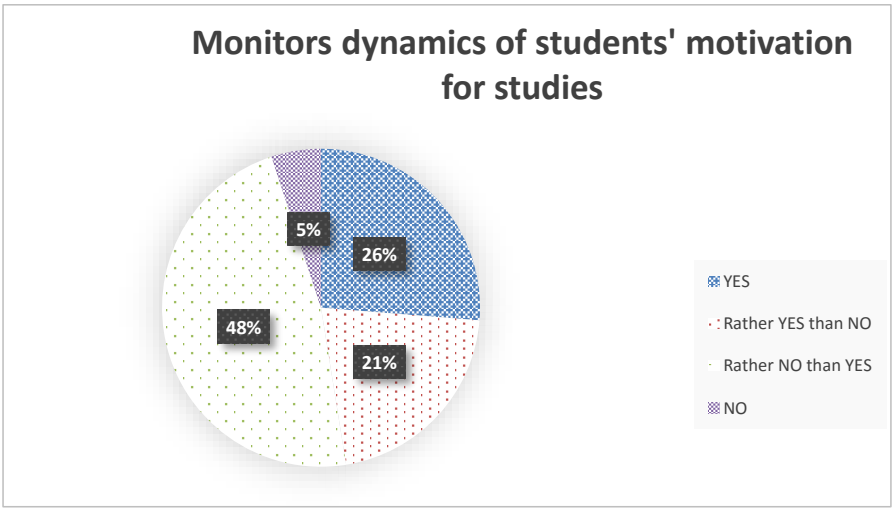

Figure 4. Diagram "Monitors dynamics of students' motivation for theoretical and practical studies"

Evaluation at the level "Rather YES than NO" has been made by 21% of the expert respondents, whereas 47% and 5% of the respondents have given a negative answer "Rather NO than YES" and "NO".

This instability in evaluation of these three indicators demonstrates a formal approach to taking into account the needs and motivation sphere of the students' personality in the training and production process, which is likely the result of insufficient vocational pedagogical literacy or underestimation of

importance of feedback when establishing conditions for formation of full-scale motivation of future workers and mid-ranking specialists for cognitive activities.

Description of quality of the educational process in vocational training of future workers and mid-ranking specialists will be incomplete if we fail to consider training and production interaction with the employer (Davydovaet al., 2016).

Currently, training and production work performed together with the employer is a necessity both for the purpose of establishment of conditions for synchronous (rather than catching up) training and subsequent employment of graduates. For this reason nowadays many vocational educational establishments cooperate with employers on the basis of social partnership agreements. Lesson plans and educational programmes are developed for the purpose of joint work involving social partners into the training and production process. Arrangement and holding of the pedagogical process at the production site of the social partnering enterprise is a precondition for the highest-quality formation of professional competences, provision for the result of vocational education which conforms to the current level of production development.

Participation in education and production integration processes demonstrates high skills of a professor of the vocational educational establishment.

At the same time, when considering the indicator "Develops organizational and methodological framework for education and production integration", only21% of the expert respondents answered "YES" (Figure 5).

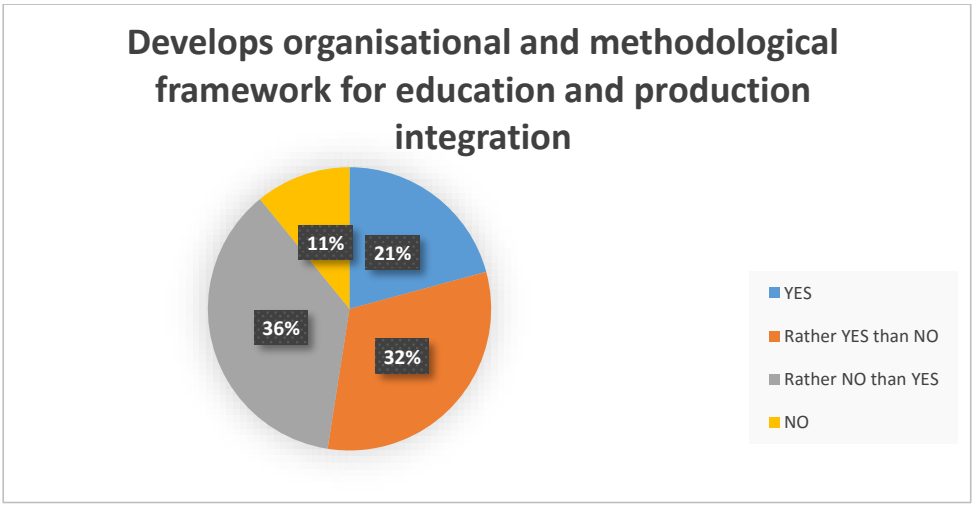

Figure 5. Diagram "Develops organisational and methodological framework for education and production integration"

32 % of the expert respondents answered "Rather YES than NO". 37 % and 11% of the respondents respectively gave answers "Rather NO than YES" and "NO".

The fact that 48% of the experts negatively evaluate participation of a professor of the vocational educational establishment in integration and production processes demonstrates the low level of involvement of a professor of secondary vocational education into the process of creation of the subject-spatial educational and production environment, which provides for personal activity

nature of vocational training with account of requirements of the modern economy.

Success of the student's cognitive activities is directly associated with his or her personal development. Vocational and pedagogical support of the student is necessary for efficient personal development of a future worker and a mid-ranking specialist. This support shall be performed via the process of social and vocational education.

Let's consider the results of the propaedeutic research, which characterize competence of a professor of secondary vocational education in development of personal traits of future workers and mid-ranking specialists.

Evaluation of the indicator "Is tolerant to social, ethnic, confession and cultural differences" (Figure 6) draws attention.

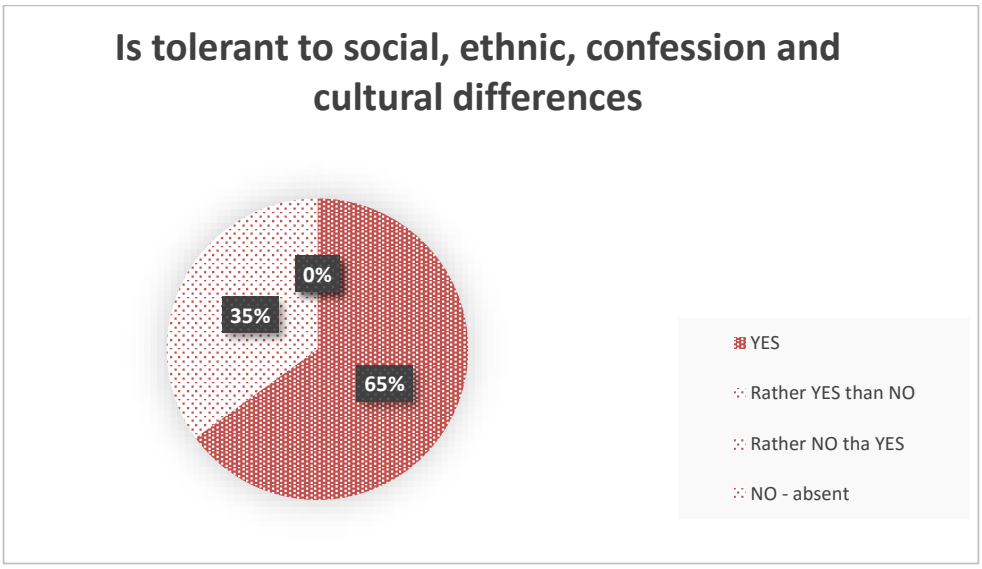

Figure 6. Diagram "Is tolerant to social, ethnic, confession and cultural differences"

65% of the expert respondents answered "YES" whereas remaining 35% of participants of the expert evaluation have selected "Rather YES than NO". There are no negative evaluations.

Many professors establish pedagogically expedient relations with their students (Figure 7): "YES" has been selected by 60% of the respondents, 35% of the respondents have answered "Rather YES than NO", and only 5% of the respondents have evaluated the indicator as "Rather NO than YES".

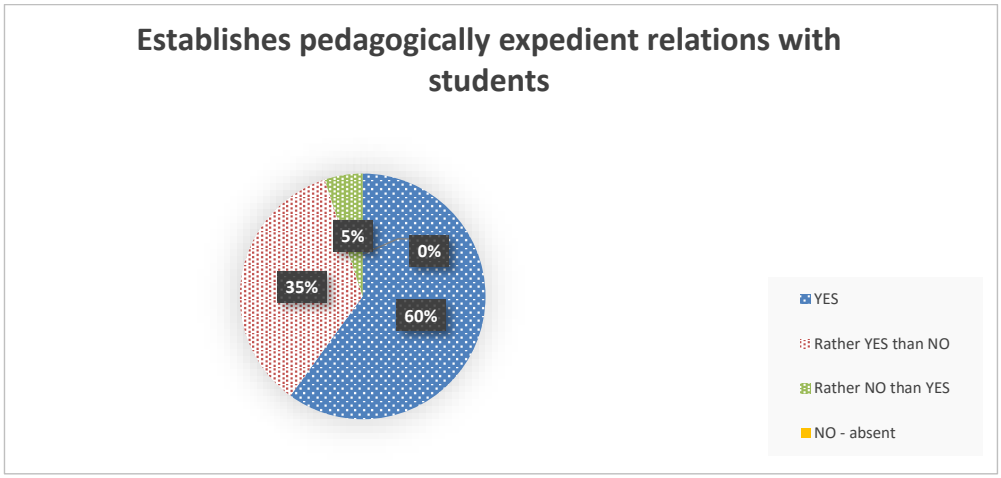

Figure 7. Diagram "Establishes pedagogically expedient relations with students"

However, the systemic nature of the concept of value attitude to a human is evaluated as "YES" by 35% of the respondents only whereas 30% of the respondents select "Rather YES than NO", and 30% answer "Rather NO than YES" (Figure 8).

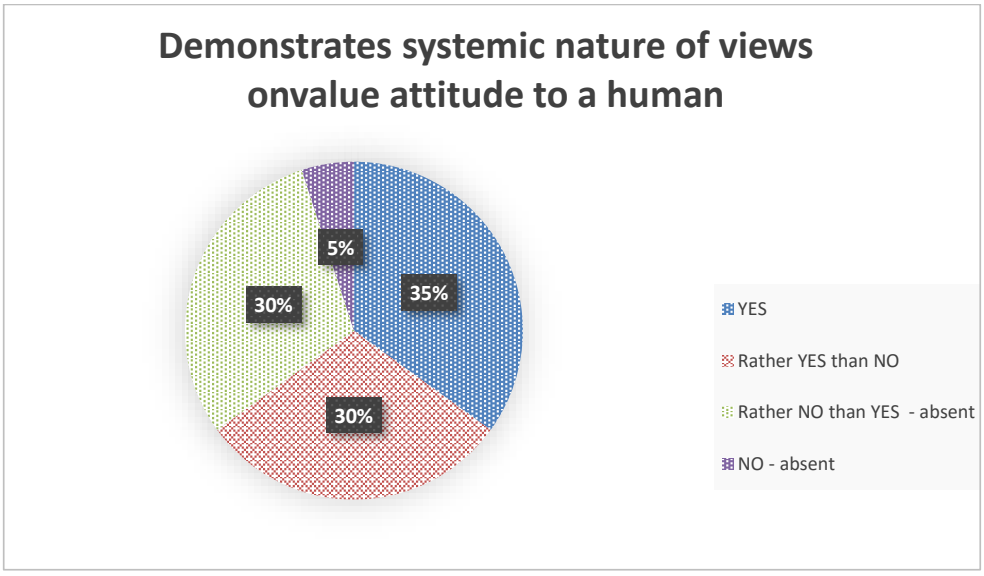

Figure 8. Diagram "Demonstrates systemic nature of views on value attitude to a human"

The controversy is evident: on the one hand, most professors establish pedagogically expedient relations with their students and demonstrate tolerance to social, national, religious and cultural differences. On the other hand, much fewer respondents (35%) register systemic nature of views on value attitude to a human. This result is quite logical. Pedagogically expedient relations may be established, and tolerance to another personality may be demonstrated by the person owing to his or her personal attitude to the world and other people. Systemic nature of views on value attitude to a human presupposes knowledge of the core and specifics of approaches in the course of interaction with the personality and mechanisms for their implementation. A professor has such knowledge and skills only provided that he or she has good vocational

pedagogical education (or self-education): systemic nature of views results from reading special literature.

Development of individual educational paths is one of manifestations of the systemic nature of views on value of a human. It includes sustained and hard efforts to be taken together with the student, his or her parents (legal representatives) and colleagues.

The result of the propaedeutic research into this issue is not surprising: only 15% of the respondents evaluate this indicator as "YES", 45% select "Rather YES than NO", and 40% of the Respondents tend to evaluate it negatively (Figure 9).

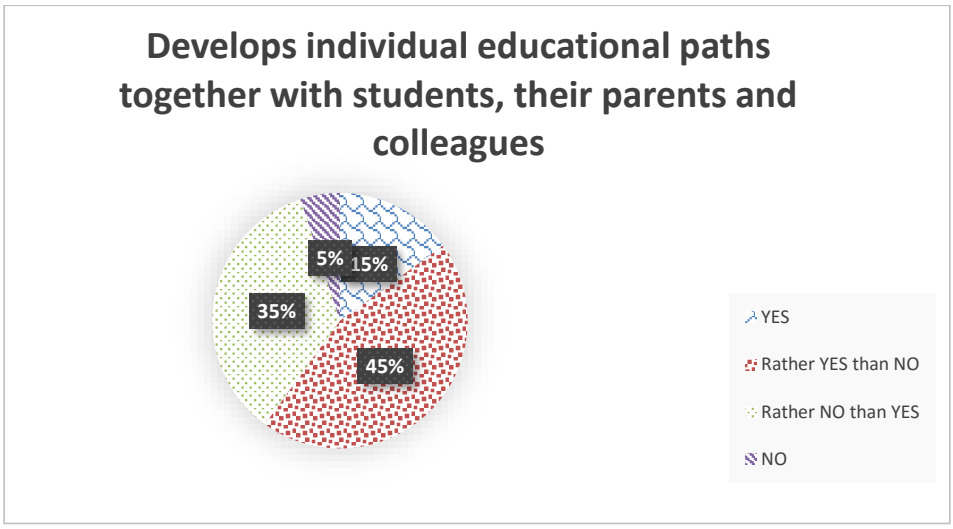

Figure 9. Diagram "Develops individual educational paths together with students, their parents and colleagues"

Therefore, only 15% of the respondents, participating in expert evaluation of competence of a professor of secondary vocational education in development of students' personal traits, are entirely sure that the tasks, related to implementation of the personality-oriented approach, are solved competently. It is obviously not enough for high quality training of future workers and mid-ranking specialists.

Personality is development in the social group, and here a key role is played by development and pedagogical support of the self-government. When asked about pedagogical support of students' self-government, 40% of the respondents answered "YES" and 30% said "Rather YES than NO". 15 % of the respondents evaluated the indicator at the level "Rather NO than YES", and 15% of the respondents selected "NO" (Figure 10).

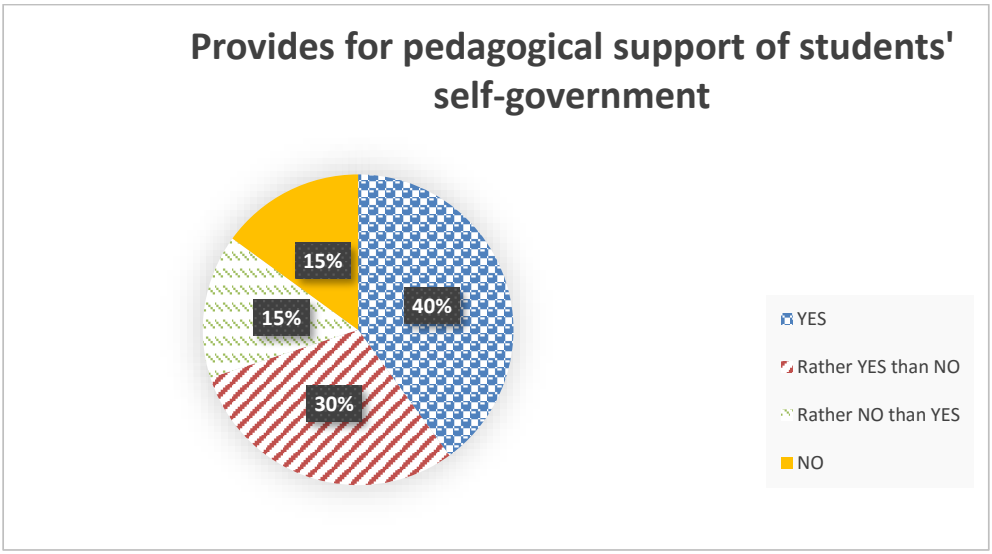

Figure 10. Diagram "Provides for pedagogical support of students' self-government"

Students' self-government is generally supported by professors (70%), but it is done confidently by only 40% of the professors, and 45%of them simply sympathize and "do not hinder" self-government.

The result of expert evaluation of the issue of emotional and will, needs and motivation, and intellectual spheres of students does not actually meet the requirements of high-quality organization of educational work. Only 10% out of all respondents answered "YES" and stated that the professor diagnosed value and sense, emotional and will, needs and motivation, and intellectual attributes of students, 45% selected the answer "Rather YES than NO", and 45% tend to give a negative answer (Figure 11).

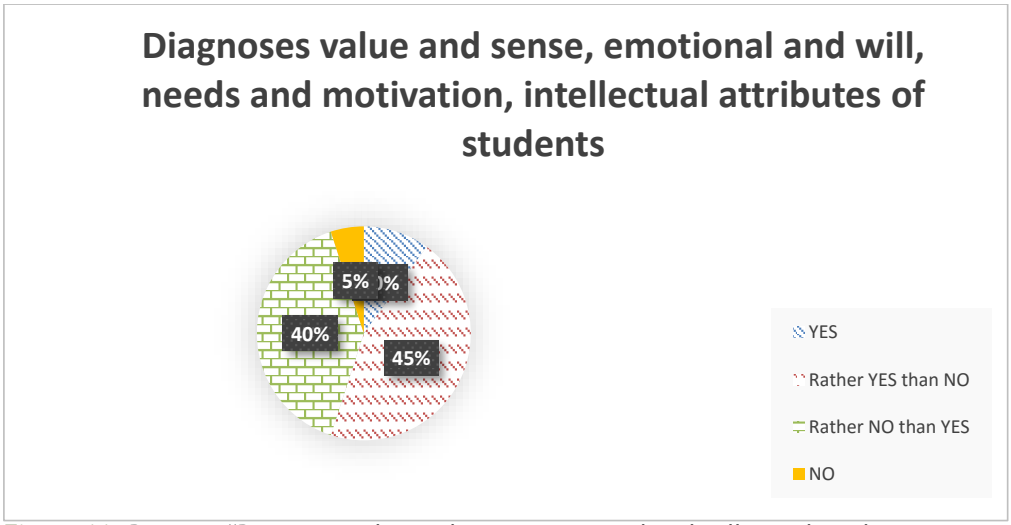

Figure 11. Diagram "Diagnoses value and sense, emotional and will, needs and motivation, intellectual attributes of students"

Analysis of the results of the propaedeutic research into monitoring indicators related to education considered thirty-six indicators characterizing competence of a professor in development of a student's personality. The general condition of the human resource potential of secondary vocational education in solution of educational tasks may be considered satisfactory. However, it should be noted that it is the student's personal development that preconditions his or her success in cognition, social and vocational establishment. Therefore, the satisfactory level may not be considered to be sufficient, as good and high-quality educational work is a precondition of high-quality and advanced or at least synchronous development of the entire training and production process.

The following shall be emphasized concluding the analyzing of the results of the propaedeutic research into confirmation of applicability of monitoring of the human resource potential of secondary vocational education:

— Developed procedures for monitoring of the human resource potential of secondary vocational education provide for objective and prompt evaluation of key, basic competences of a professor and enabled identifying drawbacks of vocational pedagogical education of professors and masters of vocational training, which decrease the general level of training of future workers and mid-ranking specialists;

— The most general difficulties of the training and production process are preconditioned by insufficiency of consistent knowledge of the pedagogical staff of secondary vocational education about organization of vocational pedagogical interaction which provides for personal activity nature of vocational training and social and vocational training;

— Implementation of vocational pedagogical training and retraining programmes for pedagogical staff of secondary vocational education, as well as organization of the system of regular seminars on current vocational education issues, are the optimum forms of psychological and pedagogical support of activities of professors of secondary vocational education.

At the same time, approbation of the monitoring model and procedures enabled to determine objectives of their improvement. The following was done on the basis of the propaedeutic research:

— Survey questions have been specified and made more detailed;

— Questions were consolidated into one list instead of three modules;

— Quantity of questions was reduced;

— Correlation between questions and competences in the competence model of a professor has been adjusted.

Discussions

Comparative analysis of Russian and international research, the subject matter of which is to identify and substantiate key and emerging competences has been conducted. This became a basis for establishment the competence model of a professor of secondary vocational education, used in the monitoring system.

In different countries skills and competences demanded by employers and the labour market are regularly studied. For instance, basic knowledge and applied skills in the US (demand for key competences) have been evaluated by the employers in the USA as follows: critical thinking / problem solving (77.8%); information technologies (77.4%); team work / collaboration (74.2%); creativity /

innovation (73.6%); diversity (67.1%); leadership (66.9%); oral communication (65.9%); professionalism / work ethics (64.4%); ethics / social responsibility (64.3%); written communication (64.0%) (Emerging Skills and Competences, 2011).

T. Wagner (2008) who studied this issue in the USA surveyed several hundreds of leading employers and proposed "seven survival skills" on the basis of that survey:

— Critical thinking and problem solving;

— Collaboration;

— Adaptability;

— Initiative and entrepreneurship;

— Accessing and analyzing information;

— Curiosity and imagination.

Survey of 233 employers which was conducted the same year by the Council for Industry and Higher Education (Great Britain) (Archer & Davison, 2008) also demonstrated that employers were interested in so called "soft" skills and abilities, i.e. skills which were not directly related to their professional activities (in Russian they are called meta-discipline ones). They included communication skills (88%), team working (85%), honesty (81%), intellectual ability (81%), confidence (80%), character/personality (75%), planning and organizational skills (74%), good writing skills (71%), good with numbers (68%), analysis and decision-making skills (67%). However, only 60% found the availability of the relevant degree important, and 61%found IT skills important. Similar results were obtained from the survey of 29 employers in Indonesia (Graduate employability in Asia, 2012).

T. Wagner's (2008) proposals have much in common with the results of the research into the Russian labour market although there are some evident differences. For instance, in Tatarstan the first employers' requirement is performance discipline: 92% of compulsory requirements and 8% of preferable ones (Bobienko, 2013). This trait is not mentioned by T. Wagner (2008). Sociability (65/30) and team spirit (65/29) which can be combined under T. Wagner's skill "collaboration", are running second. An ability to master new equipment (58/36) and flexibility (42/55) (Wagner's "adaptability"), readiness to share experience (included into Wagner's "collaboration"), and work initiative (45/49) are also of importance.

Different countries actively work to develop lists of skills any person needs in 21st century. They are developed by several specialized consortiums.

At the same time, according to the meta research of BCG and the World Economic Forum, Asian countries and regions lead in the level of development of the so-called 21st century skills among their students. These skills include the ones which are especially demanded in 20th century, such as reading and mathematics literacy. In addition to that, they include creativity, critical thinking, curiosity etc. Shanghai and Singapore are at the top of most ratings (the authors of the research found sufficient comparison data for 9 out of 16 skills). However, Finland leads in terms of cultural and civic literacy (ability to understand, analyse and apply humanitarian knowledge). Good results are demonstrated by Hong Kong, Macao, Japan and South Korea. Vietnam is in top 20-30%. Russia is somewhere in the middle or lower. Creativity, critical thinking

and team work, the skills demanded by employers in 21st century, are mastered by Russian school graduates more rarely than in half of the countries. And as school graduates do not have necessary skills, competences, personal traits, companies have to spend years to train them, or arrange their operations in more primitive manner (Petrova, 2015).

21st Century skills developed in education:

Basic skills: reading and writing skills (Russia is 41st place out of 91); mathematics literacy (33rd out of 91); natural sciences literacy (36th out of 75), ICT literacy (25th out of 31); financial literacy (10th out of 18); cultural and civic literacy (18th out of 35).

Competences: critical thinking/problem solving (25th out of 43); creativity (30th out of 64); communication and collaboration skills.

Personal traits: curiosity (27th out of 43); initiative; persistence; adaptability; leadership; social and cultural awareness (Petrova, 2015).

If school graduates demonstrate an insufficient level of development of 21st century skills, we can suppose it may result in considerable hardships in mastering their profession at the following educational levels.

S.A. Morozova &E.E. Symanyuk (2012) conducted experimental research into development of such a competence as occupational mobility of pedagogical staff of secondary vocational education. They examined the role of occupational mobility in implementation of innovative activities as well as its key characteristics: focus on innovation, above-level activity, creativity, lability and reflexivity. The following results of the ascertaining diagnostics.

"In general, according to the summary of the authors, formedness of the mobility components (characteristics of professional importance) of the college pedagogues was at the middle level, and focus on innovation and additional activity were evident. Such traits as intellectual lability, reflexivity and creativity have not been formed to a sufficient extent." (Morozova & Symanyuk, 2012).

The research of D. Konanchuk & A. Volkov (2013) starts with the words, "Currently the world is on the brink of a new wave of innovation which may considerably change the established "educational landscape".

According to the authors, the main trends setting principal prospects of vocational education development include the following:

— Massification of education;

— Internationalization of education;

— World economy turbulence and establishment of the new technological industry-related principles;

— Digital revolution.

According to these trends, professional skills which will be demanded in the future are predicted.

According to P.G. Shchedrovitsky (2016), competences are an ability to use technologies of the current industrial revolution. Today competences are changing according to the challenges of the Third Industrial Revolution.

Competence structure and changes thereof will depend on the following: sign and symbol systems and new thinking technologies; exteriorization of work with symbols and graphic representation; psycho-physiological self-organization techniques (personal assistant, neuro-interfaces of support of psycho-physiological functions); information technologies supporting communication and joint problem solving; organization of intellectual capabilities of a human into the high-level synergistic structure; neuro-interfaces supporting communication with machines; the fact what operational elements were transferred to new machines and robot systems (Shchedrovitsky, 2016).

The report of F.F. Dudyrev (2016), the head of the secondary vocational group of the Institute of Education of the Higher School of Economics, focuses on the following trends of secondary vocational education and vocational training development:

— High requirements for communication skills and general culture:

— Increase in demand for highly-qualified manual labour (handmade) and unique work skills;

— Increase in demand for work qualification in the IT industry;

— High-tech professions with high requirements for academic knowledge (mathematics, physics, chemistry) and assuming integral application of used knowledge for problem solving (Dudyrev, 2016).

The Emerging Occupations Collection (2014) drafted by the Agency for Strategic Initiatives and Skolkovo Moscow School of Management and the research conducted within the framework of the scientific school of academician Romantsev, 2007; Fedorov & Khamatnurov, 2010 was selected for analysis.

In Russia, proper attention is paid to the world changes, which is confirmed by Global Education Future international project. The large-scale research "Competence Foresight – 2030" was held within the project with support of the Agency for Strategic Initiatives and Skolkovo Moscow School of Management. More than 2,500 Russian and international experts participated in this research; their goal was to detect emerging occupations in 19 branches of the economy sectors. Experts discussed technology changes, social and economic processes which affected structure of work tasks, and developed industry-related "maps of the future" which were used to detect demand for emerging competences and develop an image of emerging occupations. The results of the research were consolidated in the Emerging Occupations Collection (2014).

Emerging professions to appear in Russia in the nearest decade by 2020 were structured by the authors by configurations of competence packages which included the following: occupational competences (intra and inter-industry packages) and extra occupational competences.

The abovementioned approaches are based on futurology macro-models of strategic development and form the following logic: global trends are established and transform the environment and technologies, labour division forms. They turn into a basis of emerging competence system modelling. Then objectives of development of these emerging competences and search for development platforms are solved. However, another approach is necessary as well. According to H. Mintzberg, B. Ahlstrand & J. Lempel (2001), strategies must not only be planned, they must be formed as well. They shall not only be based on the expected future models, but they may be grown and developed out of sprouts of the future, which exist in the present and even in the past. Strategies of this kind are based on analysis and detection of best practices, their development

and distribution. Logic of this approach is as follows: best practices are analyzed, then new operational references and standards are developed and later turn into the basis of training and other forms of support and distribution thereof.

H. Mintzberg, B. Ahlstrand & J. Lempel (2001) defines those two types of strategies as prescriptive and descriptive ones. Prescriptive strategies are based on the expected future models whereas descriptive strategies are based on description of sprouts of the new in the past and present.

In vocational education, activity within WorldSkills movement is a vivid example of the descriptive approach is. It is an international non-commercial movement, the purpose of which is to increase prestige of blue-collar jobs and to develop vocational education by harmonizing best practices and professional standards all over the world by arranging and holding vocational workmanship competitions in each individual country and all over the world.

Now the WorldSkills practice is perceived in Russia as a basis for shaping the new strategy for developing secondary vocational education and forming the competence model of a specialist in compliance with the new economic needs, rather than "the sport of records". Russia's participation on WorldSkills competitions allows joining the system of international requirements and experience in the area of competence development in a natural manner (National Competition, 2016).

The analysis confirms that we need monitoring, which would provide an opportunity of assessment of formation of key, basic competences of the professor, his readiness to develop advanced competencies. Monitoring is important to identify shortcomings in vocational pedagogical competences of professors in the secondary vocational education system, which reduce the overall level of training of future workers and mid-level professionals, as well as for the formation of the system of professional and pedagogical support and support capacity building in secondary vocational education

Conclusion

On the basis of analysis of regulatory documents of the Russian Federation, the Occupational Standard "Pedagogue of Vocational Training, Vocational Education and Supplementary Vocational Education" (2015), Russian and international research into establishment of the list of competences of a professor of secondary vocational education, the following conclusions were made:

— Monitoring must be based on the competence model of a professor;

— Competence model of a professor of the secondary vocational education must be relevant to the competence model of a specialist (blue-collar jobs) in terms of its structure, but it must have different contents;

— As basic (key) and emerging competences play a major role in the competence model of a specialist (blue-collar jobs), it is expedient to establish the same structural units in the competence model of a professor. It will not only enable granting the monitoring procedures the function of reflection of the current system condition, it will also establishing vectors of advanced development;

— Integration of social occupational and technological occupational approaches, prescriptive and descriptive approaches to strategic analysis, competence, functional and general pedagogical approaches must be the

methodological basis of development of the competence model of a professor of secondary vocational education.

Practical significance of the results is the development of the monitoring model and tools. The developed competence model of a professor of secondary vocational education, the questionnaire, the organizational and methodological monitoring model and results of approbation thereof are of practical significance.

Monitoring on the basis of the developed model will enable developing a substantiated approach to setting applicable and prospective objectives of human resource potential development of the secondary vocational education system, forming optimum forms of psychological pedagogical support of pedagogical staff in the secondary vocational education system.

Recommendations

The main theoretical and practical results of the research may be applied to develop the conceptual framework to improve the quality of the human resource potential of the secondary vocational education system, to develop scientific and methodological support of arrangement and implementation of the analysis and monitoring procedures in the secondary vocational education system, to establish the information and analytical database, and may be implemented into practical operation of secondary vocational educational establishments of the Russian Federation and government authorities managing secondary vocational education as an element of the system for monitoring of human resourcing with pedagogical staff.

Acknowledgements

The research has been conducted within the framework of government assignment of the Ministry of Education and Science of the Russian Federation No. 2.76.2016/н.м. for implementation of the project “Scientific and Methodological, Organizational and Informational Support of Implementation of the Concept of Human Resourcing of the Secondary Vocational Educational System”.

Notes on contributors

Lyudmila M. Andryukhina is Doctor of Philosophy, Professor, Professor of the Vocational Pedagogics Department, Russian State Vocational Pedagogical University, Ekaterinburg, Russia.

Sergey A. Dneprov is Doctor of Education, Professor, Head of the Vocational Pedagogics Department, Russian State Vocational Pedagogical University, Ekaterinburg, Russia.

Tatiana G. Sumina is Candidate of Sciences (Education), Associate Professor, Associate Professor of the Vocational Pedagogics Department, Russian State Vocational Pedagogical University, Ekaterinburg, Russia.

Elena Ju. Zimina is Candidate of Sciences (Education), Associate Professor, Associate Professor of the Vocational Pedagogics Department, Russian State Vocational Pedagogical University, Ekaterinburg, Russia.

Svetlana N. Utkina is Candidate of Sciences (Education), Associate Professor, Associate Professor of the Vocational Pedagogics Department, Russian State Vocational Pedagogical University, Ekaterinburg, Russia.

Valentina V. Mantulenko is Associate professor of Samara State University of Economics, Samara, Russia.

References

Andryukhina L. M., Dneprov S. A., Sumina T. G., Zimina E. Yu., Utkina S. N., Mantulenko V. V. . (2016). The model of monitoring of vocational pedagogical competences of professors in secondary vocational education //International journal of environmental & science education? 2016, VOL. 11, NO. 4, 349-358

Ashmarina, S. I., Streltsov, A. V., Dorozhkin, E. M., Vochozka, M. & Izmailov, A. M. (2016). Organizational and Economic Directions of Competitive Recovery of Russian Pharmaceutical Enterprises. *IEJME — Mathematics education, 11(7),* 2581-2591.

Bobienko, O. M. (2013). Status of Key Competences of a Professional in Qualification Requirements of Contemporary Employers. *TISBI Bulletin*, *2(54),* 32–44.

Davydova, N.N., Dorozhkin, E.M., Fedorov, V.A. & Konovalova, M.E. (2016). Research and Educational Network: Development Management. *IEJME - Mathematics Education, 11(7),* 2651-2665.

Dorozhkin, E.M., Leontyeva, T.V., Scherbina, Y.Y., Shchetynina, A.V. & Pecherskaya, E.P. (2016). Teacher's Labour as a Tool of Forming Human Capital of Higher School Graduates. IEJME-Mathematics Education, 11(7), 2773-2787.

Dudyrev, F. F. (2016). *On Development Trends of Secondary Vocational Education and Education Training*.Direct access: http://worldskills.ru/wp-content/uploads/2016/02/26.05.2016_-YEkspertnaya-diskussiya_O-trendakh-razvitiya-SPO_Dudyrev.pdf.

Emerging Occupations Collection. (2014). *Agency for Strategic Initiatives and Skolkovo Moscow School of Management*.Direct access: http://www.skolkovo.ru/public/media/documents/research/sedec/SKOLKOVO_SEDeC_Atlas.pdf.

Emerging Skills and Competences – A transatlantic study EU-US Study for the European Commission (2011). DG EAC, 141 p.

Fedorov, V. A. & Khamatnurov, F. T. (2010). Scientific and Educational School "Scientific Fundamentals of Development and Design of Vocational and Vocational Pedagogical Education in Russia" of academician of the Russian Academy of Education, G. M. Romantsev. *The Education and science journal,10(78),* 126-140.

Graduate employability in Asia (2012). *Bangkok, UNESCO, 2012*.Direct access: http://unesdoc.unesco.org/images/0021/002157/215706E.pdf.

Konanchuk, D.&Volkov, A. (2013). *Greenfield Epoch in Education.* Skolkovo: Business School Education Development Centre, 352 p.

Kutepov,S. N. (2015). *Vocational Education and Regular Labour Force Training in Europe:* PhD Thesis. Tula: Tula State L. N. Tolstoy Pedagogical University, 146 p.

Mintzberg, H., Ahlstrand, B.& Lempel, J. (2001).*Strategy Schools*.. Saint-Petersburg: Piter, 336 p.

Morozova, S. A.&Symanyuk, E. E. (2012). Occupational Mobility as a Factor of Innovation Activities of a Pedagogue.*The Education and science journal*,*4 (93),* 50–60.

National Competition "Young Professionals" (2016). Direct access: http://worldskills.ru/home/missiya/.

Petrova,N. (2015). Economy without the Smart. Why Russian School Fails to Develop XXI Century Skills. *Kommersant Dengi, 16,* 44-46.

Professional Standard "Pedagogue of Vocational Training, Vocational Education and Supplementary Vocational Education" (2015). Direct access: http://xn--c1arjr.xn--p1ai/wp-content/uploads/2015/02/Pedagog-DPO.pdf.

Romantsev, G. M. (2007). *Theory and Practice of Vocational Pedagogical Education*. Ekaterinburg: Publishing House of the Russian State Vocational Pedagogical University, 304 p.

Set of Measures Designated for Improvement of the Secondary Vocational Education System for 2015 – 2020. Aapproved by Resolution of the Government of the Russian Federation dated March 3, No. 349-p.

Shchedrovitsky, P. G. (2016). *III Industrial Revolution and Changes in Competence Requirements*.Direct access: http://worldskills.ru/wp-content/uploads/2016/02/25.05.2016_Lekciya-dlya-BC_CHast-1_SHHedrovickiy.pdf.

Skills USA Framework (2016). Direct access: http://www.skillsusa.org/about/skillsusa-framework/.

The Strategy for Developing the Regular Labour Force Training System and Forming Applied Qualifications for the Period until 2020 (2013) Direct access: http://xn80abucjiibhv9a.xnp1ai/%D0%BF%D1%80%D0%BE%D0%B5%D0%BA%D1%82%D1%8B/413/%D1%84%D0%B0%D0%B9%D0%BB/2605/BookEducation_02.pdf.

Wagner, T. (2008).*The Global Achievement Gap: Why Even Our Best Schools Don't Teach the New Survival Skills Our Children Need – And What We Can Do About It.* New York: Basic Books. 363 p.

Venkov, S. S. &Dneprov S. A. (2016). Factor Analysis of Expert Evaluation of Online Tests on Universal Personality Traitsof Information Technology Teachers. *Municipal Education: Innovation and Experiment, 2,* 13-18.

Zeer, E. F& Streltsov, A. V. (2016). Technological Platform for Realization of Students' Individual Educational Trajectories in a Vocational School. *IEJME — Mathematics education, 11(7),*2639-2650.

Zeer, E. F. (2013). *Vocational Education Psychology*. Moscow: Akademiya Publishing Centre, 416p.

Zhilin, D. M. (2014). *XXI Century Skills and XXI Century Science – Controversy or Conformance?*Direct access: https://docviewer.yandex.ru/.