About Professional Orientation of the Mathematics as a Discipline for Students Majoring in Biotechnology

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Abstract

Background/Objectives: In terms of new approaches to the system of higher professional education, the problem of teaching non-core disciplines is acute; as they are basic ones and should be completely revised. **Methods/Statistical analysis:** The presented personal-activity approach to teaching, educational methods selected by the authors, a complex of means to develop the cognitive interest have formed the basis of the elaborated model for development of cognitive interest in high school students while studying mathematics. **Findings:** Analysis of the existing teaching methods had led to the conclusion that the applied methods of teaching mathematics in high schools do not always lead to the desired result, so the modern specialist's level of mathematical knowledge is insufficient. The paper proposes to improve the process of teaching mathematics to the university students majoring in biotechnology by means of professional orientation on future activities of students and thus to raise the level of student performance and arouse interest in the study of mathematics, laying the foundation for research activities using mathematical methods in modern biotechnology. **Application/Improvements:** The theoretically substantiated and experimentally validated data can be used to improve methods of teaching the non-major university disciplines.

Keywords: Cognitive Interest, Professional Orientation, Teaching Mathematics

1. Introduction

In recent years, the widespread use of mathematical methods has become a prerequisite for improving the quality of research in medicine and biology, so today one of the most important factors is a better education of young people. Therefore, in the pedagogical science there is an intensive search for ways and means of improving mathematical education system to raise the level of the education quality.

Issues concerning the development of interest in the history of educational thought were substantiated in the works of Comenius¹, Rousseau², Ushinskii³. The first attempts to study the issues of interest were made by

foreign scientists: Kant⁴, I. Herbart⁵, Ieruzalem⁶, Bühler⁷, Natorp⁸, James⁹, Claparède¹⁰.

The study of educational literature has revealed the fact that in order to achieve a certain pedagogical result, it is necessary to develop a set of external demands, the satisfaction of which will ensure a positive result. In this study, such a pedagogical result is a development of cognitive interest of students of high school in studying mathematics, and a set of external requirements is a set of pedagogical conditions for its development.

An analysis of scientific-pedagogical and psychological literature has shown that today there is a certain teaching material accumulated concerning the problem of development and formation of cognitive interest. However, some aspects of this problem have not yet been properly considered, this is particularly so with the scientifically grounded approach to the problem of development of cognitive interest of high school students in the mathematics studying.

Thus, there is a contradiction between the increasing requirements to the dynamics of development of cognitive interest of students of high school in studying mathematics, and insufficient consideration of this problem in pedagogical science and practice.

This contradiction determines the problem of the study, which consists in the identification and substantiation of educational environment helping to develop the cognitive interest of students of high school in studying mathematics.

Teaching mathematics course in higher educational institutions has always faced great challenges: poor pre-university training and unwillingness to study mathematics, but the main problem is the fact that students do not want to study mathematics because they do not see and do not understand its role in their future careers. So, by means of the professional orientation of the mathematics course towards biotechnology, we will be able to achieve the following:

- to improve the students' performance;
- to teach how to apply mathematical methods in biotechnology;
- to teach students to work with modern technologies, since they are all based mainly on the application of mathematical methods;
- to teach students carry out research works at the intersection of biotechnology and mathematics subjects.

2. Concept Headings

The aim of this study is to provide the theoretical basis and practical studies of pedagogical conditions for development of cognitive interest of students of high school in studying mathematics (through the example biotechnology specialty). The object of study is the mathematics learning process in high school students majoring in biotechnology.

The subject of study is the formation of cognitive interest of high school students in studying mathematics.

Achieving the intended target and the solution of the fundamental problems in the study are related to the

formation of the following *hypothesis*: if in the process of teaching mathematics in high school there are specially organized pedagogical conditions for the development of cognitive interest in its studying, it will increase the level of students' mathematical knowledge, as the interested students' learning activities are more efficient and the information is learned thoroughly and firmly.

In accordance with the purpose and *hypothesis*, the following *tasks* have been set:

- to theoretically substantiate the need for the development of cognitive interest in the study of mathematics in high school students majoring in biotechnology;
- to identify the pedagogical conditions needed for the development of cognitive interest in the study of mathematics in the high school biotechnology specialty students;
- to carry out experimental verification of the effectiveness of the use of specially organized pedagogical conditions in the process of mathematics studying by high school students majoring in biotechnology.

Task 1. From the standpoint of the formation of a thinking culture in the specialist in any field, the significance of mathematics is evident. It is during the mathematics education that many thinking qualities are developing, among them: flexibility, critical and logical thinking, etc. Taking into consideration the mathematical apparatus, which is routinely used in the scientific biotechnological literature, it is reasonable to conclude that the basis of mathematical education of biotechnologists shall include elements of analytic geometry, linear algebra, principles of mathematical analysis, probability theory and elements of mathematical statistics. Knowledge of these related sciences are seen as fundamentals that contribute to the formation of specialized knowledge, combining professional knowledge and skills of singlediscipline specialists, as well as the broad general scientific fundamental knowledge.

To determine the role of all sections provided by a typical mathematics educational program we will determine the importance of each of them in professional work of the future expert in the field of medicine:

• Mathematical treatment of chemical and biological measurements. This matter is not a separate branch of mathematics, and its elements need to be considered

when teaching mathematics, so students can see where in the chemical and biological research the mathematical processing is applied.

- Elements of analytic geometry. Geometric analysis of living forms is a subject of common scientific interest. It is known that the thesis of the relation of the space with the matter became the principal idea of modern science. The first application of geometry in biology was equating of material bodies to geometric ones. Bacillus is cylindrical, coccus is spherical, nucleus is ellipsoidal, such an equating is useful not only because it introduces the various geometrical terms, but also because it allows estimating and making quantitative judgments based on the geometry results. Lines, planes and surfaces are used in the description of the forms of molecular bonds, the spatial patterns of DNA, membrane structures, as well as their various transformations, both in normal and pathological conditions. After measuring the diameter of the nucleus in the microscopic section, it is possible to calculate its volume and surface. It is possible to analyze the change in the surface relating to the volume during the process of cell growth. It is known that the smaller body in terms of the volume has a larger relative surface, for example biological membranes. Knowledge of proportions helps to learn the laws of the biological organism construction. The ratios are used in the calculation of biological parameters.
 - Elements of linear algebra. The rate of enzymatic reactions in tissues and biological fluids is linear. Naturally, it can be described by linear algebraic expressions. For practical biology, the classification of linear and nonlinear systems is of great importance. The linear systems features can be described by means of linear differential equations. Mathematics is used widely in experimental biology as well: for digital expressions, by means of curves, equations, etc.; for processing the results of observations and experiments, which can be impacted not only by measurement errors and random interferences, but also by the inner biological variability.
- Introduction to mathematical analysis. Studying the regularities occurring in chemical, biological, and others processes, it is necessary to always deal with the constant values and the variables ones. And the basis for the study of relationship between the variable

values includes the concepts of function and limit, so their study is an integral part of the "Mathematics" discipline. Fundamentals of mathematical analysis have become firmly integrated into methods of processing the results of chemical and biological processes. It should be noted that hearing, vision and ultrasound perception used by many biological species are associated with oscillatory processes described by means of trigonometric functions. Cells capable to be excited due to the external influences, such as nerve cells, muscle cells, etc. are discontinuous functions.

- Differential calculus of functions of one variable. When studying many of biological, chemical and pharmaceutical processes, it is often necessary to determine the rate of change in a process value. The general meaning of the derivative function lies in the fact that it characterizes the rate of change of the function at a certain change of the argument. In practical conditions, the function and the argument can have very diverse character. For this reason, the concept of derivative function is widely used in various domains, such as the chemical dissolution rate, rate of response to chemical drugs, rate of reproduction of bacteria, etc.
- Differential calculus of functions of several variables. When solving the chemical and biological problems we often have to deal with the functions that depend on several variables, as there are a lot more processes around us that depend on several variables than on one. Thus, most of the processes are regulated by laws expressing the dependence between multiple arguments, one of which is functionally related to the other one. For example, any chemical or biological characteristic is a function of several variables.
- Integral calculus. Numerous questions arising during the chemical, biological and pharmaceutical researches, as well as when using the modern technology, lead to the formulation of the inverse problem for the differential one, it is the subject of the study of integral calculus.
- Differential equations. In a very large number of cases, the chemical and biological pharmaceutical laws describe some relations between the values characterizing the process under study, and the rate of change of these values. These laws are expressed by equations involving the unknown functions

and their derivatives, such equations are called differential equations. They represent a mathematical formulation of chemical, biological and other laws. The differential equation obtained as a result of the study of a real phenomenon or process is called the differential model of this phenomenon or process. It is understood that the differential model is an individual case among a great number of mathematical models that can be built during the study of the world around us. In the process of building a differential model, it is very important, and sometimes it is crucial to know the laws of the science related to the problem being studied.

- Number series. Basic concepts and properties of number series, as well as their summation are used in the description of certain characteristics of biological structures.
- Probability theory principles. Methods of probability theory are widely used in natural science, technology, various sections of biotechnology and pharmacy. Probability theory is used to study the mathematical and applied statistics. This theory studies the laws of mass phenomena of random nature. Methods of probability theory are widely used for processing the results of biological and chemical researches on issues related to neural activity, diagnostics, statistics and inheritance.
- Elements of mathematical statistics. The study of this section is focused on the processing and use of statistic data in order to obtain scientific and practical conclusions. In practice, the biotechnologist should often deal with different values. For example, when using a chemical agent, the specialist is first of all interested in its effectiveness. In order to use a chemical agent, it is necessary to know the scope of its application, i.e., in which cases the use of this chemical will produce a positive effect in a particular case.

The above sections lay a solid basis for the learning of mathematical methods by the biotechnology specialty students and allow more deeply exploring the methodological bases of researches in biotechnology, principles of genetic engineering, etc. Thus, mathematical education of the biotechnology student determines the main aims of teaching mathematics in high school:

• teaching the system of mathematical knowledge and

skills needed in everyday life and professional activity of biotechnologist in modern society, sufficient for studying general theoretical and specialized subjects;

- formation of ideas about the mathematical notions and methods and their role in cognition;
- formation and development by mathematical means of intellectual qualities of the person.

It may be concluded from the above that the development of chemistry is not possible without the use of mathematical methods in it.

Task 2: In the world of pedagogy, among the variety of ways and means developed in practice for the formation of stable cognitive interests, the focus is put on: enthusiastic teaching, originality of educational material, historicism, demonstration of the practical application of knowledge in connection with the students' life plans and aims, use of new and innovative forms of education, alternation of teaching forms and methods, problem-based learning, heuristic learning, use of interactive computer tools, testing knowledge and skills, etc.

In view of the above mentioned, the formation and development of cognitive interest in high school students regarding the mathematics is a priority task, the solution of which will largely determine the intellectual development of students, development of the basic methods of their thinking, formation of their cognitive abilities and research skills.

To get the biotechnology student interested in mathematics, to provide strong knowledge, to promote the development of his creative abilities and skills it is the task set for the mathematics teacher.

Therefore, we believe that to solve this problem it is necessary to do the following:

- to pay more attention to teaching methods: the methods that stimulate students' activity, raise their self-study skills shall get the maximum development;
- to revise the procedure of presentation of lectures and practical exercises in order to strengthen interdisciplinary connections with theoretical and special subjects in high school.

Shchukina¹¹, one of the leading developers of the problem of forming and developing the interest in the learning process, believes that an interesting lesson depends on the following factors: personality of the

teacher; content of educational material; educational methods and techniques.

If the first two conditions do not always depend on the teacher, the last condition is a field for creative activity of any teacher. The main task of the mathematics teacher in high school is not just to teach, but to develop the thinking ability of students by means of his subject. The teacher shall try whenever possible to integrate the knowledge by associating the content of the subject with future professional activities of students. Mathematics and biotechnology are two related areas of knowledge. The introduction of mathematical methods in biotechnology has become a necessary condition for its successful development. In turn, biotechnology poses for the mathematics the problems that have no solutions yet and they need to be developed. Mathematics enriches biotechnology by developing imaginative, logical and systematic thinking.

For the cognitive interest development, it is important to realize that it gets developed and formed during the working activity. In our opinion, the formation of cognitive interests of students in the process of teaching can be performed in two main directions, on the one hand the "Mathematics" discipline contains this opportunity in itself, and on the other hand it can be done by organizing in a certain way the cognitive activity of students. The first thing that is the subject of cognitive activity of students is the application of mathematical knowledge in biotechnology. That is why a deep thoughtful selection of the content of educational material shows the richness enclosed in scientific knowledge, being an important element in the formation and development of interest in the study. What are the ways to accomplish this task? First of all, the interest gets excited and reinforced by the educational material which is new and unknown for students, affects their imagination and makes them wonder.

Of course, not every educational material can be interesting for students, so then another source gets used, which is no less important: the activity process itself. Consequently, mathematics education in high school should be presented not only in the logic of mathematics, but also in the logic of the future professional activity of the student.

This educational approach is the first pedagogical condition for the development of high school students' cognitive interest regarding the study of mathematics. In the scientific literature, the terms of pedagogical condition mean the totality of the necessary external requirements, the satisfaction of which will produce the desired result. In our study, this desired pedagogical result is an effective formation and development of cognitive interest of students of high school in studying mathematics in order to increase the level of mathematical knowledge. When selecting pedagogical conditions, the criterion of efficiency and optimality is the final result which is the mathematical education of the future of biotechnologist.

On the basis of the identified lack of mathematical knowledge of high school students, the second pedagogical condition of development of cognitive interest of high school students in the study of mathematics has been found to be the introduction into the educational process of teaching methods that excite the cognitive interest.

There are many method classifications in pedagogical science. When choosing the classification of teaching methods, we held on to the classification by type of cognitive activity of Lerner and Skatkin^{12,13}. The following methods are distinguished in this classification:

- explanatory and illustrative (informational and receptive) method;
- reproductive method;
- problem solving presentation method;
- partially searching (heuristic) method;
- research method.

The terms 'educational methods' is understood as the ways of working of the teacher and the students that help to acquire knowledge, skills and abilities, to form the worldview of students and to develop their potential. Educational methods vary in line with changes in the objectives and content of education. Analyzing the methods of classification proposed by Lerner and Skatkin^{12,13}, we have identified the methods that excite the interest of high school students in the study of mathematics. They are the following:

- problem method;
- reproductive method;
- research method;
- partially searching (heuristic) method.

Thus, we have selected the educational methods that excite the interest of high school students in the study of mathematics, allowing defining a set of means for its development. Complex of such means as problem lectures, chemical, biological and pharmaceutical problem tasks, professionoriented tests, laboratory research and descriptive works, is the third pedagogical condition for development of cognitive interest.

Thus, the presented personal-activity approach to teaching, educational methods selected by us, a complex of means to develop the cognitive interest form the basis of the elaborated model of development of cognitive interest of high school students in the study of mathematics.

3. Results

The effectiveness of the proposed pedagogical conditions for development of cognitive interest in the study of mathematics in medical school can be assessed during the experiment.

During the study, the ascertaining and educational experiments have been carried out. The ascertaining experiment was aimed at the statement of the actual state of the object under study; the ascertaining experiment data are the starting point for the educational experiment the purpose of which is to check the effectiveness of the proposed pedagogical conditions for development of cognitive interest of high school students in the study of mathematics.

The ascertaining experiment was carried out in 2011-2012 and 2012-2013 academic years, and it included the following tasks:

- to determine the interest of students in the study of mathematics;
- to determine the initial state of a basic level of mathematics knowledge;
- to identify the level of formation of cognitive interest of high school students in the study of mathematics.

The experiment involved first year students of all specialties of Karaganda State Technical University majoring in Biotechnology, who were divided into the control and experimental groups (Table 1).

Table 1.Distribution of students by groups

Groups	2011-2012	2012-2013	Total
	Academic year	Academic year	
Control group	57	55	112
Experimental	59	56	115
group			
Total	116	111	227

In order to solve the first problem of ascertaining experiment, it was needed to identify whether the biotechnology students were interested in the mathematics study. To solve this problem, the questionnaire survey method has been used.

The general analysis of the responses has showed that the university students are not interested in the study of mathematics. According to the results of the survey, the main reason of the lack of interest is that students are not aware of the role of mathematics in the process of preparation of the future biotechnologist. The survey has revealed a positive attitude towards the acquisition of mathematical knowledge and skills only in a small number of respondents.

In solving the second problem of ascertaining experiment, the state of initial level of knowledge of mathematics was studied through the control work, the results of which are shown in Table 2.

Table 2.	Average grade of the initial level of
mathema	tical knowledge

Groups	Years				
-	2009-	2010-	2011-	2012-	
	2010	2011	2012	2013	
Control group			3.13	2.95	
Experimental			3.11	2.85	
group					
Total	3.24	3.30	3.12	2.90	

At the second stage of ascertaining experiment with the students of 2011-2012 academic year, when students were divided into control and experimental groups, it can be seen that the students of control and experimental groups had the same school knowledge of the "Mathematics" discipline, therefore, the sample of students for the corresponding groups is representative. Thus, the students have the same opportunities studying this subject.

Solution of the third problem of ascertaining experiment allowed us determining the criteria of the level of formed cognitive interest. Analysis of the world educational literature regarding the cognitive interest criteria determination has led us to the following criteria:

- propensity of the student to the study;
- understanding of the nature of the processes under study;
- *ability to apply mathematical knowledge in the practice of biotechnologist;*
- basic theoretical and scientific knowledge in

mathematics;

• *ability of the student to improve his own mathematical knowledge.*

Thus, we propose to assess the effectiveness of development of cognitive interest in the study of mathematics by high school students according to given criteria.

As a result of this study, we have revealed that biotechnology students, having average school knowledge of mathematics, together with the lack of interest in the study of mathematics, have a quite low final achievement score.

The analysis of mathematical knowledge of biotechnology students has allowed finding the following deficiencies:

- mathematical knowledge of students do not meet modern requirements regarding the education of specialists in the field of biotechnology;
- students underestimate the role of mathematics in their future careers and have no interest in its study.

In the process of educational experiment, the students of the experimental and control groups were taught using the same curriculum, but in the educational process of the experimental group students we introduced some special methods and means of development of cognitive interest of high school students in the study of mathematics.

The experiment was conducted with the first-year biotechnology students studying mathematics. Special methods and means were introduced in the educational process of the experimental groups.

To evaluate the effectiveness of the pedagogical conditions, at the end of the mathematics study, the tests were carried out by the same criteria. The results of educational experiment concerning the development of cognitive interest of high school students in the study of mathematics showed that the experimental group students developed cognitive interest to its study and actively learned the subject.

4. Discussion

The results of the educational experiment in the development of cognitive interest of biotechnology

students in the study of mathematics have provided strong evidence of the effectiveness of implemented pedagogical conditions. To prove the result differences in control and experimental groups, the K. Pearson χ^2 fitting criterion ("chi-square") has been used.

We will verify the accuracy of the differences of the results of control and experimental group by all five criteria of formation of cognitive interest. The calculated χ^2 values for all the criteria of formation of cognitive interest of medical students in the study of mathematics for the 2011-2012 and 2012-2013 academic years, are significantly bigger than the critical χ^2 value = 9.21 with a probability of 0.99 (Table 3).

Table 3. χ^2 values by formation of cognitive interestcriteria

No.	Criterion	χ ² method result
1	Student's propensity to the learning	30.7>9.21
2	Understanding the nature of the pro- cesses under study	37.7>9.21
3	Ability to apply mathematical knowl- edge in the practice of biotechnologist	62.6>9.21
4	Basic theoretical and scientific knowl- edge in mathematics	28.5>9.21
5	Ability of the student to improve his own mathematical knowledge	76.5>9.21

Thus, the results of experimental verification received after the introduction into the educational process of specific methods and means of development of cognitive interest in the study of mathematics are significantly higher compared with the results of the control group and this comparison is valid when students are randomly selected with a probability of 0.99.

Thereby, the representativeness of the survey results has been confirmed.

To find the correlation coefficient, we will make a correlation data table, where:

X - the criteria of cognitive interest formation,

Y - levels.

Students among which 50% of persons had average criteria results were considered as having a low level of formation, students at the sufficient level had positive results up to 80%, and the higher level students were those who were able to reach 95% (Table 4).

X	1	2	3	4	5	n _y
Y 🔪						
50	9.0	11.7	13.7	5.4	24.7	64.5
80	73.6	65.9	67.1	68.0	57.2	331.8
95	17.4	22.4	19.2	26.6	18.1	103.7
n _x	100	100	100	100	100	N = 500

Table 4.Correlation table

Based on the data in the table, we can find y_{x_i} conditional average of Y value for all X values:

 $\overline{y}_{x=1} = 79.91; \overline{y}_{x=2} = 32.40; \overline{y}_{x=3}$ = 78.77; $\overline{y}_{x=4} = 82.37; \overline{y}_{x=5} = 75.51.$

Based on the data in the table, we can find \overline{x}_{y_j} conditional average of X value for all Y values:

$$\overline{x}_{y=50} = 3.39; \overline{x}_{y=80} = 9.65; \overline{x}_{y=95} = 3.17..$$

Thus, we obtain:

$$\overline{X} = 3; \overline{Y} = 79.24;$$

$$(\overline{X})^2 = 9; (\overline{X})^2 = 9;$$

$$\overline{X^2} = 11; \overline{X^2} = 11;;$$

$$\overline{XY} = 253.54;$$

$$\sigma_x = 1.4; \sigma_y = 12.74..$$

According to the formula for calculating the correlation coefficient:

$$r = \frac{\overline{XY} - \overline{X} \ \overline{Y}}{\sigma_x \sigma_y},$$

we have

$$r = \frac{253.54 - 3.79.24}{1.4 \cdot 12.7} \approx 0.89.$$

Based on the obtained values, we can surely draw the following conclusion: since the sample correlation

n_{x_i}	$n_{x_i} x_i$	$n_{x_i} x_i^2$	$x_i n_{x_i} \overline{y}_{x_i} = x_i \sum_{j=1}^l n_{ij} y_j$
100	100	100	7991
100	200	400	6480
100	300	900	23,631
100	400	1600	32,948
100	500	2500	37,785
$\Sigma = 500$	$\Sigma = 1500$	$\Sigma = 5500$	$\Sigma = 10,8835$
<i>n</i> _{y_j}	$n_{y_j}y_j$	$n_{y_j} y_j^2$	$y_j n_{y_j} \overline{x}_{y_j} = y_j \sum_{i=1}^k n_{ij} x_i$
64.5	3225	161,250	1572.5
331.8	26,544	2,123,520	77,176.0
103.7	9851.5	935,892.5	30,086.5
$\Sigma = 500$	$\Sigma = 39.620.5$	$\Sigma = 3,220,662.5$	$\Sigma = 108.835$

coefficient is close to unity, therefore, there is a close connection between the selected criteria of formation of cognitive interest of high school biotechnology students in mathematics study.

Thus, we have confirmed the effectiveness of the pedagogical conditions aimed at developing cognitive interest of high school students in the study of mathematics, which in turn improves the quality of mathematical knowledge.

To test the notion of the study of improvement of the mathematical education quality, the final performance of control and experimental group students has been analyzed and shown in Figure 1. The results clearly show that the level of mathematical knowledge of students of control and experimental groups is significantly different.

Thus, it has been determined that with the same basic knowledge of the subject, the students of the control group have shown lower results than the students in the experimental group. In the academic year 2009-2010, the grade-point average was 3.8, in the academic year 2010-2011, it was 3.7 points. Starting from the year 2011-2012, when students become taught in the control and experimental groups, a sharp contrast was observed, as the result of the control group was equal to 3.6 points, but at the same time the results of the experimental groups was 0.4 points. The situation was similar in the academic year 2012-2013, but the control group still had the same 3.6 average grade, and experimental one had 4.1.



Control group

Experimental group

Figure 1. Final performance results.

Thus, the average grade of the initial level of mathematical knowledge in the control group was 2.98, in the experimental group it was 3.04 (the difference

was 0.06 points, which means 1%), and the final level of mathematical knowledge in the control group was 3.60, in the experimental one it was 4.05 (the difference was 0.45 or 9%).

5. Conclusion

On the basis of the developed theoretical statements and obtained experimental results of pedagogical work, the following conclusions shall be made:

- The study of the level of mathematical knowledge of biotechnology students of high school has revealed a necessity to increase it, as the modern world has increased requirements for the mathematical education of biotechnologists, since the mathematical methods are extremely effective in processing the results of experimental observations, testing new chemicals and drugs, etc. The significance of mathematics for modern biotechnology and for the education of future specialists has been determined.
- Analysis of psychological and educational literature has allowed determining that the level of mathematics knowledge can be improved through the development of cognitive interest in the mathematics study.
- Identified pedagogical conditions for the development of cognitive interest of high school students in mathematics study help to increase the levels of mathematical knowledge. The following has been determined as pedagogical conditions:
 - approach to teaching: *mathematical education in medical school should be presented not only in the logic of mathematics, but also in the logic of the future professional activity of the student;*
 - teaching methods: *problem*, *reproductive*, *research*, *partial searching (heuristic) method*;
 - set of means for the development of cognitive interest;
- The criteria of development of cognitive interest in mathematics study in medical school have been determined, and the indicators and the levels of its formation have been identified.
- To verify the hypothesis suggesting that the introduction into the high school educational process of pedagogical conditions for the development of cognitive interest in the study of mathematics will increase the level of mathematical knowledge

of students, an analysis of the final mathematical performance of students involved in the experiment has been carried out. The results have showed that experimental group students have a higher level of mathematical knowledge than students of the control group, as the average results of the experimental group students were 0.45 points higher than the results in the control group, which has made 9%.

Based on the results obtained during the experimental and pedagogical work, the following recommendations have been developed:

- successful development of cognitive interest of high school students in the study of mathematics depends on the pedagogical conditions which are to be implemented as a whole complex;
- elaborated pedagogical conditions for development of cognitive interest of high school students in the study of mathematics can be applied in the educational process of other universities offering education in the field of chemistry, biology and biomedicine;
- presented pedagogical conditions for development of cognitive interest of high school students in the study of mathematics can be used in the educational process of any high school offering education in the field of chemistry, biology and biomedicine when teaching non-core subjects, in order to promote interest in the study of this science as a tool necessary for the formation of a coherent structure of the future specialist.

This study is one of the possible solutions to the problem of increasing the level of mathematical knowledge of high school students.

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