

V International Forum on Teacher Education

On the Models of Teacher Training Within the Context of Scientific and Educational Cluster at Technical Universities

Rais S. Safin* (a), Eugene A. Korchagin (b), Ruslan N. Abitov (c)

(a), (b), (c) Kazan State University of Architecture and Engineering, Kazan, Russia

Abstract

Providing the system of secondary vocational education with qualified teachers is one of the urgent problems of vocational education. The main objective of the study is to create opportunities to provide secondary and tertiary technical educational institutions with teachers of specific subjects with the help of the scientific and educational cluster of Kazan State University of Architecture and Engineering (KSUAE). In this regard, this article aims to develop educational models of training vocational teachers within the cluster. A key method to study the problem of designing models of teacher training is a systematic approach. In accordance with the approach, designed objects are seen as pedagogical systems. In the process of training, it is necessary to form general and professional competencies in order to carry out engineering and pedagogical activities, which is possible due to competence-based, activity-based and integrative approaches. The focus of educational programs on students' personal development involves the use of a student-centered approach. Having studied all these approaches, we can suggest a comprehensive approach to the problem. The components of the proposed pedagogical model and educational features of PhD students training at a technical university are discussed. The optional models of teacher preparation at secondary and tertiary educational institutions within the scientific and educational cluster are given. Professional and pedagogical education of teachers in accordance with the models ensures the integration of psychological, pedagogical and vocational training. The content of pedagogical disciplines in basic and optional part of the curriculum is given. This is achieved by the optimal combination of teaching abilities and qualities of a highly qualified teacher.

Keywords: vocational education; teacher of special disciplines; federal state educational standards; areas of training; master's degree; scientific and educational cluster.

© 2019 Rais S. Safin, Eugene A. Korchagin, Ruslan N. Abitov

This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Published by Kazan Federal University and peer-reviewed under responsibility of IFTE-2019 (V International Forum on Teacher Education)

* Corresponding author. E-mail address: safin@kgasu.ru

Introduction

The construction industry is experiencing an acute shortage of skilled construction workers. The competencies are largely determined by the level of teaching of general and major-specific disciplines at secondary vocational schools. This sphere mainly involves teachers who do not have a degree in construction. Only 18% of teachers have a degree. All this testifies to the impossibility of high-quality training of construction workers and engineers. The training of such specialists is not being carried out these days since the Ministries of Education, both federal and regional, do not fund such educational programs anymore. Hence, the educational programs have been discontinued both at KSUAE and other secondary vocational schools.

In this regard providing the system of secondary vocational education with qualified teachers is one of the urgent problems of vocational teacher education.

Vocational training refers to the complex system and consists of interrelated components: principles, goals, objectives, contents, means, forms, methods, functions and has its own specifics. A vocational teacher trained in the system of professional teacher education has not only knowledge, skills and competencies, but also a profession-oriented personality capable of self-realization (Korchagin & Safin, 2013; Korchagin, Safin, Vildanov, & Abitov, 2014).

One should note that the problem of pedagogical training of university lecturers remains quite relevant. This problem in the context of further vocational education is analyzed by Verbitsky (2014) and Minin, Belomestnova, Benson, & Pakanova (2014). The best solution to this problem, according to the authors, is engineering education suggested by Minin, Belomestnova, Benson, & Pakanova (2014), and Prikhodko & Sazonova (2014).

An integrative approach to the solution of this problem within the context of engineering education involves the integration of technical training with pedagogical training. At the same time, the training of university lecturers within the system of tertiary education and the development of specific models and programs for such training have not received much attention.

One might notice that the implementation of new Federal Educational Standards (FES) and a transition to the three-level system of higher education requires lecturers to do a considerable amount of research and didactic work, which in turn has led to an increase in the workload.

Thus, according to Sorokopud (2012), more than 70% of lecturers experience difficulties in developing educational and methodological documents on the basis of Federal Educational Standards, 75% of academics – when introducing integrative forms of training, more than 50% of educators – when using information technologies. The survey involved 750 university teachers, 272 graduate students, 258 undergraduates in 6 major universities of Russia.

Consequently, we need the implementation of pedagogical training of university lecturers and its inclusion in educational programs, especially at technical universities where lecturers are university graduates who have no specific pedagogical training.

The main objective of the study is to create opportunities to provide secondary and tertiary technical educational institutions with teachers of specific subjects building on the scientific and educational cluster of Kazan State University of Architecture and Engineering (KSUAE).

Methodology

Research methods: theoretical analysis of pedagogical and psychological literature on the training of teaching staff; analysis of federal educational standards for educational and engineering programs; study

of the experience of educational institutions; pedagogical modeling.

A key method to study the problem of designing models of teacher training is a systematic approach. In accordance with the approach, designed objects are considered as pedagogical systems. In the process of training, it is necessary to form general and professional competencies in order to carry out engineering and pedagogical activities, which is possible due to competence-based, activity-based and integrative approaches. The focus of educational programs on students' personal development involves the use of a student-centered approach.

The link between the technical and pedagogical training is methodological activity. It is known that the components of instructional activities are comprised of the objectives, content, means, forms, and methods of training. They are interdependent and interrelated. For example, the learning objectives determine the content which in turn determines the choice of basic mental operations, etc.

Results

There are three variable models of training and retraining of teachers in the proposed scientific and educational cluster.

The first option: training of teachers is conducted on the basis of a bachelor's program (FES code: 44.03.44) "Vocational Training", a master's program (FES code: 44.04.04) "Vocational Training", and a postgraduate program (FES code: 44.06.01) "Education and Pedagogy".

Graduates of "Vocational Training" programs get a double degree diploma both in a relevant technical field and in pedagogy. They can work at technical secondary vocational schools as teachers of specific subjects.

Vocational training refers to the complex system and consists of interrelated components: principles, goals, objectives, contents, means, forms, methods, functions and has its own specifics. A vocational teacher trained in the system of professional teacher education has not only knowledge, skills and competencies, but also a profession-oriented personality capable of self-realization (Korchagin & Safin, 2013; Korchagin, Safin, Vildanov, & Abitov, 2014).

A master's program "Practice-Oriented Education Technology of Professional Disciplines" was tailored taking into consideration the Federal educational standards.

This program includes such disciplines as:

- 1) Methods and Forms of Practice-Oriented Education;
- 2) Practice-Oriented Design of Professional Disciplines;
- 3) Organization of Extended Education of Workers and Employees in the Industry.

Profession-oriented courses include: "Instructional Design, Practice-Based Learning", "Creation of a Practice-Oriented Educational Environment", "Psychology of Career Management in Organizations".

These programs contribute to the humanization of technical education, integration, and interaction of technical and pedagogical knowledge; they broaden and deepen the skills of future lecturers of technical university, improve the quality of their preparation for teaching. And most importantly, these pedagogical courses develop abilities and personal qualities of a prospective teacher.

The second option is recommended for the training of teachers of vocational subjects on the basis of a bachelor's program (FES code: 08.03.01) "Civil Engineering", a master's program (FES code: 08.04.01) "Civil Engineering", and a postgraduate program (FES code: 44.06.01) "Education and Pedagogy".

Federal educational standards in relation to engineering bachelor's programs, as rule, do not

include pedagogical training although education and research work activities are mentioned. Graduates of these programs should be ready to solve the following problems: research, development, technology, organization and management, maintenance, expertise and analysis.

Therefore, the curricula practically do not contain pedagogy courses.

Federal standards of master's programs involve research and educational activities. Thus, FES program "Civil Engineering" includes education and research work activities (within a specific sphere of training and further vocational training for the construction industry, housing and communal services, and scientific research). For example, in accordance with the fields of activity, a graduate should be ready to address the following professional tasks: develop teaching materials, lecture notes and practical sessions in courses of the secondary vocational and higher education; conduct classroom teaching, supervise course and diploma projects, organize internships. To perform the specified activity a postgraduate should have only one FES competence, namely *"to take part in the educational work"*. It is obvious that the above-mentioned competence is not enough to implement the educational activity to a full extent. For example, it does not involve the use of innovative teaching technologies. In our opinion, the situation can be improved if we introduce pedagogical disciplines within the context of optional subjects.

The third option can be implemented on the basis of a bachelor's program (FES code: 38.03.10) "Housing and Communal Services Infrastructure", a master's program (FES code: 38.04.10) "Housing and Communal Services Infrastructure", and a postgraduate program (FES code: 44.06.01) "Education and Pedagogy". The last option is more attractive to students because FES provides teaching as its main activity.

The option is the most preferable, because Federal standards specify competencies of training and research activities within general, secondary, vocational and additional vocational education. In order to gain FES competencies within an optional set of disciplines, "Vocational Training" course has been developed. The main objective of the discipline is the development of teaching competencies specific to the activities necessary for the practical activities in the organization of education at secondary, higher, supplementary education and certification of employees. The course content includes elaboration of the educational process in higher, vocational and further vocational education institutions; issues of the content of education; techniques of giving lectures in higher, vocational and further vocational education institutions; design of lectures.

The optional part of the program provides a pedagogical orientation. It includes psychology of social interaction; principles of pedagogy and andragogy; psychology and pedagogy of higher education; pedagogical internship etc.

All three models of teacher training offer PhD programs. Let us mention some peculiarities of training of postgraduate students at technical universities.

Recent publications on PhD programs according to the new Federal educational standards mainly deal with ideological, organizational and management issues, but practically do not reveal the didactic aspects of training of postgraduate students who, in our opinion, are important for the development of doctoral studies (Muratova, Dvoretzki, & Ivanov, 2015; Karavaeva, Malandin, Pilipenko, & Teleshova, 2015; Bednyi, Rybakov, & Sapunov, 2017; Shestak & Shestak, 2015; Reznik & Chemezov, 2018; Senashenko, 2016; Berezhnaya & Gurtov, 2017; Raychuk & Minina, 2016; Popova & Biricheva, 2017; Bekova et al., 2017; Mironos, Bednyi, & Rybakov, 2017; Petrov & Babichev, 2017; Muratova, Popov, & Rakitina, 2017; Karavaeva, Malandin, Mosicheva, & Teleshova, 2018). Let us reveal some of them.

A modern Russian technical university has, as a rule, several areas of doctoral training regulated

by Federal educational standards. According to them, a graduate of such programs is prepared for research and teaching activities. The qualification of a researcher and a lecturer-researcher is conferred upon completion of a doctoral program. Accordingly, the educational component of postgraduate training involves two components: training in research activities and preparation for teaching. It is obvious that research and teaching activities are different. They require different pedagogical techniques. Classes on research activities within PhD programs are mainly focused on the study of the technosphere, and its objects are comprised of the artificial human environment. Teaching classes relates to the humanities field and its object is a human being.

Research activities are aimed at obtaining new reliable knowledge about reality, establishing objective logical relations between phenomena, while teaching at the university is aimed at applying knowledge for learning, education, and development of students. However, research and teaching are closely linked due to the relationship between science and education: teaching “is built” on the achievements of science, and science requires qualified personnel. On the basis of science, education and its functioning in every part of the country are ensured. Science provides the subject-specific content of all courses in education.

The duality of training of PhD students in different and interrelated types of activities requires the development of an appropriate scientific and methodological support. In accordance with FES, postgraduate training involves the development of universal, general and professional competencies both in the field of research and teaching activities. Their development is the most essential task of education.

The educational component of postgraduate education includes disciplines related to research activities and teaching. Accordingly, the pedagogical element of postgraduate education consists of two processes: preparation for research activities and preparation for teaching. In accordance with the comprehensive approach, these processes cannot be considered as independent ones. Complexity means the unity of objectives, tasks, content, methods, and forms of these processes in shaping the holistic personality of a future teacher and researcher. Thus, through a comprehensive approach the idea about the integrity of postgraduate training is implemented.

The following approaches are used in the process of design and implementation of the educational component: systematic approach, in the framework of which preparation for the research and teaching is considered as a pedagogical system; competence and activity-based approaches to the development of general and professional competencies within research and teaching activities; learner-centered approach, the focus on personal development and “one-of-the-kind” PhD students training for the research and teaching activities in accordance with their individual education plans (Korchagin & Safin 2019).

The main methods of designing and implementing the educational component are those of goal-setting and implementation, selection, structuring etc.

The link between preparation for research and teaching activities is a methodological activity. All components of instruction are interrelated and interdependent: goals depend on the learning content; the content largely determines a choice of dominant mental operations, teaching methods and consequently organizational forms of training.

Postgraduate training at technical universities involves students in five main stages: 1) preparation for examinations; 2) preparation for teaching; 3) internship; 4) carrying out scientific research; 5) state final examination.

Design and implementation of the educational component at each stage includes the development of lectures and tutorials, independent work of students, different types of control and self-control.

The content of the educational component is based on a complex approach. The structure comprises a basic (invariant) part of the corresponding Federal educational standard while the elective part includes variable components that comply with a postgraduate program. The basic part of the educational content, which is up to modern standards, is fairly well-developed and presented in curricula and textbooks on the subjects “History and Philosophy of Science” and “Foreign Language” (Korchagin & Safin, 2019).

Quality control of the process and results of the implementation of the educational component is carried out by applying a tiered approach and different (knowledge, skills, competencies) means of evaluation (papers, individual tasks, etc.).

The assessment of results, effectiveness and quality of training in research and teaching activities is carried out by means of assessment tools, including ones for monitoring and interim assessment of students, an integrated tiered method of evaluation of guaranteed results through adequate criteria (quantitative and qualitative), indicators and parameters of determining the development of universal general and professional knowledge and skills, i.e. competencies.

Discussions

Having studied the psychological and pedagogical literature, we can state about a lack of special studies devoted to the problem of designing models of teacher training in the scientific and educational cluster. According to Verbitsky (2014, p. 15), “*Pedagogical consciousness of university lecturers has been developed on a purely empirical basis, quite “nominally” because they have no pedagogical education, i.e. “we teach the way we were taught”. It is believed that the most important is the knowledge content of the subject*”. This confirms the relevance of the problem of professional teacher education.

However, pedagogical training of university teachers is considered in the work of Minin, Belomestnova, Benson and Pakanova (2014). The issues of training teachers for secondary vocational schools are discussed in many papers. Approaches to the professional training of future teachers and their readiness for the scientific and methodological activities are investigated in works of Bogdanova (2013) and Bogdanova & Gilmeeva (2015). The model didactic paradigm of teacher development is presented in the work of Mirzagitova (2016). The supervision of scientific and methodological activities of teachers was researched by Krivykh (2013) and Shakuto (2014). The readiness of secondary vocational school teachers to the innovation activity was considered by Glazyrina (2012). Zatsepin (2013) studied the development of competence-oriented educational programs.

Conclusion

The opportunity of teacher training for educational institutions of the Republic of Tatarstan at a technical university within the scientific and educational cluster is described. The proposed model and pedagogical disciplines in the educational programs develop pedagogical abilities and personal qualities of a future teacher. Thus, the research result is optional pedagogical models of vocational training of teachers at technical universities.

References

- Bednyi, B. I., Rybakov, N. V., & Sapunov, M. B. (2017). Doctoral Education in Russia in the Educational Field: Interdisciplinary Discourse. *Sociological Studies*, 9, 5-134.
- Bekova, S. K., Gruzdev, I. A., Jafarov, S. I., Malashonok, N. G., & Terentev, E. A. (2017). *Portrait of a*

Modern Russian PhD Student. Moscow: Publ. House of Higher School of Economics (National Research University).

- Berezhnaya, Yu. N., & Gurtov, V. A. (2017). Postgraduate Studies in New Reality. *University Management: Practice and Analysis*, 3, 57-65.
- Bogdanova, L. G. (2013). Module-competence approach as a basis of professional training of future teachers in the secondary vocational institutions. *Kazan Pedagogical Journal*, 1, 128-133.
- Bogdanova, L. G., & Gilmeeva, R. H. (2015). Training and modular materials for scientific and methodical support of formation of readiness of pedagogical collective to the realization of Federal educational standards. *Secondary Professional Education*, 10, 31-33.
- Federal state educational standard of higher education, code: "08.03.01 Civil Engineering (undergraduate level)". Retrieved from <http://fgosvo.ru/uploadfiles/fgosvob/080301.pdf>
- Federal state educational standard of higher education, code: "08.03.01 Civil Engineering (postgraduate level)". Retrieved from http://fgosvo.ru/uploadfiles/fgosvom/080401_Stroitelstvo.pdf
- Federal state educational standard of higher education, code: 38.03.10 "Housing and communal services (undergraduate level)". Retrieved from <http://fgosvo.ru/uploadfiles/fgosvob/380310.pdf>
- Glazyrina, T. G. (2012). Organizational-pedagogical conditions of the innovative activities of college teachers. *Pedagogy. Society. Right*, 2(2), 18-22.
- Karavaeva, E. V., Malandin, V. V., Mosicheva I. A., & Teleshova, I. G. (2018). Postgraduate Course as a Level of Higher Education: Status, Problems, Possible Solutions. *Higher Education in Russia*, 27(11), 40-48.
- Karavaeva, E. V., Malandin, V. V., Pilipenko, S. A., & Teleshova, I. G. (2015). The First Experience in the Development and Implementation of Training of the Teaching Staff as a Third Level of Higher Education Programs: Identified Problems and Possible Solutions. *Higher Education in Russia*, 8-9, 5-15.
- Korchagin, E. A., & Safin, R. S. (2013). Integration as the basis of the level of professional education in scientific and educational cluster. *Higher Education in Russia*, 6, 20-29.
- Korchagin, E. A., & Safin, R. S. (2019). The Educational Component of Doctoral Students Training at Engineering Universities. *Higher Education in Russia*, 28(3), 67-74.
- Korchagin, E. A., Safin, R. S., Vildanov, I. E., & Abitov, R. N. (2014). Pedagogical training of the future teacher in technical University. *Higher Education in Russia*, 8-9, 36-44.
- Krivykh, V. V. (2013). The essence of the process approach in the management of scientific and methodical work in educational organizations. *Kazan Pedagogical Journal*, 5(100), 132-137.
- Minin, M. G., Belomestnova, E. N., Benson, G. F., & Pakanova, V. S. (2014). The teacher training of an engineering University. *Higher Education in Russia*, 4, 20-29.
- Mironos, A. A., Bednyi, B. I., & Rybakov, N. V. (2017). Academic Careers in the Spectrum of Postgraduate Students' Professional Preferences. *University Management: Practice and Analysis*, 3(109), 74-84.
- Mirzagitova, A. L. (2016). Model of formation of didactic paradigm of future history teacher. *Modern Problems of Science and Education*, 3. Retrieved from <http://www.science-education.ru/ru/article/view?id=24873> (date of views: 30.01.2019).
- Muratova, E. I., Dvoretzky, S. I., & Ivanov, A. Y. (2015). Curriculum Development Peculiarities for Highly Qualified Personnel Training. *Higher Education in Russia*, 2, 40-48.

- Muratova, E. I., Popov, A. I., & Rokitina E. A. (2017). Technology of formation of readiness of post-graduates to teaching. *Alma-mater (Journal of Higher Education)*, 1, 52-59.
- Petrov, V. L., & Babichev, Yu. E. (2017). Models of Scholarship Training Programs for Highly Qualified Personnel. *Higher Education in Russia*, 7(214), 5-14.
- Popova, N. G., & Biriicheva, E. V. (2017). Training Young Researchers at the Postgraduate Level: In Search of a Goal. *Higher Education in Russia*, 1(208), 5-14.
- Prikhodko, V. M., & Sazonova, Z. S. (2014). Engineering pedagogy: a base for professional training of engineers and doctoral students. *Higher Education in Russia*, 4, 6-12.
- Raychuk, D. Yu., & Minina, N. V. (2016). About Positioning Postgraduate School in a Three-Tier System of Higher Education. *Higher Education in Russia*, 4, 33-41.
- Reznik, S. D., & Chemezov, I. S. (2018). Postgraduate Education Russian Universities: State, Problems and Prospects of Development. *Tomsk State University Journal*, 430, 159-168.
- Senashenko, V. S. (2016). Problems of Postgraduate Training Organization and Development on the Basis of the Federal State Educational Standards of the Third Level of Higher Education. *Higher Education in Russia*, 3(199), 33-43.
- Shakuto, E. A. (2014). Management of scientific and methodical activity of teachers on the basis of project-oriented approach. *Bulletin of the Chelyabinsk State Pedagogical University*, 6, 169-178.
- Shestak, V. P., & Shestak, N. V. (2015). Postgraduate Studies as a Third Level of Higher Education: The Discursive Field. *Higher Education in Russia*, 12, 22-34.
- Sorokopud, Y. V. (2012). Education of high school teachers in the process of implementation of Federal state educational standards of new generation. *Bulletin of University (State University of Management)*, 6, 96-101.
- Verbitsky, A. A. (2014). The teacher is the main subject of educational reform. *Higher Education in Russia*, 4, 13-20.
- Zatsepin, V. A. (2013). Formation of readiness of college teachers to the development of competence-oriented educational programs. *Kazan Pedagogical Journal*, 5(100), 132-137.