



Didactic Aspects of the Academic Discipline "History and Methodology of Mathematics"

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ABSTRACT

The purpose of this article is to develop the content and methods, as well as the analysis of the approbation of the program of the academic discipline "History and methodology of mathematics" for graduate students of the Master's program of mathematical program tracks. The leading method in the study of this problem was the method of modeling the work program of the academic discipline "History and methodology of mathematics", as well as the selection and structuring of the system of classes of different types, which allowed us to generate a logically constructed course. The structural model of the curriculum "History and methodology of mathematics" has been developed and presented; the selection and structuring of this course has been carried out, which combines such meaningful lines interwoven with time and history as: 1) history of mathematics, 2) history of mathematical education, 3) philosophy of mathematics, 4) methodology of mathematics; the types of classes on selected topics have been offered; the examples of the successful implementation of creative ideas are given which can be adopted and taken as a basis by other academic researchers. The competent teaching of the academic discipline "History and methodology of mathematics", based on the developed work program with the application of the proposed forms of classes, broadens the scientific horizons of graduate students of mathematical and pedagogical program tracks and allows them to focus on educational, scientific and methodological types of the future professional activity. The materials of the article can be useful for graduate students of mathematical program tracks for teaching university teachers of mathematics.

Keywords: mathematics, history of mathematics, methodology of mathematics, higher education

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State of the literature

- Some changes, related to the transition to a multilevel education system and the introduction of new educational standards, take place in the system of higher education. In that context, it became necessary to conduct scientific and methodological research on the development of curricula of disciplines that take into account the continuity of education in bachelor-master-postgraduate courses.
- In the literature on history and methodology of mathematics, theory and methodology of teaching mathematics in higher education, the issues of setting up training courses for graduates - students of the second stage of higher education, including a course on history and methodology of mathematics have been studied insufficiently.
- Most of the proposed course books and teaching aids on this topic for higher education are related to the presentation of questions on history of mathematics, and in our opinion, methodology of mathematics is not enough systematically reflected in the educational literature.

Contribution of this paper to the literature

- A structural model of the curriculum of the academic discipline "History and methodology of mathematics" is proposed for graduates of mathematical program tracks, the content of which takes into account the interrelation of educational programs of Bachelor's, Master's and postgraduate programs.
- The methodology of conducting lessons on the history and methodology of mathematics, developed on the basis of the educational program of the Master's program, is described.
- Methodical recommendations for implementation of the discipline program were developed, providing interaction of participants in the educational process and a variety of forms and methods of conducting classes.

INTRODUCTION

In 2003, Russia became one of the countries participating in the Bologna process. Some specific changes in the system of higher education of our country connected with the transition of universities to a multi-level educational system and the introduction of new federal educational standards have been taking place recently. The emergence of new levels of higher education, bachelor's and master's degrees, led to the new requirements for the preparation of graduates of higher educational institutions (Varankina & Vechtomov, 2015). A new request to conduct scientific research on the development of methodological support for new educational programs, in particular, the work programs of the curricula of the Master's program appeared.

The competency-based approach, implemented in higher educational institutions in accordance with the federal educational standards, presupposes the formation of

philosophical and general scientific ideas about modern mathematics, its foundations, history and ways of development in future teachers of mathematics and mathematical researchers. The solution of these problems is carried out through the educational process by the means of many academic disciplines.

A special role in the formation of the scientific picture of the world in the future mathematician belongs to the course "History and methodology of mathematics", which is universal and comprehensive. Academician S. P. Kapitsa wrote on the importance of history of science in the preface to the publication of the library "Quantum" (Savin & Krotov, 1987): "It is well known that science can be studied completely without regarding its history. But it is difficult to understand its method and it is absolutely impossible to determine the place of the science in our culture correctly, without taking into consideration its history". We agree with the historian of science, Professor Rybnikov (1995), and mean "a set of methods of mathematical research in historical development" under the object of history and methodology of mathematics in the broad sense.

The knowledge of history and methodology of mathematics helps the student to understand mathematics much better, because it allows him to master mathematical concepts and methods more deeply through their evolution, to understand their role and place in other sciences. All this ultimately enhances the quality of mathematical education.

The importance and necessity of the development of the course "History and methodology of mathematics" is also explained by its close links with other components of educational programs that provide mathematical and pedagogical training for students, with any choice of the trajectory of training, such as: practice, research, preparation and writing their graduation theses. The discipline "History and Methodology of Mathematics" of the curriculum of the Master's program is based on the course "History of Mathematics", which is delivered to the bachelors, future mathematics teachers.

It is ideologically connected with the discipline "History and Methodology of Computer Science", which is studied by graduates later. Its logical continuation at the next stage of education is the obligatory postgraduate discipline "Methodology and methods of scientific research" (universal and particular). The special courses for post-graduate mathematicians are also based on it (Vechtomov, 2015).

Aims and tasks of the study

The purpose of this study is to develop a program and methods for teaching graduate mathematicians the academic discipline "History and methodology of mathematics".

To achieve the aim, the following tasks were set:

1) to identify the main content lines on the basis of the analysis of the literature that can be used in the program of the discipline "History and methodology of mathematics" for students of mathematical program tracks in the following areas:

- history of mathematics;
- philosophy of mathematics;
- methodology of mathematics;
- history of mathematical education;

2) to carry out the selection of materials and structuring of the course program "History and methodology of mathematics";

3) to develop methodological recommendations for teaching this discipline, which are aimed at increasing the cognitive activity of graduates and, in general, the quality of their mathematical education.

LITERATURES REVIEWING

Analysis of Russian scientific and pedagogical literature

The problem of periodization of history of mathematics development was convincingly solved by Academician Kolmogorov (1954). We, like most mathematicians, adhere to the periodization proposed by him: 1) the birth of mathematics (before the 6th century BC); 2) the period of elementary mathematics (from VI - V century BC to XVI century); 3) the period of mathematics of variables (XVII - XVIII centuries); 4) the period of modern mathematics (from XIX century).

Vygotsky (1967), one of the founders of the Soviet school of history of mathematics, in the monograph solves the problem of describing the origin and development of arithmetic and algebra in the Ancient World. The book by Depman (1965) is devoted to the period of elementary mathematics and covers the main sections of arithmetic. There are many vivid examples in it, which can be used as illustrations in conducting classes on history of mathematics.

The work of Rybnikov (1995) is still one of the main course books of MSU students on history of mathematics. The first volume describes the development of mathematics on the Earth in the first three periods - from the ancient times to the 17th century inclusive. The topics, which revealed the patterns of the development of mathematics most clearly, are selected from all the material relating to this time and briefly outlined. The second volume covers the questions of the period of modern mathematics in the last 200-250 years.

The work of Gindikin (2001) contains the detailed information on the life and work of twelve outstanding mathematicians and physicists (from the 16th to the 20th century), whose scientific results largely determined modern mathematical science. Prasolov (2015) devoted his research on the history of mathematics to the development of mathematics in the Ancient World: Egypt and Babylon, Greece, China, India and Arab countries, in addition, the

problems and achievements of mathematics in the Renaissance and in XVII century are described.

The outstanding Soviet mathematician Steklov (2010) conducts a philosophical analysis of the origin and development of mathematics; shows that mathematics is the source of philosophy; he consistently traces the movement of thought in solving the philosophical question of the origin and validity of human knowledge, in particular, the reliability of the basic provisions of geometry.

Vechtomov (2013) in the monograph examines the elements of epistemology, conducts a comparative analysis of the philosophical and mathematical forms of cognition. The particular attention is paid to the epistemological origins and metaphysical foundations of mathematics.

The researches of Aleksandrov (1964), Perminov (2001) are devoted to the solution of the ontological problem of the status of mathematical objects and the epistemological problem of correspondence between mathematical theories of reality and the adequacy of research methods, and problems of epistemology.

Mader (1995) also speaks of the problem of correlation of mathematics and epistemology in his studies. He revealed the questions of semantic nature - the structure of the language and the theory of meaning, the nature of equality, etc. It is told about various attempts to substantiate mathematics, about struggle of ideas and crises in mathematics.

The history of Russian mathematical education of the era of the Russian Empire is reflected in the book of Polyakova (2002). It contains a detailed scientific analysis of the historical process, which resulted in overcoming the colossal gap between the European and Russian levels of mathematical education.

Kolyagin (2001) examines the history of school mathematics education in Russia against the background of the evolution of the entire national educational system. The period from the era of Peter to the beginning of XXI century was studied in detail. The author establishes the interrelation of the development of pedagogics and methods of teaching mathematics and the development of mathematical science through personalities.

The work of Academician Kolmogorov (2016) is devoted to the problem of increasing interest in mathematics as a science and as a profession in the young generation.

Analysis of international studies

The questions of history and methodology of mathematics are thoroughly analyzed in foreign studies. Many books were translated into Russian and well known in Russia. The monograph of the Dutch mathematician Van der Waerden (2010) "Awakening Science" refers not only to the history of science, but also to the history of culture. It is a complete exposition of the history of mathematics of the ancient world, describing the awakening and the first

steps of the natural sciences against the background of the general history of the culture of the Ancient World. The book on history of mathematics by Mankiewicz (2011), which was translated from the English language, contains biographies of famous mathematicians with indications of their main scientific achievements.

The book "Essays on History of Mathematics" written by a group of French mathematicians, is known under the pseudonym of Burbaki (1963), is the part of the multi-volume work "Elements of Mathematics", which was created with the aim of structuring and systemic presentation of the main results of mathematical science. The volume, which is devoted to the history of mathematics, systematically describes the development of mathematical ideas in XIX and XX centuries.

In the work of the famous Dutch mathematician and historian of mathematics Stroik (1990), the consistent presentation of the main facts, events, ideological trends of the centuries-old history of mathematics from its birth to the beginning of XX century is given. The novelty of the author's scientific approach is that the development of mathematics is considered taking into account the driving forces of social development as a whole.

The books on methodology of mathematics of the American researcher Maurice Klein reveal the essence of mathematical science and describe its place in the surrounding world (Kline, 1984, 1988). In his works the author solves the problem of substantiation of mathematics, truth and reliability of mathematical theories and evidence, gives a description of the historically arising crisis phenomena in mathematics and the essence of disagreements between various mathematical schools.

In the work of the German mathematician Weil (2005), a historical review of the problem of substantiating mathematics is given, the ideas and techniques of mathematical logic, the axiomatic method, the doctrine of numbers, the ideas of intuitionism and formalism are expounded.

The scientific work (Stillwell, 2001), in addition to traditional themes, contains some chapters detailing the history of the development of mathematics in China and India, it also covers the development of the 20th-century mathematics, for example, modern theory of numbers, including the theory of hypercomplex numbers.

The voluminous work of the American scientists (Merzbach & Boyer, 2011) contains all traditional sections of the course in history of mathematics in a detailed presentation. This edition also covers topics related to the success of mathematics of the 20th century: "The Last Theorem of Fermat" and "The Poincaré Hypothesis", "The Theory of Finite Groups" and "Automated Evidence."

In 2014, Schneps (2014) published a book about the French mathematician Alexander Grothendieck (1928-2014), which describes the life and work of the scientist, his contribution to many areas of mathematics, which determined its development for decades to come. The

scientist was a member of the group of mathematicians who published their articles under the pseudonym of Nicolas Burbaki.

This necessity for students to study history of the development of mathematics is reflected in scientific and methodological articles (Youchu, 2016; Charalambos, Panaoura & Philippou, 2009; Furinghetti, 2007). The fragments from history of mathematics are an indispensable element in conducting classes in mathematics (Liu, 2009), they are an illustration and an understandable logical addition to any mathematical book (Eren, Bulut & Bulut, 2015).

History of mathematical education is also reflected in the works of foreign researchers, one of them is an article devoted to the issues of higher mathematical education in Brazil (Rios, 2016). It outlines the general problem of educating students - future mathematicians and mathematics teachers for the entire mathematical world community.

The article (Heering, 2014) is devoted to the problem of implementing historical approaches to teaching students in Germany. This publication provides a general analysis of historical approaches in teaching and their role in German natural science education, as well as some ideas about modern approaches implemented in German educational institutions. The need to use facts from history of mathematics in teaching graduate students mathematics is considered in this work (Gomes, 2013). The problem of creating methodological materials on trigonometry, combining the historical approach and the requirements of the master's program to professional training of graduate students is solved. Some part of the material is presented with the purpose of organizing a discussion among the teachers of mathematics in order to elucidate the possible pedagogical links between trigonometry and its history.

A new look at the issue of the development of Western science from Greek antiquity to quantum physics in the field of mathematics and physics is presented in the paper (Shackelford, 2016).

On the basis of the conducted experiment the author of the article (Archila, 2015) proves that the use of facts of history and philosophy of science makes students more convincing in the argumentation of their position.

MATERIALS AND METHODS

Methods of research

In our studies which are aimed at achieving the stated goal, the following methods were used: the selection and analysis of literary sources on history, methodology and philosophy of mathematics, analysis and generalization of the experience of university teachers in similar disciplines and their own pedagogical experience, a systematic approach. The leading method of research is modeling the system of class activities, containing such

types as: an information lecture, a problem lecture, a lecture-visualization, a seminar-conference, a seminar - collective reading, etc.

Experimental research base

The research and trial base was the FSBEI of HPE "Vyatka State University".

Stages of research

The study is conducted in three stages.

At the first stage, the state of the problem was revealed in the theory and practice of training graduates of mathematical program tracks of higher educational institutions. The study and analysis of historical-mathematical, mathematical-methodical literature on the research problem, observation and analysis of the experience of teachers of history and methodology of mathematics with the purpose of developing a content line of the course and organizing possible types of classes for effective formation of general cultural, general professional and professional competencies of a mathematics Master and a teacher-Master were conducted.

At the second stage, methodical approaches to the implementation of the constructed model of the curriculum of the discipline "History and methodology of mathematics" with various organizational forms and types of classes were developed.

The third stage of the research involves the approbation of the curriculum of the course "History and methodology of mathematics" on the proposed methodology and the development of methodological recommendations for teaching it. The lessons (lectures and seminars) in this discipline have been held with graduates of mathematical programs tracks since 2009 at Vyatka State University.

RESULTS

Structure and content of the discipline

The article suggests a structural model of the work program of the academic discipline "History and methodology of mathematics" for graduates of mathematical programs tracks. In developing the content of the curriculum "History and Methodology of Mathematics", the following didactic tasks aimed at the professional development of future Masters were set as benchmarks:

- 1) to acquaint graduates with the main stages of history of mathematics,
- 2) to introduce the leading directions in the development of mathematics,
- 3) to teach the understanding of the basic structures of mathematics in its development,

4) to make undergraduates see, find and apply manifestations of fundamental philosophical categories and regularities in mathematics,

5) to cultivate skills of modern mathematical thinking,

6) to acquaint with the main stages and directions of the development of mathematics and mathematical education in the region, Russia and in the world.

The content was compiled with due regard to the interrelation of the educational program of the Master's degree course with the educational programs of the Bachelor's and postgraduate courses of the mathematical and pedagogical programs tracks. As a result, the content of the discipline "History and methodology of mathematics" includes the following topics.

Topic 1. The subject and object of mathematics. The concept of methodology of mathematics. What is mathematics? Different approaches to understanding mathematics. Methodological questions of mathematics.

The basis for presentation and discussion of this topic are the articles with the same title "Mathematics" in GSE (Kolmogorov, 1954), in the philosophical encyclopedia (Aleksandrov, 1964), in the books by Vechtomov (Vechtomov, 2013, Philosophy of Mathematics), (Vechtomov, 2013, Basic mathematical structures). It is worth taking into consideration the article (Vechtomov, 2015, Mathematics as the study of the boundaries of scientific knowledge).

Topic 2. The fundamental philosophical categories in mathematics. On the system of philosophical categories. The interpretation of philosophical categories in mathematics.

When discussing this topic, we rely on the books (Vechtomov, 2013a, 2013b; Mader, 1995), on the article of Aleksandrov (1964), and we also speak about the graduate of 1960 year of the Kirov State Pedagogical Institute named after V.I. Lenin and now the distinguished professor of Moscow State University named after M.V. Lomonosov, Doctor of philosophical sciences Perminov (2001).

Topic 3. The main periods in the development of mathematics. The periods in history of mathematics. The main crises in the development of mathematics.

Presentating this topic, we adhere to the periodization of history of mathematics, proposed by Kolmogorov in the article "Mathematics" (Kolmogorov, 1954). See also (Rybnikov, 1994).

Topic 4. The arithmetic, geometric and functional lines in history and methodology of mathematics. Arithmetic. The development of the concept of the number. Euclidean geometry and non-Euclidean geometry. The formation of the concept of the function.

The most interesting questions related to the history of the development of the concept of the number are considered in classes: the numbering of the ancient Slavs, the Babylonian numbering, the doctrine of Pythagoras, etc. (Depman, 1965; Rybnikov, 1995; Daan-Dalmediko & Peiffer, 1986).

Topic 5. Mathematics in the world around. Mathematics and art. The golden section. The calendar. Mathematical constants.

This topic is always of great interest to students. The results of their creative attitude are interesting video films, colorful presentations and informative reports. So, in 2012 one of the graduates created a computer program and made a plenary report "Mathematics of a sounding string" at a scientific session of VSHU. He realized and demonstrated different types of musical system to the listeners - Pythagorean frets, a uniformly tempered system. See, for example, (Voloshinov, 1992). When discussing the topic "Mathematics and Painting", the golden section traditionally occupies the central place in the discussion (Kovalev, 1989). It can be also recommended to tell students about the theory of perspective, outlined by Raushenbach (1986) in his books.

Topic 6. The main currents in the foundations of mathematics. The problem of substantiation of mathematics. Logicism. Intuitionism. Constructivism. Formalism. Set-theoretical direction.

The leading directions in philosophy and methodology of mathematics are discussed, which origins were the crises of the logical and substantive foundations of mathematics (late XIX - early XX centuries. We use the following sources (Vechtomov, 2013b; Mader, 1995; Perminov, 2001; Weil, 2005).

Topic 7. The history of higher mathematical education in Russia and in the Kirov region. The development of mathematical education. The formation of mathematical departments in the universities. The scientific research and pedagogical activities of the leading scientists. The formation and development of scientific schools in the field of mathematics and the methods of its teaching (Polyakova, 2002; Varankina, Vechtomov & Kanin, 2014).

Methods of conducting classes

The course "History and methodology of mathematics" for graduate students presupposes methods for conducting classes, based on interaction of participants in the educational process and actively using ICT technologies.

In the 2016-2017 academic year, the curriculum provided: lectures - 16 hours, seminars - 24 hours, the midterm assessment - an exam. All classes were held with the application of a computer, a screen and a projector, allowing us to show presentations, audio and video materials.

Topics of lectures:

1. The subject and object of mathematics. The concept of methodology of mathematics.
2. The periods of history of mathematics. Different approaches.
3. The main periods in the development of mathematics and their achievements.
4. Arithmetic, geometric and functional lines in history and methodology of mathematics.
5. The main currents in the foundations of mathematics.
6. Mathematics in the world around us.
7. The history of the development of mathematical education in Vyatka.

Seminars are traditionally held according to the following plan:

- 1) 2-3 reports of graduate students with presentations, videos created by them;
- 2) discussions of reports.

The list of reports related to the topics of classes is given to graduate students at the first introductory lecture. Graduates choose the topics of the reports from the list to prepare for the seminars, or independently determine the topic in accordance with the content of the program and the range of their interests. The order of presentations of graduates is determined by the sequence of topics of the discipline program.

Every discussion becomes free and the issues and problems mentioned in the report become the centre of each discussion. Such classes contribute to the development of graduate students' skills of searching and analyzing educational information, to the ability of participating in creative discussions, raising questions and formulating conclusions. At the seminars graduate students do not only discuss the main problems of the topic, but draw conclusions, the activity of graduate students is assessed.

In the 2016-2017 academic year, students chose the following topics for the reports:

- Fundamental categories in mathematics.
- Periodization of history of mathematics according to Kolmogorov (2016).
- Pythagoras School and its achievements.
- Development of the concept of the number.
- The role of "Elements" of Euclid in the development of mathematics.
- The period of elementary mathematics and its achievements.

- R. Descartes and the idea of co-ordination in mathematics.
- Crises in history of mathematics.
- The concept of infinity in mathematics and in philosophy.
- The Cantor theory of sets and its contradictions. Axiomatization of set theory.
- The crisis in the foundations of mathematics in the early twentieth century, the reaction to it: logicism, formalism, intuitionism.
- The emergence of the Bourbaki group, its activities and ideology.
- Leonard Euler and the Russian mathematical school.
- International Mathematical Congress in Paris (1900). Mathematical problems of D. Hilbert.
- Mathematics and art.
- Mathematics of a sounding string.
- The golden section.
- Time measurement. The calendar.
- History of the development of the concept of the function.
- I. Newton and G. Leibniz - founders of differential and integral calculi.
- Women- mathematicians.
- Activities of international mathematical societies.
- Awards in the field of mathematics.
- Professors-mathematicians in Vyatka and their role in the development of mathematical education.

The midterm assessment is conducted in the form of presenting speeches on topics. Each graduate student must hand in texts of reports in printed form, as well as presentations and video materials in electronic form. A collective discussion of the positive aspects and shortcomings of the reports is the basis for the assessment.

Methodical recommendations for the implementation of the discipline program

1. When choosing forms and methods of teaching, it is necessary to take into account that graduates have already mastered the first stage of higher education, the Bachelor's degree. At the same time, the bachelors of the pedagogical program track have already studied the discipline "History of Mathematics".

Graduate students have sufficient theoretical training and are able to solve many educational problems independently. Interaction of the student and the teacher is an indispensable element of any class activity for the successful mastering of the course materials by graduates. The teacher has a guiding and coordinating role: to determine the order of reports; to ask questions that cause discussion; to supplement speeches of speakers with interesting and informative facts.

2. In our opinion the forms and methods of conducting classes should not be a dogma, they can be annually adjusted, taking into account planned scientific and organizational activities of the leading department and the university, as well as by lively participation and interest in individual topics of graduates themselves.

The choice of the lecture type delivered by a teacher using interactive means (a lecture-conversation, an information lecture, a problem lecture) is determined by the content of the topic, the planned work of the leading department, and also by "live finds" related to the problems of the course.

For example, in 2017, a problem lecture was organized in connection with the ancient Old Slavic book "Christ's sufferings", the numbering of pages and the year of publication of which were written in Slavonic figures. After the decipherment, which was organized together with the graduates, they found out that it had been written in 7197 from the Creation of the World or in 1688 Anno Domini. During the discussion, the following problems were identified: 1) How were numbers written by the Slavs? 2) What calendars were used by our ancestors and how are they connected? 3) What calendars exist at the present time?

Such lectures revive students' interest in the subject and evoke a sense of belonging to history in them.

We recommend using different types of seminars to stimulate students in their cognitive activity. Let us give some examples.

Round table discussions.

In 2014, the study of the topic "History of Higher Mathematical Education" was combined with the presentation of the book (Varankina, Vechtomov&Kanin, 2014) on the history of higher mathematical education in Vyatka. The graduate students prepared a series of reports which they presented at the round table discussion which was organized on this occasion and some veterans, university mathematics teachers were invited.

Such lessons can be conducted dedicating them to some dates associated with the names of great mathematicians and mathematical discoveries.

Collective reading lessons.

Since 1998 the annual inter-university collection of scientific and methodological works "The Mathematical Bulletin of Pedagogical Institutions and Universities of the Volga-Vyatka region" has been published in Vyatka State University. In 2017 the 19th edition of the collection was published. The first section of this collection is traditionally called "History and Methodology of Mathematics," articles that are closely related to the subject of the same-name course are often published here. A lecture (or a seminar) with elements of collective reading can be devoted to the most interesting articles which are relevant to the topics of the curriculum. For example, in 2013, at one of the seminars each student received a collection of articles after the report "Mathematical creativity and its role in scientific research", and the topic was discussed reading and analyzing the article of G.A. Klekovkin (2012).

One more collective reading was organized in 2017 after the students' report "Women-Mathematicians". Reading the excerpts from the novel "Childhood Memories" by Sophia Kovalevskaya generated students' interest and made most of the graduates read this novel and her other books. Let us note that history of mathematics is inextricably connected with history of society development. It is important that the discussion of the course issues should be combined with the historical time in question, and the personality of the mathematician is revealed not only through enumeration of his achievements in science, but also through the story of his life, which can become an example of devotion to the profession for graduate students.

Conference-lessons.

There are two scientific schools at the degree-granting department of Vyatka State University: of algebra and of methodology of teaching mathematics which are headed by Professor Vechtomov and Professor Kalinin (Varankina & Vechtomov, 2009; Varankina, Vechtomov & Mordkovich, 2014; Vechtomov & Varankina, 2015). The department regularly organizes scientific and methodical conferences on mathematics and computer sciences. Graduate students become assistants in organizing and conducting conferences, actively participate in the work of the sections, where they report on the results of their studies, listen to the reports of other speakers.

The following conferences were held with the active participation of graduate students:

- V All-Russian Scientific and Methodical Conference "Problems of Modern Mathematical Education in Universities and Schools in Russia" (2012, May);
- All-Russian Youth Conference within the framework of the science festival "Higher School Personnel Resources: Modern Models for Training Scientific and Teaching Personnel" (2012, October);
- All-Russian Youth Scientific and Practical Conference "Mathematics and computer modeling in research of students and schoolchildren" (2013, May);

- XXXIII International Scientific Seminar of Teachers of Mathematics and Informatics of Universities and Higher Educational Institutions, dedicated to the 100th anniversary of VSHU (2014, September).

Scientific and organizational events conducted together with graduate students allow us to set educational tasks of further personal and professional growth for them, to create the basis for transferring new professional experience to them, and, consequently, for the continuity of generations in higher mathematical education of the region.

DISCUSSIONS

The study of literature on history of mathematics and history of mathematical education, on philosophy of mathematics, showed that there are many sources on all sorts of topics relevant to the course "History and methodology of mathematics." "At the same time the problems of training courses for graduates – students of the second stage of higher education have been studied very little in the literature on the theory and methodology of teaching mathematics in higher educational institutions. Thus, the problem of logical construction, selection of the content and methods of teaching of the course "History and methodology of mathematics" for graduate students of mathematical program tracks is actual and not completely solved. It is obvious, that the discipline "History and Methodology of Mathematics" has a powerful didactic and cultural-value potential for upbringing and self-education of graduates as future mathematicians, school teachers and university teachers of mathematics.

The important conditions for the successful mastering of this discipline by graduates are:

- 1) interaction of all participants of the educational process in classes,
- 2) regular updating of the content and forms of conducting classes with new ideas, including those reflecting the current state of mathematical science in general and the research and organizational activities of the degree-granting department that produces it in particular.

CONCLUSION

The course "History and methodology of mathematics" is aimed at the education of new professionals in the field of mathematics and methods of teaching mathematics, that's why graduate students of mathematical program tracks are actively included in the research, methodical and organizational work of the degree-granting department and the university through educational activity.

This is facilitated by the selection of the content and methodical implementation of the curriculum of the course "History and methodology of mathematics."

The content of the author's proposed program differs in a wide coverage of the directions in question, namely: 1) history of mathematics, 2) history of mathematical education, 3) philosophy of mathematics, 4) methodology of mathematics. The choice of the most interesting topics for discussion is determined by the students themselves. The teacher has a guiding and coordinating role. Methodical recommendations for the implementation of the discipline program provide various types of lectures and seminars, which allows actively involve students in the educational process and has a good educational effect, setting them up for further creative and intellectual development.

The materials of the article can be useful for teachers of history and methodology of mathematics, adapting to new requirements in professional activity in conditions of the competence approach in a multi-level system of higher education.

In the process of research, some new questions and problems arose that require professional solutions. It is necessary to introduce more information technologies into the educational process, not only by creating presentations. It is urgent to continue research on the development of teaching technologies for the selected, most important topics of the course.

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