International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 02, 2020
ISSN: 1475-7192

Methodology for the Formation of Creative Competence of Future Teachers in the Process of Teaching Mathematics based on a Special Complex of Tasks

Makhmudova Dilfuza Melievna[1]

Abstract-- *This article was written with the aim of developing a methodology for creating the creative competence of future teachers in the process of teaching mathematics based on special tasks. The article discusses the implementation of components of creativity in conditions such as: didactic - the allocation in the target component of mathematics education of the goals of forming the creative competence of future teachers, the use of methods and forms of teaching mathematics aimed at creating the creative competence of future teachers, the sequential complication of types of creative activity; organizational and methodological - the implementation of differentiated teaching of mathematics, the use of life experience of students in the educational process, building up the subject-subject relations between all participants in the educational process - the conditions for teaching mathematics to future teachers contributes to the formation of their creative competence. The article defines the main criteria for the level of formation of creative competence of future teachers: motivational, cognitive, active, reflective; levels of formation: low, medium, high. A special complex of creatively-oriented mathematical tasks has been developed that meets the requirements of problematicity, focusing on students to gain new knowledge and gaining experience in conscious inclusion in creative activity, non-determinism of the student's actions when completing the task, the significance of the result for the student, the orientation of the tasks to form one or more components creative competency is a means of forming and developing a creative competency of future teachers in teaching mathematics.*

Key words--*creative technologies, special tasks, interactive ways of teaching, problematic teaching, creative thinking in mathematics, mathematic teaching.*

I. INTRODUCTION

The construction of individual learning paths, depending on Most researchers are unanimous in their opinion that the value of mathematics lies not only in its applied utility, but its humanitarian potential is equally important. Teaching mathematics provides an opportunity to develop such qualities of thinking that allow you to both master new areas of knowledge and gain experience in creative development: abstractness, algorithmicity, logic, flexibility, originality, breadth and depth of the student's mental activity. The combination of these qualities determines the mathematical worldview and "contributes to the correct orientation of a person in the world, his desire for truth and

Makhmudova Dilfuza Melievna[1,] obtained her Bachelors and Master's Degree in Mechanics & Mathematics from The Tashkent State University.

DOI: 10.37200/IJPR/V24I2/PR200376
Received: 17 Dec 2019 | Revised: 03 Jan 2020 | Accepted: 15 Jan 2020

beauty, mastery of the principles of mathematical culture, the scientific foundations of the profession, ways of knowing and reasonably transforming the world and oneself" [5].

Mathematics teaches to fully argue, develops conciseness, a sense of objectivity, the ability to generalize, critical and logical thinking, that is, contributes to the formation of creative competence of students. At the same time, setting goals for the formation of creative competence of future teachers, as one of the results of their training in mathematics at the university, must be carried out on the basis of regulatory documents and the structure of this competency.

II. METHODOLOGY

We specify the goal of creating the creative competence of future teachers in the process of teaching mathematics. A common goal is a collection of a group of goals. To determine them, we use the experience of M.V. Noskov, V.A. Shershneva [12] taking into account the foregoing, we formulate the main groups of goals for the formation of creative competence of future teachers in the process of teaching mathematics:

- the formation of mathematical knowledge that is in demand in the creative activities of future teachers, as well as knowledge about creative methods for solving mathematical problems;
- the formation of knowledge and skills of students in the field of methods for developing creativity of students;
- formation of the ability to mathematical modeling in solving problems requiring the resolution of non-standard professional (pedagogical) situations;
- formation of the value attitude of future teachers to creative activity;
- formation of experience in the implementation of the basic actions of creative activity (analysis and synthesis of available information, search for a solution to a problem in a non-standard situation, transfer of existing knowledge to a fundamentally new situation, etc.);
- formation of the ability to reflect and self-reflection of the results of creative activity.

Based on the principles, stages and goals of the formation of creative competence of future teachers, we will build a structurally-meaningful model of creative competence of the future teacher as the target vector of its formation, represented by four interconnected components: motivational, cognitive, active, reflective in accordance with the goals of creating creative competence of future teachers, it is necessary to enrich math learning content.

III. LITERATURE SURVEY

In particular, the theoretical, methodological and methodological foundations for improving the content of education with the help of problem tasks are reflected in scientific research: Zh. Ikromov [8], D.I. Yunusova [17], B.S. Abdullaeva [1], M. Sh. Mamatov [11], D.M. Makhmudova [10], I.S.Bekesheva [3] S. Alikhonov [2]; students have problems of developing independent creative activity through the introduction of information and communication technologies in education: N.R.Rustamova [15], T.Tulaganov [16], and others. The teaching of geometric problems and simple differential equations based on computer technologies was disclosed in the works of O.V. Zimina [18],

DOI: 10.37200/IJPR/V24I2/PR200376
Received: 17 Dec 2019 | Revised: 03 Jan 2020 | Accepted: 15 Jan 2020

Yu.M. Kolyagin [9], T.V. Dmitrieva [4], M.V.Egupova [5], M.V.Noskov [12] also, the methods of teaching topics on differential equations using special tasks. Scientific studies of such scientists as A. Renier [13], J. Renzulli [14], J. Gilford [7], were carried out, devoted to the importance of using problematic tasks in the process of teaching mathematics.

IV. THEORY AND DISCUSSION

The main idea of the study is to use a set of creatively-oriented mathematical tasks for the formation of creative competence of future teachers in the process of teaching mathematics.

The purpose of the study: theoretical justification, development and experimental verification of the effectiveness of the methodology for the formation of creative competence of future teachers in the process of teaching mathematics based on a special set of tasks.

The object of study is the process of teaching mathematics to future teachers at a university.

The subject of the study is the formation of creative competence of future teachers in the process of teaching mathematics.

The didactic element enriching the course content is represented by a complex of creatively-oriented mathematical tasks (COMT) [3].

Competency-oriented tasks are understood to mean tasks that simulate standard or non-standard life and professional situations and require students to learn independently, as well as personal qualities that determine their readiness for such activities.

To define the concept of creatively-oriented mathematical tasks (COMT), we consider the generic concepts - “educational task”, “mathematical task (task)”.

We will understand creatively-oriented mathematical tasks as tasks that model non-standard mathematical, life or professional situations in the language of mathematics, containing explicitly or implicitly the requirements to use mathematical methods of solving the problem, implying the implementation of creative activity.

Analyzing the requirements for the development of competence-oriented tasks of various authors, taking into account the above-described conditions for the formation of creative competence of future teachers and the content of the mathematical training of students of various profiles, we single out the principles for developing creative-oriented mathematical tasks:

The wording of the assignment should contain some problem and motivate students to implement elements of creative activity.

The goal of the assignment should be to provide students with new knowledge and the experience of conscious inclusion in creative activities in solving mathematical problems.

The condition of the task is formulated as a problem or a problem situation that must be solved by means of

DOI: 10.37200/IJPR/V24I2/PR200376
Received: 17 Dec 2019 | Revised: 03 Jan 2020 | Accepted: 15 Jan 2020

mathematics. Under this condition of the assignment, there should not be an explicit indication of the necessary mathematical knowledge that needs to be applied, or mathematical operations that need to be performed.

The task involves non-determinism of the student's actions when completing the task, that is, the student is not fully aware of the way to complete the task or consists of a combination of methods known to him.

The information in the task may be redundant, missing or contradictory. The student must select the data necessary for him to solve the problem, or in case of insufficiency, search for additional information. The data in the task can be presented in various forms: in the form of a picture, table, diagram, chart, graph, text, video, etc.

The obtained result of solving the mathematical problem should be significant for students, therefore, it is advisable to use the students' experience of life, as well as explicit or implicit indication of the area of application of the result.

The complex of creatively-oriented mathematical tasks should be aimed at the formation and development of all components of the creative competence of future teachers in the process of teaching mathematics.

To describe the typology of creatively-oriented mathematical tasks, we have analyzed studies relating to classifications of mathematical or competence-oriented tasks.

Taking into account the selected principles for developing COMT, the basis of their classification in this study is the orientation of tasks on the formation (development) of one or another component of creative competence of future teachers (cognitive, motivational, active, reflective), so each component of creative competence has its own COMT group.

Note that this classification of creatively-oriented mathematical tasks is not strictly defined, intersections are possible in it, some tasks can be attributed to different groups.

At the same time, not all tasks of the complex require the development of the component to a high level (5 points on the grading scale), for completing a series of COMT students are assigned up to 4 points, which corresponds to the average level of formation of creative competence. Mostly, such tasks are provided at the initial stage of the formation of creative competence.

Let us consider in more detail each of the COMT groups.

Tasks focused on the formation and development of the cognitive component of creative competence.

This COMT group involves students working with the concepts of "creative competence", "creative qualities", "creative activity", as well as the acquisition of knowledge about creative methods for solving mathematical problems (stage 1 - teaching the discipline "Fundamentals of Mathematical Information Processing"), as well as methods of formation of the development of creative competence of students using the mathematical apparatus (stage 2 - mastering the students 'choice course "The role of creative mathematical activity in a professional spine subject teachers". Stage 3 - Implementation of alternative jobs). Accomplishment of tasks is estimated on a scale from 2 to 5 points. At the same time, the content of the assignments should correspond to the students' current knowledge in

DOI: 10.37200/IJPR/V24I2/PR200376
Received: 17 Dec 2019 | Revised: 03 Jan 2020 | Accepted: 15 Jan 2020

mathematical disciplines and disciplines of the psychological and pedagogical unit.

We give examples of the main types of tasks in this group, reflecting indicators of the formation of the cognitive component of the creative competence of the future teacher.

Example. A physical education teacher needs to transport a 5-foot-long sports equipment on the bus. He knows that no more than 4 feet are allowed in public transport. How to pack a projectile in order to travel in public transport without breaking the rules?

Indication According to the results of the assignment, answer the following questions:

- What type of mathematical problems can this task be assigned to? (Non-standard task, the task of ingenuity, etc.)
- What personal qualities (abilities) helped you cope with this task (or: the lack of any abilities did not allow you to complete the task)? (Imagination, imaginative (spatial) thinking, etc.)
- Are these qualities connected with creativity? How do you understand the terms "creativity", "creativity"?

This task relates to tasks of input control (discipline "Fundamentals of the mathematical processing of information") and allows you to set the initial level of formation of the cognitive component of the creative competence of the future teacher.

Tasks focused on the formation and development of the motivational component of creative competence.

The results of the tasks of this group reveal the modern needs of society in innovative thinking, creative specialists, as well as help students realize the role of the teacher in the training of such specialists at each educational level. In our opinion, they motivate students to self-develop creative personality traits (fluency of thinking, risk appetite, etc.)

At the first stage of the formation of creative competence of future teachers, the tasks are aimed at revealing the student’s interest in carrying out creative activities in the framework of educational and future professional (mathematical) activities, this type of COMT includes tasks that allow the student to express their attitude to the creative activity of the teacher, as well as evaluate its activity in the self-development of creative personal qualities (fluency of thinking, risk appetite, etc.).

Example. Three students found an old vessel. Each expressed his assumption about the origin of the find: 1): “The vessel is Greek and made in the 5th century”; 2): "The vessel is Phoenician and made in the III century"; 3): "The vessel is Greek and made in the 4th century." The history teacher noted that each of the young men is right in only one of two assumptions. Where and in what century is the vessel made? Suggest at least three ways to solve this problem.

The need to search for several ways to solve a problem that has a non-mathematical formulation (logical reasoning, the introduction of elementary statements, the construction of a logical formula and the corresponding truth table) contribute to the formation of students' sustained interest in the implementation of creative activities, and also motivates them to develop such creative personality qualities as fluency and originality of thinking.

DOI: 10.37200/IJPR/V24I2/PR200376
Received: 17 Dec 2019 | Revised: 03 Jan 2020 | Accepted: 15 Jan 2020

Tasks focused on the formation and development of the activity component of creative competence.

Fulfillment of the tasks of this group involves the implementation by students of elements of creative activity in the framework of solving mathematical tasks: analysis and synthesis of available information; generating ideas; transfer of knowledge and skills from a subject area to another adjacent to it, etc. At the same time, the statement of tasks plays an important role: it is non-standard and puts the student before the need to highlight the problem in the proposed situation, to carry out a variational search for a solution. The lack of a direct indication of the mathematical knowledge and solution methods that must be applied to solve the problem provides the student with the opportunity to be creative in choosing technology and methods of activity.

Consider some examples of COMT in this group, corresponding to the various stages in the formation of creative competence of future teachers.

We believe that at the first stage (training in the discipline "Fundamentals of Mathematical Information Processing") of the formation of the activity component of creative competence, students can be offered tasks that require explicit manifestations of creativity, while allowing to systematize (or update) the mathematical material: compiling a crossword puzzle; writing an essay, a mathematical fairy tale (for example, using only utterances and observing the laws of logic), etc.

The non-standard tasks will ensure the interest of most students (regardless of the profile of preparation) and their inclusion in creative activity, which will lead to the formation of an activity component of creative competence. Also, the implementation of such tasks will contribute to the formation of the motivational component of the creative competence of future teachers.

At this stage, students actualize existing and acquire new knowledge on topics such as: elements of set theory; mathematical logic; basic elementary functions and their properties; mathematical modeling; combinatorics and probability theory; math statistics.

Solving COMT on these topics involves highlighting a new problem in the proposed conditions, finding signs of constructing mathematical structures, highlighting in the problem conditions excessive or insufficient conditions, visual interpretation of the object (or part thereof) or verbal description of the object in the proposed image.

Example. Several settlements are connected by roads with the city, and there are no roads between them. The car leaves the city with goods immediately for all settlements. The cost of each trip is equal to the product of all cargo in the back. Prove that if the weight of each cargo is numerically equal to the distance from the city to the destination, then the total cost of transportation does not depend on the order in which the points are circled.

Note that the problem is not the only way to solve, which allows the student to show their creative qualities in the search for the most original of them.

Consider possible solutions to this problem.

Using the method of transitional states of a problem: first, the statement is proved that the cost of the trip will not

DOI: 10.37200/IJPR/V24I2/PR200376
Received: 17 Dec 2019 | Revised: 03 Jan 2020 | Accepted: 15 Jan 2020

change from a rearrangement of the order of two consecutive trips, then using mathematical induction it is proved that if there are two different orders of detour of settlements, one order can be turned into another, rearranging the sequence of the trip. At the same time, students actualize existing knowledge from the school course of mathematics (mathematical induction method), acquire skills in compiling mathematical models in non-obvious situations (in this case, you need to specify an expression for the cost of the trip: + + + 2, where m and n are the cost of delivery of goods to some cities M and N), and also gain new knowledge for themselves - one order of permutations can be turned into another by changing successive elements (one of the important properties in the theory of permutations).

COMT, focused on the formation and development of the reflective component of creative competence.

The tasks of this group are focused on objective self-assessment by students of the level of formation of their creative qualities, as well as reflection of future qualities about their mathematical knowledge and their application in non-standard professional situations.

In our opinion, the stage of reflection is mandatory in the performance of any activity. Thus, all the tasks described above at COMT are more or less aimed at creating the creative competence of future teachers. At the same time, the following questions for the tasks are key:

- What creative personality traits helped you cope with the task? Which of them, in your opinion, need to be developed to a higher level?
- What elements of creative activity did you carry out during the course of the assignment?
- What new things did you learn about creative-oriented math problems?
- What difficulties did you experience in completing the assignment? How can you explain them?
- What solution to the pedagogical situation would you suggest? etc.

Note that reflection can be carried out both orally and in writing. T.V. Dmitrieva identifies the following forms of written reflection in teaching mathematics: “reviewing, reviewing, annotating, reflective work on errors, structuring educational material, compiling guides, testing and self-testing, etc.” [4] students' competencies, this list of written types of reflection is complemented by essays, modified Williams tests, and an author's questionnaire.

For example, as a final reflective-oriented task in the discipline "Fundamentals of Mathematical Information Processing", it is advisable for future bachelors of teacher education to complete an essay on the topic: "My creative qualities before and after."

The choice of methods and forms of teaching mathematics that contribute to the formation of creative competence of future teachers takes place in accordance with the principles of its formation, justified and formulated above: appropriateness, consistency and continuity, component-wise completeness, consciousness and activity.

We emphasize that the formation of the student’s creative competence is carried out through methods, technologies and forms of training in which the student plays the leading role. Such forms include a prepared lecture, a search seminar, a seminar - the presentation of projects, a round table, a business game and other forms of interactive learning, as well as group interaction, interpersonal and professional (pedagogical) communication.

DOI: 10.37200/IJPR/V24I2/PR200376
Received: 17 Dec 2019 | Revised: 03 Jan 2020 | Accepted: 15 Jan 2020

We can also use the “mediaquest +" [15] method in the process. Interactive method “mediaquest +” (media + web-quest + vitagenic information) based on optimizing the development of the qualities of media culture of students, web-quests (short and long-term web-quests) and vitagenic technologies (vitagenic experience and vitagenic information) with a personality-oriented education.

When answering the question, students can also be invited to characterize the possibilities of using previously studied creative methods to complete the assignment.

Thus, in the course of performing such tasks, students acquire knowledge about creative methods for solving mathematical problems, as well as about methods for the formation and development of creative competence, students using the mathematical apparatus.

The four-stage methodological model of the formation of creative competence of future teachers in the process of teaching mathematics is focused on the positive dynamics of the level of formation of this competency; during its development, the principles of formation of creative competence were taken into account: the target component of the methodology for the formation of creative competence of future teachers complies with the social order, continuity, consistency and continuity, the interconnectedness of the components of creative competence of future teachers, consciousness and activity of students; general requirements for creating a model: inertia, simplicity and adequacy, as well as the principles of normativity and universality.

The methodology for the formation of creative competence of future teachers in the process of teaching mathematics is effective; its main components correspond to the developed methodological model:

1) target - reflects the target vector of the formation of creative competence of future teachers in the process of teaching mathematics;

2) substantive - enriches the content of teaching mathematics of future teachers with creatively-oriented mathematical tasks at each stage of the implementation of the model;

3) organizational and procedural - it is a set of mutually appropriate methods, forms and teaching aids adequate to the goals and content of the training (methods: heuristic methods, case study method, project method, game technology, etc .; forms: various types of lectures, seminar, business the game, students 'independent work, etc.; means: teaching aids, methodological recommendations for studying a course of students' choice, alternative forms of tasks, etc.);

4) diagnostic - developed taking into account the specifics of the creative competence of the future teacher and provides reliable information about the dynamics of the level of its formation.

V. EXPERIMENTAL RESULTS

Pilot work was carried out at the National University of Uzbekistan and consisted of the following stages: search, ascertaining, formative and generalizing. The total number of students involved in the experimental work was 242 people. The level of formation of creative competence was measured using the created diagnostic complex: special tasks, questionnaires, and expert sheets.

DOI: 10.37200/IJPR/V24I2/PR200376
Received: 17 Dec 2019 | Revised: 03 Jan 2020 | Accepted: 15 Jan 2020

Using quantitative processing of the results of students performing control and experimental groups of tasks of input and final control, a distribution of students by the level of formation of creative competence at the beginning and end of each sub-stage of the forming experiment was obtained.

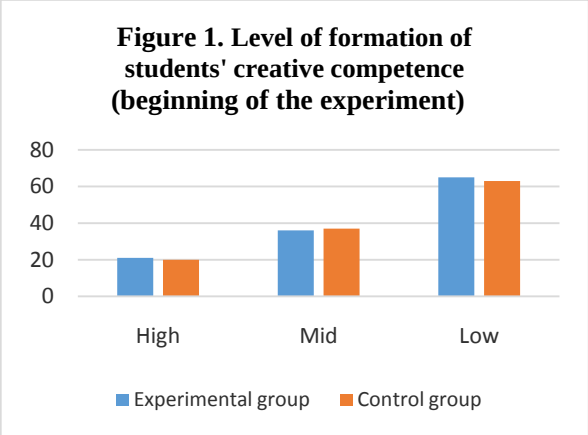
It was found that the difference between the average levels of creative competence and the mathematical preparation of students in control and experimental groups is not statistically significant at the beginning of the formative experiment.

To conduct a component-wise analysis of the formation of the components of creative competence of future teachers, empirical data were presented in table form.

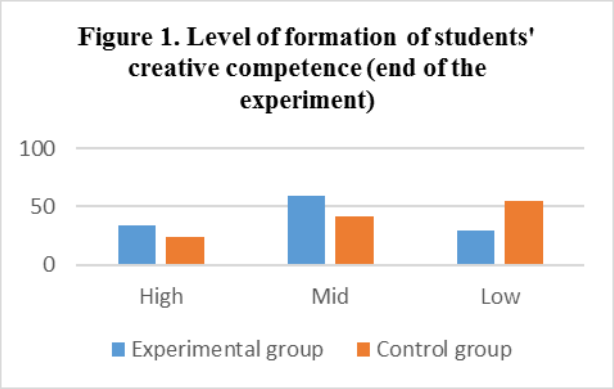
Table 1. Dynamics of the level of formation of students' creative competence at the beginning and end of the forming experiment.

Table I. Dynamics of the level of knowledge of students'

Groups Number of respondents	Arithmetic expression	Level indicators					
		At the beginning			In the end		
		High	Mid	Low	High	Mid	Low
Experimental n_i =122	X_i	21	36	65	34	59	29
Control n_i = 120	Y_j	20	37	63	24	41	55



DOI: 10.37200/IJPR/V24I2/PR200376
Received: 17 Dec 2019 | Revised: 03 Jan 2020 | Accepted: 15 Jan 2020



Thus, the effectiveness of the developed methodology for the formation of the creative competence of the future teacher in the process of teaching mathematics has been experimentally confirmed.

VI. RECOMMENDATION AND CONCLUSION

The article developed a methodology for the formation of creative competence of the future bachelor of a teacher in the process of teaching mathematics on the basis of a special set of tasks and presents the results of its testing.

The approach to setting goals for the formation of creative competence of future teachers in the process of teaching mathematics in the form of a structural model of the expected result is determined.

The content of teaching mathematics to future teachers is enriched by a complex of creatively-oriented mathematical tasks, formed taking into account the principles of developing creatively-oriented mathematical tasks.

Groups of creatively-oriented mathematical tasks are distinguished depending on the orientation toward the formation (development) of one or another component of the creative competence of the future teacher:

- tasks focused on the formation and development of the cognitive component of the creative competence of the future teacher;
- tasks focused on the formation and development of the motivational component of the creative competence of the future teacher;
- tasks focused on the formation and development of the activity component of the creative competence of the future teacher;
- tasks focused on the formation and development of the reflective component of the creative competence of the future teacher.

A set of interdependent methods, forms and means of training adequate to the goals and content of training is presented:

- methods: heuristic methods, case study method, project method, game technology, etc.;
- forms: lectures of various types, seminars, business games, independent work of students, etc.;
- funds: teaching aid “Fundamentals of the mathematical processing of information”, methodological recommendations for studying a course at the students' choice, alternative forms of assignments, etc.

DOI: 10.37200/IJPR/V24I2/PR200376
Received: 17 Dec 2019 | Revised: 03 Jan 2020 | Accepted: 15 Jan 2020

The diagnostic component of the methodology for the formation of creative competence of a future teacher is presented, the basis of which is diagnostic materials developed taking into account the specifics of this competency and providing reliable information about the dynamics of its level of formation.

Three stages of the implementation of the methodology for the formation of creative competence of future teachers in the process of teaching mathematics are described:

1) the development of the discipline "Fundamentals of the mathematical processing of information", provided for by the curricula of various profiles of the areas of training "Mathematics" (1-2 course);

2) teaching a course at the students' choice “The role of creative mathematical activity in the professional activity of a teacher” (3 year);

3) the implementation of alternative forms of tasks. For each of these stages, the goals and objectives of teaching mathematics are determined, aimed at creating creative competence, as well as the forms and methods of organizing teaching mathematics.

An experimental study showed that:

• the developed methodology for the formation of creative competence of future teachers in the process of teaching mathematics provides an increase in the level of formation of creative competence of future teachers;

• the formation of creative competence in the process of teaching mathematics helps to increase the level of mathematical competence of future teachers.

The effectiveness of the methodology for the formation of creative competence of future teachers in the process of teaching mathematics on the basis of a special set of tasks has been confirmed.

REFERENCES

1. Abdullayeva B.C. Fanlararo aloqadorlikning metodologik-didaktik asoslari (Ijtimoiy-gumanitar yo‘nalishlardagi akademik litseylarda matematika o‘qitish misolida): ped. fan. dokt. diss.avtoref., Tashkent, 2006, pp44-49.
2. Alixonov S. «Matematika o‘qitish metodikasi», Tashkent, 1992, pp.146-200.
3. Bekesheva (Egorova), I.S. Zadachnyj podhod k formirovaniju kreativnoj kompetentnosti budushhih uchitelej pri obuchenii matematike. Vestnik Krasnojarskogo gosudarstvennogo pedagogicheskogo universiteta im. V.P. Astaf'eva – Krasnojarsk: «Litera-print», 2017. – No.2
4. Dmitrieva, T. V. Razvitie refleksii u studentov kak pedagogicheskaja zadacha. Vestnik TjumGU. 2009. No. 5. – pp. 33–42.
5. Egupova, M.V. Zadachi na prilozhenija matematiki v metodicheskoj podgotovke uchitelja v pedvuze. Materialy XXXIV Mezhdunarodnogo nauchnogo seminara prepodavatelej matematiki i informatiki universitetov i pedagogicheskih vuzov. – Kaluga.: 2015 – pp. 319-321
6. Gaybullayev, N.R. Dirchenko I.I. Razvitiye matematicheskix sposobnostey uchashixsya: Metodicheskoye posobiye dlya uchiteley. Tashkent: Oqituvchi, 1988, pp. 114-248.
7. Gilford Dj. Tri storoni intellekta. Psixologiya mishleniya: sb. perevodov/pod red. A.M.Matyushkina.-Mocow, Progress, 1965, pp. 433-456.
8. Ikromov J. “Maktab matematika tili”. – Tashkent: Oqituvchi, 1977, pp.163-195.
9. Kolyagin Yu.M., Oganesyan V.A. Uchis reshat zadachi. Posobiye dlya uchashixsya 7-8 klassov. –Moscow, Prosvesheniye, 1980, pp. 96-105.

DOI: 10.37200/IJPR/V24I2/PR200376
Received: 17 Dec 2019 | Revised: 03 Jan 2020 | Accepted: 15 Jan 2020

10. Makhmudova D.M. Use of problem tasks in development of independent creative activity of students. International Journal of Innovative Technology and Exploring Engineering (IJITEE), Volume-IX, Issue-II, December 2019. Aviable to: https://www.ijitee.org/wp-content/uploads/papers/v9i2/B6309129219.pdf.
11. Mamatov M.Sh. Maktab matematika kursida mantiq va intuitsiya uyg‘unligi. Xalq talimi.. Tashkent. 2003, Volume № 5, pp. 120-124.
12. Noskov, M.V. Kakoj matematike uchit' budushhih bakalavrov? Vysshee obrazovanie v Rossii. – 2010. No. 3. – pp. 44–48.
13. Renier A. Dialogi o matematike. –Moscow, Mir, 1980, pp 300-376, chapter “V mire nauki i texniki”.
14. Renzulli Dj.S., Ris M. Model obogashayushego shkolnogo obucheniya: prakticheskaya programma stimulirovaniya odarennosti detey. Osnovnie sovremennie konsepsii tvorchestva i odarennosti. – Moscow, Molodaya gvardiya, 1997, pp 312-37.
15. Rustamova N.R. The Technology of Developing Media Culture in Secondary School Students. International Journal of Innovative Technology and Exploring Engineering (IJITEE), Volume-IX, Issue-II, December 2019. Aviable to: https://www.ijitee.org/wp-content/uploads/papers/v9i2/B6181129219.pdf.
16. Tulaganov T. Matematika oqitish metodikasi (ma’ruzalar toplami), TDPU, 2011.
17. Yunusova D.I. Matematikani o‘qitishning zamonaviy texnologiyalari, Tashkent, Fan va texnologiyalar, 2011, pp. 122-200.
18. Zimina O.V. Problemnoye obucheniye visshey matematiki v tehnicheskix vuzax. Matematika v visshem obrazovanii.Moskva, 2006. Volume №4, pp.55-77.
19. Zlotskiy G.V. O psixologo-pedagogicheskoy i metodiko-matematicheskoy podgotovke studentov matematikov universitetov k professionalno-pedagogicheskoy deyatelnosti. Ta’lim muammolari. – Tashkent, 2000, Volume №2, pp.28-30.

DOI: 10.37200/IJPR/V24I2/PR200376
Received: 17 Dec 2019 | Revised: 03 Jan 2020 | Accepted: 15 Jan 2020