

# Design, experience in the implementation and prospects of the master's program "professionally oriented training in mathematics"

Diseño, experiencia en la implementación y perspectivas del programa de maestría "formación profesional en matemáticas"

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## ABSTRACT

The author's approach to the design of professional training of future teachers of higher mathematics involves filling the content of training with academic disciplines, research work and industrial practice, which are associated with the formation of competencies from the Federal state educational standard of higher education in the direction of training 44.04.01 Pedagogical education (master's level) and labor actions from the Professional standard "Teacher of vocational training, vocational education and additional professional education". Training is carried out in accordance with the requirements of the principle of professional orientation and the Concept of development of mathematical education in the Russian Federation.

**Keywords:** professionally oriented training in mathematics, future teachers of mathematics, master's program.

## RESUMEN

El enfoque de los autores para el diseño de la formación profesional de futuros profesores de matemáticas superiores implica llenar el contenido de la formación con disciplinas académicas, trabajos de investigación y práctica industrial, que están asociados con la formación de competencias a partir del estándar estatal federal de educación superior en dirección de formación 44.04.01 Educación pedagógica (nivel de maestría) y acciones laborales de la norma profesional «Profesor de formación profesional, educación profesional y educación profesional adicional». La formación se lleva a cabo de conformidad con los requisitos del principio de orientación profesional y el concepto de desarrollo de la educación matemática en la Federación de Rusia.

**Palabras clave:** formación profesional en matemáticas, futuros profesores de matemáticas, programa de maestría.

Recibido: 14/02/2019 Aceptado: 16/04/2019

## INTRODUCTION

The modern world is subject to total mathematization of almost all branches of science. Accordingly, the circle of students for whom mathematics becomes a professionally significant academic discipline is expanding. The invariant of mathematical knowledge is included in the content of most educational programs for vocational training, while the variable component of mathematics is specific and possesses a professionally significant potential for each specific specialty (field of study), which confirms the appropriateness of the professional orientation of teaching future mathematics specialists. However, students are not always aware of the importance of studying mathematics for the upcoming professional activity. There is a need for mathematically and methodologically competent teachers who are able to motivate and interest future specialists in the process of professionally oriented study of mathematics.

At present, the contingent of teachers of mathematics in a vocational school consists of graduates of the mathematical faculties of classical universities, pedagogical institutes and specialized postgraduate studies. The most high-quality teaching staff for vocational school supplies postgraduate studies in mathematical (01.01.00) and methodical (13.00.02) specialties. However, to meet the demands of a modern vocational school, the available number of graduates of the mathematical postgraduate course is not enough.

Another part of the teachers of the mathematics departments of the vocational school is represented by graduates of non-pedagogical specialties (areas of study) of the mathematical faculties of classical universities, who have mastered, in addition to the main educational program, the additional qualification program "Teacher", consisting of psychological, pedagogical and methodological disciplines, studied at senior courses in the framework of disciplines optional, with obligatory teaching practice, state examination according to the method of teaching anija Mathematics and final qualifying protection operation. The advantages of such training of teachers, according to R.M. Zaynieva and A.S. Safarov [1], are its fundamental nature, the presence of research skills, the need for constant self-education. The disadvantages are the lack of methodological training of its graduates, which is expressed in the exaggerated requirements of young specialists for students of non-mathematical areas of training, the inability to qualitatively explain the teaching material, etc. Another significant component of the contingent of teachers of mathematics departments of a vocational school is graduates of pedagogical institutes and universities, the main problem of which, as a rule, lies in the lack of knowledge of mathematics in conjunction with good psychological, pedagogical and methodological training. After analyzing the advantages and disadvantages of the existing practice of training future teachers of mathematics in a vocational school, it makes sense to pay attention to the second level of higher education and purposefully prepare teachers of mathematics for educational institutions of secondary vocational and higher education as part of the pedagogical magistracy, which, according to the online help system of master programs Magistracy.su "[2], steadily holding the 3rd place in popularity among applicants, as n the number of educational programs (253), and the number of budget places (674).

Various aspects of the preparation of teaching staff in the magistracy were considered in the research: V.A. Kozyrev, N.F. Radionova, A.P. Tryapitsynaya [3], focusing on the competence approach in teacher education; E.G. Nikulina [4], pointing to the need for the professionalization of the magistracy of the modern university (targeted training of graduates for a particular segment of the labor market); Vs Senashenko [5], who substantiated the key areas of improving the quality of education in the magistracy (raising the level of theoretical training of graduate students, improving information, personnel, material and technical support of the magistracy) and others. Kostikov [6] clarified their influence on the national education system and concluded that the current Russian model of training high school teachers has some common features with the German model and is now closely integrated with the British-American model. The author proposes to use the results obtained for a more effective design of the national system of vocational training for higher education teachers.

At present, Russian universities have a number of master's programs in which, to one degree or another, the tasks of forming the professional and pedagogical competencies of a teacher of mathematics in a vocational school are indicated. Thus, in [7] S.P. Grushevsky and N.V. Andrafanova described the experience of implementing two such programs ("Teaching Mathematics and Informatics" (the "Mathematics" training direction) and "Information Technologies in Education" (the "Mathematics and Computer Science" training direction) in the Kuban State University. Another approach to designing such a master's programs are presented in the work of S.E. Starostina and Yu.S. Tokareva [8]. The Master's program in Physics and Mathematics (Trans-Baikal State University) is multidisciplinary. The study is focused on the training of teachers of mathematics and physics for schools and institutions of secondary vocational education. The article [9] characterizes the master's program "Professionally Oriented Mathematics Education" (training direction "Pedagogical Education"), implemented in 2016 at Saratov National Research State University. However, in connection with the approval on February 22, 2018 of the Federal State Educational Standard of Higher Education (level studies) in the direction of training 44.04.01 Pedagogical education (hereinafter - FES HE) [10], it seems relevant to revise the existing educational programs for professional training of mathematics teachers for educational institutions of secondary vocational and higher education and

bring them in line with the approved FES HE [10] and Professional Standard “Teacher of vocational training, vocational education and additional vocational education” (hereinafter - the Professional Standard) [11] as well as the requirements for competencies graduates employers industry and available domestic and foreign experience.

### Methodology

The purpose of the article is theoretical substantiation, practical development and analysis of the results of approbation of the master’s program “Professionally Oriented Mathematics Education”. The program is focused on preparing a graduate who is able to successfully work in the field of professionally oriented mathematics education, ready to be included in innovative activities of educational institutions on the basis of mastering universal, general professional and professional competencies from the Federal State Educational Standard of Higher Education [10] and some generalized labor functions from the Professional Standard [11]: “3.1. Teaching according to vocational training programs (hereinafter - PE), secondary vocational education (hereinafter - SVE) and additional professional programs (hereinafter - APP), focused on the appropriate level of qualification ” 3.8 “Teaching under bachelor and DPP programs focused on the appropriate level of qualification”; 3.4 “Organizational and pedagogical support of the group (course) of students in higher education programs (hereinafter - HE)” [11, p. 2].

Research methods used in writing the article: analysis of psychological, pedagogical and methodological and mathematical literature; study of regulatory documents; generalization of the experience of teachers of mathematics; development and testing of teaching materials; pedagogical experiment.

The theoretical significance of the study is justified by the fact that the training of future mathematics teachers for the design and implementation of teaching students in the context of their upcoming professional activities has been modernized, which involves filling the contents of the graduate program with academic disciplines, research work and work experience, linked to the formation of competences from the Federal State Educational Standards of Higher Education [ 10] and labor functions from the Professional Standard [11].

The practical significance of the research lies in the development and implementation in the educational process of the Saratov National Research State University of methodological support of the implementation of the masters’ program «Professionally oriented teaching mathematics.»

### RESULTS

Let’s begin with the characteristics of the contingent of applicants entering the program. In 2016, out of 13 first-year students (age 22-35 years old, residents of Moscow, Saratov, Moscow, Saratov and Volgograd regions, Dagestan Republic) 12 people had a diploma of pedagogical bachelor’s degree in Mathematical Education, 1 person - a diploma of the Faculty of Mechanics and Mathematics , 5 people worked in schools as teachers of mathematics. In the recruitment of 2017 of 14 people (age 22-25 years, residents of Moscow, Saratov, Saratov region) 12 people had a profile (mathematics) pedagogical bachelor’s degree, 1 person had a diploma of the Faculty of Mechanics and Mathematics, another 1 applicant was a graduate of a technical university , 6 people worked in schools as teachers of mathematics. The number of applicants with non-core diplomas increased dramatically in the 2018 enrollment (age 22-30 years, residents of the cities of Saratov, Samara, Moscow, Saratov regions, Iraq): of the 12 newly enrolled only 7 people had a diploma of a specialized pedagogical bachelor’s degree university (1 person), the Academy of Public Administration (1 person), the Mechanics and Mathematics Faculty of a classical university (2 people), a computer science specialist - 1 person. At the same time, 4 people at the time of admission to the magistracy were taught mathematics at school, 1 - in technical school. Such heterogeneity (from year to year) of the initial vocational education of applicants has created a number of problems, both during the entrance examinations and in the organization of the further educational process. To conduct an entrance test in the magistracy (interviews), a program was developed, the content is almost similar to the final state exam program in mathematics and its teaching methodology in the specialized pedagogical bachelor degree. The main purpose of the entrance test is to determine the level of mathematical and mathematical knowledge, skills and competencies available to applicants, and to assess the potential opportunities for students to master the chosen master’s program. The entrance test program consists of two sections: “Mathematics” and “Methods of teaching mathematics”. They identify the main issues of algebra, geometry, mathematical analysis, methods of teaching mathematics, which are necessary for applicants to continue their studies in the magistracy. Graduates of the profile pedagogical bachelor degree, planning to continue their studies, went to the magistracy almost formally. For holders of non-core diplomas of bachelor and specialist degrees, an absolutely objective entrance test was conducted, allowing to identify among applicants who have the necessary knowledge and competencies for training in the magistracy. According to the results of the interview for enrollment in the master’s program “Professionally oriented training in mathematics” were recommended: in 2016 - 13 people; in 2017 - 14 people; in 2018 - 12 people.

The Master's program is focused on the pedagogical, project and research types of professional tasks. As a result of mastering the master's program, a graduate must possess a set of universal competences (UC) [UC-1 - UC-6] and general professional competencies (hereinafter - OPK) (OPK-1 - OPK-8) prescribed in the FES HE [10]. Professional competencies for the Master's program "Professionally Oriented Mathematics Education" were formulated by the program manager based on an analysis of the relevant upcoming professional activities of graduates of the Professional Standard [11], taking into account the requirements of employers for graduates, summarizing domestic and foreign experience.

A graduate of the master's program, in accordance with the FES HE [10] and the Professional Standard [11], should be ready to solve the tasks of the professional activity to which the master's program is oriented. Thus, the pedagogical type of the tasks of professional activity provides for the readiness of a graduate to:

- Teaching courses, disciplines (modules) in mathematics for software programs, secondary vocational education, higher education (undergraduate level), additional pre-vocational educational programs (hereinafter - APP);
- organization of research, project, educational and professional and other activities of students studying courses, disciplines (modules) in mathematics in software programs, secondary vocational education, HE (undergraduate level), APP.

Project tasks of the graduate's professional activity: teaching and methodological support for the implementation of training courses, disciplines (modules) in software programs, secondary vocational schools, higher education (undergraduate level), and secondary professional education. The research type of professional tasks involves a graduate's readiness for independent scientific research in the field of subject preparation using the obtained theoretical knowledge and practical skills. The types of tasks of professional activity specified in the FES HE [1] are closely correlated with the labor activities of the functions of the Professional Standard [11]:

- the pedagogical type of tasks of the FES HE corresponds to the functions 3.1.1; 3.1.2; 3.8.1; 3.8.2; 3.4.1; 3.4.2 Professional Standard;
- the design type of tasks of the FES HE corresponds to the labor actions of functions 3.1.3; 3.8.3 Professional Standard;
- the research type of tasks (partially) corresponds to the labor activities of functions 3.1; 3.4; 3.8 Professional Standard.

We will formulate professional competences (hereinafter - PC) and indicators of their achievement, established by the Master's program "Professionally Oriented Mathematics Education"

PC-1. Able to carry out the teaching of training courses, disciplines (modules) in mathematics through software programs, secondary vocational schools, higher education (undergraduate level), and vocational training programs, taking into account the principle of professional orientation, using modern educational technologies corresponding to the personal and age characteristics of students, including special educational needs.

Indicators of the achievement of PC-1:

PC-1.1. Demonstrates knowledge of the features of the organization of the educational process and the content of training courses, disciplines (modules) in mathematics in software programs, secondary vocational education, higher education (undergraduate level), VET, taking into account the principle of professional orientation; principles of selection and features of the use of forms, methods, means of professionally oriented teaching of mathematics; modern educational technologies that meet the personal and age characteristics of students, including those with special educational needs; methodologies for the use of measuring and controlling and evaluating means, interpreting the results of monitoring and evaluation.

PC-1.2. Performs the tasks stipulated by the work programs of "training courses, disciplines (modules) in mathematics under software programs, secondary vocational education, higher education (undergraduate level), and APP; applies pedagogically sound forms and methods of organizing the activities of students, modern technical means of professionally oriented teaching of mathematics and modern educational technologies, taking into account: the specifics of educational programs, the requirements of the FES VE, SVE, HE (bachelor degree); features of the taught training course, discipline (module), tasks of the lesson (cycle of lessons), type of lesson age and individual characteristics of students (for training people with disabilities - also taking into account the peculiarities of their psychophysical development, individual capabilities); uses pedagogically sound forms, methods, methods and techniques for organizing monitoring and evaluating the development of a course,

discipline (module) ”[11].

PC-1.3. Conducts studies, organizes independent work and carries out monitoring and evaluation of students' mastering of training courses, disciplines (modules) in mathematics under software programs, secondary vocational education, higher education (undergraduate level), and APP, taking into account the principle of professional orientation, using modern educational technologies and age characteristics of students, including those with special educational needs.

PC-2. Able to organize research, design, educational, professional and other activities of students studying study courses, disciplines (modules) in mathematics in software programs, secondary vocational education, higher education (undergraduate level), APP.

Indicators of the achievement of PC-2:

PC-2.1. Demonstrates knowledge of current problems and development trends of the relevant scientific field (mathematics); theoretical foundations of the organization of research and project activities; databases, electronic libraries and electronic resources necessary for the organization of research, design and other activities of students studying study courses, disciplines (modules) in mathematics in software programs, secondary vocational education, higher education (undergraduate level), APP; requirements for registration of design and research works.

PC-2.2. “With the help of a higher qualification specialist: he formulates the themes of design and research works, provides methodological assistance to students in choosing a theme and carrying out the main stages of design and research works, assesses the quality of implementation and design of design and research works, develops proposals for organizing scientific conferences, design competitions and research papers of students ”[11].

PC-2.3. Under the guidance of a higher qualification specialist: organizes research, design and other activities of students studying study courses, disciplines (modules) in mathematics through programs of software, secondary vocational education, higher education (undergraduate level), and APP; carries out orders for the organization of scientific conferences, competitions of design and research work of students.

PC-3. Able to develop teaching and methodological support for the implementation of training courses, disciplines (modules) in mathematics for software programs, secondary vocational education, higher education (undergraduate level), APP.

Indicators of the achievement of PC-3:

PC-3.1. Demonstrates knowledge of the regulatory documentation governing the organization of the educational process and the development of teaching and methodological support for the implementation of training courses, disciplines (modules) in mathematics through software programs, secondary vocational education, higher education (undergraduate level), APP; the current state of the field of knowledge corresponding to the teaching courses, disciplines (modules) (mathematics); the main sources and methods of searching for information necessary for the development of teaching and methodological support for the implementation of training courses, disciplines (modules) in mathematics through software programs, secondary vocational education, higher education (undergraduate level), and APP.

PC-3.2. Uses and adapts (depending on the educational context) professional knowledge and skills in the development of educational and methodological support for the implementation of training courses, disciplines (modules) in mathematics through software programs, secondary vocational education, higher education (undergraduate level), and APP: work programs of training courses, disciplines (modules), textbooks, teaching materials, including evaluation tools.

PC-3.3. “Develops (under the guidance of a specialist of a higher level of qualification) work programs of training courses, disciplines (modules) in mathematics in software programs, secondary vocational education, higher education (undergraduate level), and APP. Develops (under the guidance of a specialist of a higher level of qualification) teaching materials for conducting certain types of training sessions on the taught training courses, disciplines (modules). Develops (as part of a group of developers and (or) under the guidance of a specialist of a higher level of qualification) study guides, teaching and learning materials, including assessment tools that ensure the implementation of the taught training courses and disciplines (modules) in mathematics ”[11]. Maintains documentation to ensure the implementation of taught courses, disciplines (modules) in mathematics.

PC-4. Owns the skills of independent research in the field of subject preparation and mathematics education.

Indicators of the achievement of PC-4:

PC 4.1. Demonstrates knowledge of the characteristics of research in the field of mathematics and mathematical

education.

PC-4.2. Uses and adapts (depending on the content and organizational contexts) the theoretical knowledge and practical skills obtained in conducting scientific research in the field of mathematics and mathematical education.

PC-4.3. Solves research problems in the field of mathematics and mathematical education, taking into account the substantive and organizational contexts; designs ways of professional self-development.

Structural composition of the training of future teachers of mathematics for professional activity on the considered labor functions is represented by three interrelated modules, the contents of which include academic disciplines, educational and industrial practices and research work. Academic disciplines ("Theory and Methods of Teaching Mathematics in the Vocational Education System"; "Pedagogical Design in the Field of Professional Activity"; "Educational Activity of a Teacher", etc.) constitute the first (theoretical) module of the training under consideration. They are aimed at mastering the future teacher-mathematician of the skills of designing and organizing the process of professionally oriented education and training in mathematics in a specially organized learning environment. Practical training (the second (practical) training module) is aimed at obtaining by the trainee experience in design and pedagogical activity in a real educational organization. The third module (research work) assumes that the undergraduate conducts independent pedagogical research corresponding to the functions being formed (including, within the framework of the final qualifying work).

The preparation of a teacher-mathematician for professional work according to labor functions 3.1.1, 3.1.2, 3.4 and 3.8.1 of the Professional Standard [11], ensuring the formation of the professional competence of PC-1, is described in article [12]. The substantive basis of the theoretical module of the training under consideration consists of the following disciplines: "Selected Chapters of Higher Mathematics" (1 semester; 108 hours), etc. courses.

In the methodological section of the theoretical module, we study "Theory and methods of teaching mathematics in the vocational education system" (1-3 semesters; 432 hours) and other disciplines. education using technologies that reflect the specificity of the subject area "Mathematics" and the corresponding age, gender and psychophysical features for students' needs "[12, p. 248].

The section of the theoretical module devoted to design (corresponds to the labor functions 3.1.3 and 3.8.4, forms PC-3) is reflected in the article [13] and is presented by the disciplines: "Pedagogical design in the field of professional activity" (1 semester; 324 hours); "Methodical activity of a teacher" (2-3 semesters; 216 hours) and others. The main goal of mastering these disciplines is "to form the readiness of the future Master of Pedagogical Education for the implementation of design activities for educational programs and individual educational routes for students studying higher mathematics; development of the content of educational mathematical disciplines (modules), forms, methods and means of control; the formation of educational environments and spaces that ensure the quality of professionally oriented mathematical training; designing a further educational route and professional career "[13]. The study of the theoretical module is supported by teaching aids [14; 15; 16 et al.].

Preparing a teacher-mathematician for professional activity on the labor function 3.8.2 "Organization of research, design, educational and other activities of students under bachelor's programs and (or) DPP under the guidance of a higher qualification specialist", ensuring the formation of professional competence of PC- 2, is conducted in the classroom on the subject "Theory and methods of teaching mathematics in the system of vocational education" and is supplemented by work experience. The experience of preparation is presented in the materials of the article [17].

The generalized labor function 3.4 "Organizational and pedagogical support of the group (course) of students in higher education programs" is formed by studying the discipline "Educational activity of the teacher" (3-4 semesters; 216 hours). The main content of the discipline: "Regulatory legal acts defining modern state youth policy, requirements of the Federal State Educational Standards of Higher Education to the general cultural competencies of students. The main normative legal acts that determine the order of the curator's activities in terms of representing the interests of the group and individual students, including the Charter of the educational institution, the Supervisory Regulations, etc. Age and psychophysiological characteristics of students. Organization of the process of education. Planning and organization of work with a group of students. Creating pedagogical conditions for the development of a group of students. Social and pedagogical support of students in educational activities and professional and personal development ".

The content of the considered training provides for the management of students in the formation of their own educational program, including through the study of elective disciplines. For example, such a discipline as "Teaching mathematics to students of engineering, natural science and mathematical areas of training" (2-3 semesters; 108 hours) and similar disciplines allow future teachers of mathematics to get acquainted with the

specifics of the organization of professionally oriented mathematical education of students in specific areas of training (specialties) [18; nineteen; 20; 21; 22]. The discipline “Professionally Oriented Mathematical Education in a Multilingual Environment, Ethnopedagogy and Ethnomathematics” (2-3 semesters; 216 hours) prepares the future master for use in the process of teaching ethnomathematic material [23].

An important means of increasing the competitiveness of future teachers-mathematicians in the framework of the theoretical module –– electives offered for study: “The cultural and educational activities of the teacher” (1 semester; 72 hours); “Management of educational systems” (3-4 semesters; 36 hours); “Research activity of a teacher” (1-2 semesters; 72 hours); “Distance professionally oriented mathematics education” (1-2 semesters; 72 hours).

Educational and industrial practices, the second (practical) training module (2.4 semesters; 432 hours), form the practical readiness of the undergraduate student to perform the job duties of a mathematics teacher in the field of project (2 semester) and pedagogical (4 semester) activities in a real educational organizations [24]. In the 2nd semester, trainees learn to design a scientific and methodological support for the implementation of the discipline “Mathematics”. Practice 4 semesters is devoted to the teaching of mathematical disciplines (preparation, conduct and analysis of test lessons). The content of the practice is presented in the form of professionally oriented tasks, reflecting a set of professional tasks, in general, determining the competence of a graduate master’s program in accordance with the requirements of the FES HE [10]. For a student, the performance of tasks consists in the practical solution of one or several professional tasks aimed at mastering and working out the relevant labor activities from the Professional Standard [11].

The purpose of the third training module (research work, 1080 hours) in the Master’s program “Professionally Oriented Mathematics Education” is to shape the future master’s readiness for research in the field of professionally oriented mathematics education [25]. In the first course, the relevance of the topic chosen for research work is carried out and the methodological apparatus of the study is developed, literary sources are studied, the theoretical part of the research is carried out. The second year of research work is devoted to its practical part (presentation of theoretical results at the level of practical application, analysis, synthesis and testing of the results obtained).

The verification of the formation of the students’ universal, general professional and professional competencies, as well as the labor functions from the Professional Standard is carried out by means of intermediate and final state certification. Evaluations by experts of the results of the research work of graduates, feedback from employers, self-evaluation of graduates of the program are also taken into account.

The state final certification of graduates of the master’s program is conducted in accordance with the requirements of the FES HE [1]. Its goal is to determine the level of graduate training to perform professional tasks in accordance with the types of professional activity mastered [26]. The state final attestation is represented by one test - the defense of the master’s work in one of the following areas: theory and methods of teaching higher mathematics; higher mathematics with elements of the theory and methods of its teaching; methods of teaching professionally oriented elementary mathematics.

The subject of self-assessment of graduate students is the practical readiness of the future master for teaching activities in the design and organization of professionally oriented mathematics education. Materials for evaluation - questionnaires, the content of interviews. Experts evaluate the results of research work of graduates by reviewing published (submitted for publication) materials that reveal various aspects of the activity of a professional school math teacher. Testimonials from employers (from places of study and work experience) provide an opportunity to see through the eyes of a teacher-mentor the required competencies and work functions of students through observation of the professional activities of graduates, the characteristics presented, the content of the interview, and conversations.

The presented Master program in Professionally Oriented Mathematics Education is:

- unique, as it implies the innovative nature of purposeful preparation of future mathematics teachers for work in the field of professionally oriented mathematics education;
- interdisciplinary, as it combines the scientific knowledge of such scientific areas as mathematics, pedagogy, psychology, methods of teaching mathematics, education management, etc .;
- competitive, as evidenced by the 100% share of undergraduates credited under the agreements on the provision

of paid educational services to the total number of students enrolled (on a paid basis, students are consciously prepared to pay money for a certain set of educational services). Other factors of competitiveness of the program are the demand for graduates of the program on the labor market; customer-centric program (convenient schedule of classes; individualization of training, especially students with non-core education; the program supervisor performs the functions of students' curators from the moment of admission to defending a master's thesis; the possibility of continuing education in graduate school, etc.); the implementation of the university conditions for the implementation of the program prescribed in the FES HE [10] and others.

At the same time, during the implementation of the program under consideration, certain risks are possible, both from the university (for example, lack of funding for educational activities, the low level of training of applicants, the discrepancy between the results obtained and the money invested, etc.) and from the person (for example, the lack of process of learning theoretical knowledge, practical experience, etc.), which can only be reduced after an exact calculation of the magnitude and significance of each of the identified risks, and the determination of the degree no outbound threats.

## CONCLUSIONS

It has been established that it has been established that it has been established by the magistracy program [9], mathematical abilities [27], and cognitive independence [28]. The level of residual knowledge of students is at least 80% (for first-year students - 85%; for second-year students - 90%; for third-year students - 86%). The question of 39 students of the Master's program "Professionally oriented teaching mathematics":

- level of satisfaction with the structure of the educational program - 90%;
- the level of satisfaction with the educational and methodological support of the educational program - 87%;
- level of satisfaction with the terms of the educational program implementation - 81%;
- level of satisfaction with the material and technical support of the educational program - 80%;
- overall satisfaction with the quality of educational services provided by the educational program - 83%.

Thus, the average level of satisfaction with the quality of education in the magistracy corresponds to the norm (not less than 80%) and is 84, 2%.

And it is not by chance that already from the first year many of our students embark on independent professional activities, successfully fulfilling the labor functions indicated in the Professional Standard [11].

The presented materials can be used in the educational process of preparing future and retraining existing teachers of mathematics in a vocational school.

We associate further prospects for the implementation of the considered master's program with the more intensive use of electronic educational resources as a means of supporting students' self-study, with the modernization of the professionally oriented educational environment.



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