

Theoretical Basis Of Development Of Cognitive Competence Of Students Of Higher Education Institutions In The Process Of Teaching Elementary Mathematics

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Factors and importance of the development of cognitive competence of a future mathematics teacher in higher education institutions

A number of new laws aimed at radically improving the quality and efficiency of the education system, the educational process are being adopted in the country. President of the Republic of Uzbekistan Sh.M. Mirziyoyev's Resolution No. PP-2909 of April 20, 2017 "On measures to further develop the system of higher education" and PQ-4708 of May 7, 2020 "On measures to improve the quality of education and development of scientific research in mathematics" The main task is to improve, train highly qualified specialists at the level of international standards, create the necessary conditions for the further development of mathematics education and science.

Today, along with material factors in improving the system of higher education, professional training of future mathematics teachers, improving the quality and effectiveness of education, the level and potential of developing cognitive competencies in the teaching of elementary mathematics is also important. The higher education system plays a special role in developing the cognitive competencies of students and creating the necessary conditions for them to operate in accordance with the requirements of the time. At the same time, there are radical changes in the education system, ie the values, motives, norms, goals, role, forms and methods, tools, monitoring and evaluation of the participants of the learning process allowed to emphasize the personality, interests and vital values of the student. The specificity of the future mathematics teacher and the teaching of elementary mathematics is to highlight the impact of the choice of content, methods, tools, forms, the need to develop cognitive competence in students.

Not only the demonstration, memorization and assimilation of ready-made knowledge, but also the production of subjective new knowledge is becoming relevant. One of the strategies of modern education and modern type of socialization, according to AO Karpov, is "strategy and guidelines for the formation of cognitive competence" [16; 16-b.]. The manifestation of these social changes is reflected in the documents that define the educational process.

The analysis of the program "Methods of solving examples and problems in mathematics", which fully covers the content of elementary mathematics in the field of undergraduate education "Methods of teaching mathematics" allows pedagogical higher education institutions in the country to complete the list of competencies.

Independent learning plays an important role in the development of cognitive competence.

The mechanism of independent learning activities of students includes the following:

- 1) Reflexive nature of the distributed activity of the teacher and the student;

2) The process of independent diagnosis, which is considered as a didactic tool for the formation and development of practical skills of independent observation of changes in personal and professional growth in students.

Accordingly, an important area of education in higher education is to calculate the conditions for the formation of students in the process of preparation for independent study, especially in the field of science. In the process of training a future mathematics teacher, a special place is given to the methodology of teaching elementary mathematics. Its importance is reflected in the works of scientists from the Commonwealth countries AG Mordkovich [83], LP Shebanova [123], I. Yansufina [133], and others.

Problems of preparation of future teachers for professional pedagogical activity in our republic R.H.Juraev [55], N.A.Muslimov [85], G.A.Asilova [40], A.R.Khodjaboev [117], U.I.Inoyatov [59], Q.T.Olimov [89], M.B.Urazova [110], O.Q.Tolipov [29], and others.

Among the mathematical disciplines in the professional training of a mathematics teacher is distinguished by the universality of the content of elementary mathematical material. In contrast to the school course, the concepts studied are explained more broadly and in depth, which allows students to form not only the methods of teaching and mathematical activities, but also the methods of methodological activities and independent learning activities necessary for the development of cognitive competence.

According to the Resolution of the Cabinet of Ministers "On approval of state educational standards of general secondary and secondary special, vocational education" No. 187 of April 6, 2017, the State Education Standard is based on the approved competency approach. 8; P. 122].

The concept of "competence" was first mentioned in the scientific literature in the 50-60s of the twentieth century. The American scholar Chomsky, in his work Syntactic Structures and Aspects of Syntax Theory, interpreted competence as the ability of a person to perform an activity.

Today, when the content of education is being reformed in our country, the basis of the content of education is the formation and development of basic competencies in students. Basic competencies are the ability to act independently in uncertain situations in solving problems that are relevant to the learner [4; 94-b]. The historical roots of the issues of competent approach are reflected in the works of Eastern thinkers Abu Rayhan Beruni, Abu Ali ibn Sino, Abu Nasr Farobi, Abdullah Avloni. In our historical heritage, many ideas have been expressed about the importance and significance of the idea of focusing on the acquisition of competent knowledge in the development of society.

G.A. Asilova, summarizing the definitions of "competence" and "competence" in the dissertation, "competence" - the effective use of personal qualities and knowledge, skills and abilities in the process of working in a particular field; "Competence" is an existing and potential ability to perform a particular activity [40; Pp. 12-13].

The competency approach in education "involves teaching to use competencies effectively in a variety of situations encountered in personal, professional and social life. Particular attention is paid to the use of relevant knowledge, skills and abilities in the face of unexpected uncertainties, new, problematic situations. Therefore, in the process of teaching each subject, competencies are formed based on its content and characteristics "[40; 13-b.].

In his scientific work, JE Usarov noted that competence is "a demonstration of experience and knowledge in a particular field or direction, a willingness to carry out activities and the ability of an individual to act successfully in various non-standard situations" [111; P. 22].

Based on the comparison of the ideas expressed and their generalization on the principal cases, it is possible to distinguish three views on the definition of competencies and competencies and the establishment of meaningful connections between them.

For the first point of view, the following opinion is appropriate: competence is a set of norms, requirements, qualities, a specific qualification description of a specialist. Its task is to determine what a person, an expert, a student needs to know to do under certain conditions and in a particular place. It can be assigned appropriate levels, categories that represent the complexity of the problems to be solved or the types of work to be performed. Competence In this case, as an existing quality of a person with the competence being studied, he acquires a special character.

If, for example, we are talking about the acquisition of several competencies for a single professional activity, then competence serves as an integrative quality and is called professional competence.

The second view expands the concept of "competence" and covers not only the final requirements for the functions acquired by man, but also the mental, physiological, axiological, social, functional structures that are formed in it. Only then do competencies acquire a position of competence, as their objective content becomes a subjective image of personal qualities. The second point of view differs from the first only in the broader interpretation of the concept of "competence".

According to the third view, competencies can only be said to be related to their readiness and ability to solve specific problems and tasks, while competence is seen as a complex description that testifies to a person's acquisition of a number of competencies in a particular field.

In the following studies, we will rely on the second point of view. According to him, the phrase "development of students' competencies" is not only appropriate, but also constitutes the content of school educational activities.

In higher education institutions in the bachelor's degree in "Methods of teaching mathematics" the study of academic disciplines, including the content of elementary mathematics, is carried out over several courses. In the field of "Mathematics" in the curriculum of bachelor's degree in pedagogical education is studied the subject of the competition "Introduction to the specialty."

In this sense, cognitive competencies are a set of intercultural and cross-sectoral knowledge, skills, and abilities of an individual that are necessary for adaptation and productive activity [133; 21-b.].

Unlike some authors, we would not link these descriptions only to a person's time in an educational institution. In an environment where the idea of continuing education takes the form of a cultural norm and forms the basis of a new form of education, the learning process goes beyond specific institutions, strict time limits, and clearly defined learning cycles.

As a result of the above considerations, educational competence is defined by the expression given above in the disclosure of some general concepts to the general concept of 'competence'.

N.A.Muslimov [85], M.B.Urazovalar [110], G.A.Asilova [40], N.V.Kuzmina [67], A.K.Markova [77,78], L.M. .Mitina [82], and others in their works have made a significant contribution to the development of the concept of "pedagogical competence".

There are a variety of approaches to classifying types of competence. In particular, NA Muslimov and MB Urazova divide competencies in terms of vocational education into the following types: special competence - the ability to acquire a high enough level of professional activity, to plan further professional development; social competence - joint professional activity, cooperation, self social responsibility for the results of labor: personal competence - methods of personal independent reflection and independent development, the individual's ability to resist occupational deformations; individual competence - the ability to independently apply and develop individuality in the profession, professional growth, independent organization and independent rehabilitation training; key competencies -

intercultural and intersectoral knowledge, skills and abilities of the individual required for adaptation and productive activity [85,110]

Rubinstein also emphasized the importance of independent learning for the teacher in his research: “any school, including pedagogical, must lay the foundations for the acquisition of knowledge by its own efforts and focus on the skills to be achieved” [99; 83], and one of the greatest tasks of teacher training is to teach reading. He writes that “as a true educator, one can be a person who reads and seeks on his own, which is one of the main bridges to approach adolescence” [99; 85-p.].

We will consider the main directions of solving problems related to the training of future mathematics teachers.

Studying the quality of mathematics teacher training, T.I. Utkina [112] constructs a three-tier model: 1) entrant model, 2) specialist model, 3) teacher-researcher model. The research shows the indicators of the quality of mathematics teacher training in mathematics and methodological aspects. The research focuses on the competence of the mathematics teacher in research activities, its structure shows three main components: motivational, methodological and reflexive. Reflection “is considered as a research activity that allows a future and current mathematics teacher to design and predict independent teaching, research, and professional research activities that will not only develop their scientific potential, but also their methodological knowledge, understanding of culture, and creative independent development.” Taracova A.P. [105; 183-b.]. At the same time, reflection is a key component of methodological culture.

The fundamental research of KT Olimov studied the theoretical and practical aspects of the creation of educational literature, the concept of creating a new generation of educational literature is scientifically based, scientific and methodological recommendations are given to improve the quality of the educational process [89; 156-b].

Pedagogical scientist NA Muslimov studied the scientific and methodological basis of the formation of professional and pedagogical qualities in the future teacher of vocational education, the formation of a new generation of specialists, spiritually and morally mature, independent outlook, creative thinking, committed to universal and national values. paid special attention to the issues of adulthood [85].

In order to improve the quality of training of future mathematics teachers, AG Mordkovich proposed the concept of vocational pedagogical orientation (VET) as a basis for building a methodological system of training future mathematics teachers [83]. It is based on six principles (see Table 1.1).

Table 1.1. A brief description of the principles of KPOY

The basis of KPOY	Contents	Key areas
The principle of fundamentalism	The fundamentality of education is not a goal but a means of teacher training, so it should be coordinated with the needs of the profession.	Selection of educational content
The principle of advanced idea	Realize that math courses are related to school math courses.	Selection of educational content
The principle of binary	Combining general and methodological directions. This should provide the student with: 1) a broad range of mathematical thinking, an adequate level of mathematical culture; 2) to get acquainted with the methods of describing school mathematics. Applying this principle leads to a combination of motive and	Selection of teaching methods

	purpose in the student's cognitive activity.	
The principle of continuity	All mathematics courses should involve the student in the process of achieving continuous pedagogical activity. Transferring a student from the position of a schoolboy to the position of a teacher (promotes professional adaptation)	Choice of form and means of teaching
The principle of informatization	Probability of changes in the system of mathematics education, the creation of new teaching methods	Selection of teaching methods
The principle of a harmonious approach	Professional pedagogical orientation is considered as a system of scientific knowledge, pedagogical communication and improvement.	Choice of form and means of teaching

The application of the concept of psychological and pedagogical orientation in the context of a competent approach is considered by RM Aslanov [13]. In the research work of RM Aslanov on the example of the subject "Differential equations and special derivative equations" the connection between the components of professional competencies and the principles of teaching mathematics KPOY in pedagogical universities is established.

Also, in the scientific work of AR Khodjabaev developed the pedagogical basis of teaching and methodological support of teachers of labor and vocational education and showed ways to apply them in practice. A number of factors and conditions that provide the process of formation and training of a teacher of vocational education are identified and justified, the educational process is described as a system [117; 72-b.].

Problems of professional and pedagogical orientation of teaching students of pedagogical higher educational institutions are widely covered in dissertation researches

UI Inoyatov scientifically substantiated the theoretical and organizational-methodological bases of quality control and management of education in vocational education institutions [59; 128-p.]. Management and control create a competitive environment in every field and serve as a factor of development, high quality and efficiency.

OK Tolipov conducted research on "Pedagogical technologies for the development of general professional skills and competencies in the system of higher pedagogical education" and studied the role of pedagogical technologies in the development of professional skills and competencies in future teachers and its application in the educational process [29]

TI Arinbekov studied the research activities of students of pedagogical universities in the process of solving planimetric problems to build as a means of shaping creative thinking [38]. According to him, in the organization of the teaching process it is necessary to take into account the individual-psychological characteristics of students in the development of skills in three groups: motivational, meaningful-quick and organizational-communicative. Among the motivational skills, the focus is on striving for independent learning.

Such activity, in the opinion of TI Arinbekov, helps to restructure the base of geometric knowledge of students and serves to prepare a competent graduate [38].

In existing research, the process of training a mathematics teacher has not been sufficiently covered in terms of independent learning. One of the issues that a teacher needs to address at the same time is the implementation of professional independent learning and personal growth.

In many cases, the knowledge, skills and abilities acquired by the student as a result of this or that educational activity, the orientation of teaching to a professional orientation is observed. Thus, an analysis of the literature shows that the problems of professional training of a future mathematics teacher related to the field of independent learning activities have not been sufficiently studied, especially in terms of a competent approach.

The development of cognitive competence involves defining its definition and structure.

Many scientists B.Kh. Khodjaev [118], N.A.Muslimov [85], M.M.Vahobov [46], N.Ruzikulova [100], E.F.Zeer [14,57], I.A.Zimnyaya [15], E.A.Klimov [62], et al.

RM Aslanov and AV Sinchukov emphasize that "graduate competence is the acquisition of a set of basic competencies that determine successful resilience in society, competence is not just professional knowledge and skills that define competence, but also initiative, cooperation, teamwork, communication skills, reading, assessment, the ability to think logically, to select and use information"[13; 12-b].

For competence - the ability to apply this knowledge from generalized methods of action and learning outcomes; the level of competence for competence, from integral personal characterization to knowledge, experience and education; competence is universal in the context of competent education, and competence is individual; competence implies the experience of the manifestation of competence.

The study adopted the definition of competence proposed by L.V. Shkerina [124; p.105]: "Competence is an integral personality trait that includes not only knowledge, skills, abilities, but also the ability and willingness to demonstrate them in solving current problems."

Different levels of abstraction of the content of elementary mathematics and its concepts, the use of special symbols according to the course section, close interdisciplinary course connections create the need to develop the ability to independently acquire knowledge, skills and experience that will increase the student's level of mathematical training.

According to the analysis of scientific literature and dictionaries, the word "competence" derived from the Latin word "sotretese" ("to be worthy, worthy") means a person's awareness of a field, the level of knowledge of that field [108; 396-p].

According to B. Khodjaev, competence (a Latin word meaning to achieve, to achieve) - the readiness of the subject to set goals and effectively combine external and internal resources to achieve them, in other words, it is the personal ability of the subject to solve certain professional problems. [118; 179-b]

N.A.Muslimov [85] emphasizes that competence is not the acquisition of individual knowledge and skills, but the acquisition of integrative knowledge and actions in each independent direction.

According to MM Vahobov, "education based on a competency-based approach is education aimed at the formation of competencies for students to apply the acquired knowledge, skills and abilities in their personal professional and social activities" [46; 2-b.]

D. Temirov's research works systematically describe and reveal the essence of effective means and methods of diagnosing and correcting the level of competencies to apply the knowledge, skills and abilities acquired in the educational process in the process of education aimed at the formation of competencies in students [39].

Given the importance of competencies in N. Ruzikulova's research, as they allow students to apply their knowledge in their learning and life activities, the use of practice-oriented methods is important in the development of students' information processing competencies. [100; 63-b]

According to NM Muslimov, the English word "competence" literally means "ability", but the term competence serves to express knowledge, skills, abilities and abilities [85; 170-b].

L.A.Osipova - "an integral personality that provides the desire to apply their potential in the successful solution of problems in the process of learning and other activities (knowledge of learning technology, the ability to apply this knowledge in practice, the experience of independent learning)" [90; 9-b].

EV Vyazovova defines the cognitive competence of students as "the acquisition by the student of a set of competencies in the field of independent reproductive and productive activity, mutually coordinated with the objects of real existence" [48; 25-p].

LV Semina defines cognitive competence as "a personality trait that determines the ability to constantly improve the level of knowledge, the need to update and apply their personal potential, the ability to acquire new knowledge and skills, the ability to develop independently" [102; 224-b.].

R.V. Ovcharova considers cognitive competence as "preparation for continuous improvement of education, need for actualization and application of personal potential, ability for independent development and independent learning" [88; 50-b.].

The concept of "preparation" is often interpreted by psychologists as a specific psychological condition that should be understood as a complex goal-oriented manifestation of the individual. "Preparation for a particular type of activity includes previously acquired instruction, knowledge, skills, and competencies necessary to apply that activity," writes L.V. Shkerina [125; 56-p.].

He also cites "sluggishness, indifference, lack of a plan of action and unwillingness to make the most of his experience" as reasons that make preparation difficult [125; 106-p.].

In research, cognitive competence is an integral personality trait characterized by knowledge, skills, valuable orientations for the independent acquisition of experience, the development of actions, the ability and readiness to demonstrate them in the process of mastering learning activities.

Existing dissertation research on cognitive competence emphasizes that it can only be formed through learning activities [48, 60, 120] (see Table 1.2).

Table 1.2. The priority principles for determining the content of competence are as follows:

1	the principle of updating the basics of educational content mate-science;
2	the principle of strengthening the methodological orientation of educational content;
3	the principle of ensuring the practical orientation of general secondary education;
4	the principle of updating the content of the active component education;
5	the principle of personal orientation.

Based on the goals of modern education, EV Vyazovova distinguishes three components in the context of the concept of "cognitive competence": knowledge, speed-technological, value-meaning [48]. The component of knowledge is the degree of generalization and completeness of knowledge; agility-technological - the degree of accumulation and mastery of skills and the ability to copy the actions performed; value-meaning - characterized by value-meaning orientations. At the same time, the motives of activity are focused on the valuable components of competence. As a result, the motives of learning activities remain outside the sphere of purposeful influence in the formation of cognitive competence.

L.V. The workshop considers cognitive competence as the sum of three components: motivational, cognitive-practical, and reflexive [102]. When students have a need for motivational independent learning activities; knowledge-practical independent work experience, use of various technologies of educational activity; characterized by the ability to independently manage reflexive independent learning activities.

E.V. Vyazovova [48], L.A. Osipova [90], L.V. In the work of the seminar [102] we consider it expedient to distinguish the interconnected components of cognitive competence, such as motivation, information, agility and assessment [10, 226,

The motivational component implies that the student needs to work independently and acquire new knowledge;

The information component involves making an independent decision on the choice of the method of problem solving based on the choice of the language of presentation of mathematical information to solve the problem and the analysis of the conditions of their applicability;

Acceleration component involves the acquisition of performance skills based on the expediency of actions and the possibility of their execution using appropriate mathematical logic explanations, theorems, algorithms, and laws;

The assessment component involves the acquisition of skills to construct a corrective action plan based on the analysis of the causes of errors and to be able to see the probable results of corrective action.

According to John Raven, “to develop this type of competence, it is necessary to try to develop strategies for independent observation and independent reading” [96; 282-b.].

Independent management of learning activities is a specific management carried out with the student as a subject of activity.

As a result, the student understands his responsibilities as a subject of educational activity, builds the process of independent study towards the goal. Researchers of independent management of educational activities its structure is the same as in other types of activities.

Intellectual skills related to the characteristics of science are required to apply independent management in the acquisition of educational information.

We adapt independent management processes to the components of cognitive competence identified in the study. The mechanism of independent learning involves the choice and acceptance by the subject of the goals of their activities, personal attitude to the program of action, self-monitoring, self-assessment, analysis of their activities. Accordingly, the structure of cognitive competence is as follows (see Table 1.3).

Table 1.3. The structure of cognitive competence

Components of competence	Criteria for components
Motivational	The need for the student to search independently and acquire new knowledge
Informative	Independent decision-making on the choice of the language of presentation of mathematical information for the choice of the method of solving the problem on the basis of the analysis of problem solving and application conditions
Speed	Acquire the skills to perform actions based on their expediency and the ability to perform them using the appropriate definition, theory, algorithm, laws of mathematical logic
Appraiser	Acquire the skills to build a corrective action plan based on the analysis of the causes of errors and possibly to see the results of corrective action

Given that competence is formed in activity, its structure has been modified in contrast to this study [28, 152, 207].

The above suggests that independent management of learning activities is an effective mechanism for the formation of cognitive competence.

Analysis of the literature [90,103] allows us to distinguish the following stages of development of cognitive competence:

- 1) development of cognitive processes in the person;
- 2) development of components of educational activity;
- 3) striving for continuous independent learning.

Studying the issues of independent study, NV Kuzmina distinguished the general intellectual skills of independent educational activity: gnostic, projective, exemplary, communicative, enterprising [67].

1. Gnostic: moving learning objectives to independent learning objectives, defining the conditions for achieving the goals.
2. Designer: to plan their activities, to assess the level of readiness for this activity, to see ways to organize it rationally, to see the whole system of activities and its role in it.
3. Exemplary: building a program of actions, building a sequence of application of the program, selecting tools to achieve the goal, monitoring and evaluating the results, correcting if necessary.
4. Communicative: a sense of responsibility for the decision made, the establishment of a rational attitude to the achievement of goals, the ability to engage others in achieving the goals of the team, the ability to evaluate the results of the team.
5. Entrepreneurship: the ability to organize their own and team activities, to provide activities by the necessary means, to manage, to follow the established work schedule.

It is well known that mathematics has special tools that allow it to verify the correctness of change - it is the formalization of decisions using the language of thought logic and the language of predicate logic, and the transition to other languages of mathematical information using isomorphism of comments. The effectiveness of the application of these tools is ensured through their targeted and systematic use in the teaching of elementary mathematics. We will discuss each in detail. In mathematics, to express an opinion is to say that it is possible to draw conclusions about its rightness or wrongness. Identifies logical processes on ideas: for example, pedagogy rejects, conjuncts (attaches), disjuncts (separates), implicates, and equals (draws conclusions) according to certain rules in textbooks designed for university students. The tools presented with the logic of ideas seem to be insufficient to analyze some mathematical reasoning. It turned out to be useful to refer to the language of predicate logic. Variables are sentences that give an idea as a result of replacing free variables with their possible values.

Identifies logical processes over ideas on similar rules over predicates [51]. For them, similar laws of predicate logic are appropriate. In addition, two specific processes have been identified for predicates - operations that associate a variable with a commonality quantifier or a presence quantifier. These operations are subject to their own laws:

$$\neg(\forall xA(x)) \leftrightarrow \exists x(\neg A(x)); \neg(\exists xA(x)) \leftrightarrow \forall x(\neg A(x)); \forall xA(x) \leftrightarrow \neg(\exists x(\neg A(x)));$$

$$\exists xA(x) \leftrightarrow \neg(\forall x(\neg A(x))); \exists xA(x) \vee \exists xB(x) \leftrightarrow \exists x(A(x) \vee B(x));$$

$$\forall xA(x) \wedge \forall xB(x) \leftrightarrow \forall x(A(x) \wedge B(x)).$$

In mathematics, the isomorphism of two algebraic structures is understood as the existence between the basic sets of mutually identical axes that maintain the operations and relationships defined in the structures [47, 51]. M interpretation of this first-order K theory, other K theory M' interpretation isomorphic [53], if the interpretation of M in the D domain D' in the field M' If there is a mutual reflection in the interpretation, 1) If $(A_1)''^*$ and $(A_1)'''$ - A'' predicate letter interpretation M and M' when, then from D (b_1, b_2, \dots, b_n) in any case, $(A_1)''^*(g(b_1), g(b_2), \dots, g(b_n))$ when done $(A_1)''(b_1, b_2, \dots, b_n)$ done;

2) If $(f_1)''^*$ ба $(f_1)'''$ - f'' functional letter interpretation M and M' if at, then any of the y at D $g((f_1)''^*(b_1, b_2, \dots, b_n)) = ((f_1)''(g(b_1), g(b_2), \dots, g(b_n)))$;

3) if a_i^* ба a_i' - subject constant a_i interpretation M and M' and if appropriate, then $a_i' = g(a_i^*)$.

The text of a mathematical problem can be interpreted within the framework of various mathematical theories, such as the theory of solving equations (inequalities) or the theory of vector algebra.

Suppose we define the theory of T1 and the theory of T2 (given in its language after the text of the matter has changed). In the study, we understand the isomorphism of interpretations to mean the presence of an objective axis between the domains T1 and T2, respectively, which

must maintain the object variation of the axis, the performance of the predicates, and the operations on them.

The student's independent learning activity is associated with the "discovery" of knowledge that is new to him. Accordingly, we consider heuristic problems as a means of developing cognitive competence in the teaching of elementary mathematics.

There are different approaches to describing the problem. They often talk about the issue as if it were a system (G.A. Ball [43], Yu.M. Kolyagin [65], L.M. Friedman [113], A.F. Esaulov [128], S. Alikhonov [37]).

According to Yu.M. Kolyagin, "a more specific feature of the general concept of the problem is the existence of a separate interaction of subject and object, which leads to the formation of some system" [65; P. 48] The matter is understood as the specific situation of man in question - the interaction of many objects and the relationships between them.

AF Esaulov describes the concept of the problem: "The problem is a certain system of information processes to a greater or lesser degree, the incompatible or even contradictory interrelationships between them create the need to change them" [128; 17-b.].

Relying on scientific and methodological sources, S. Alikhonov in his methodical treatises states that "if a teacher wants to teach students a new mathematical concept in the classroom, the problem or example should be of a nature that reveals the essence of this new concept" [37; p. 63]. .

In the study, the issue was presented as any definite model of a problematic situation.

We define the definition of the concept of heuristics. There are different meaningful interpretations of this concept. In the psychological and pedagogical literature, heuristics are considered as follows:

Heuristics (Greek - seek, find) - special methods of problem solving (heuristic methods). The opposite of solving a problem based on precise mathematical models and using traditional methods. The use of heuristic methods significantly shortens the problem solving time. The solution obtained in this way is not considered the most appropriate solution, but will be one of the possible solutions. Often, the goal set by using heuristics cannot be achieved. methods that lead to the discovery of a method of solving the desired problem or the discovery of a theoretical proof (G.I. Sarantsev [101]);

- general guidelines that should be relied upon in solving non-standard problems (L.M.Friedman, E.N.Turetsky [114]);

- meta-methods, with the help of which specific-semantic methods of solution are sought; dibu reduces the excess of different solution options or possibly paths in the search maze (Yu.N. Kulyutkin [69]);

- special mechanisms of organization of thinking aimed at creating rational conditions for the manifestation of intuition (VN Sokolov [103]);

By studying the functions of heuristics in teaching, G. I. Sarantsev [101] and E.E. Semyonov [24] distinguishes among others: 1) they can be a means of motivation in the choice of this or that action; 2) can be a means of systematization of the studied or studied material; 3) can be a means of establishing similarity; 4) can be a way of acquiring knowledge; 5) may be a source of internal guidance in relation to cognitive activity; 6) can lead to mathematical discovery and satisfy the reader emotionally.

The use of heuristics motivates operations in problem solving, justifies logic, and helps to search for them. In other words, they lead the process of discovering new knowledge. We compare the components of cognitive competence with the functions of isolated heuristics. Using indicators, we show the effect of heuristics on the components of cognitive competence in the diagram (see Figure 1.1) [21; p. 157].

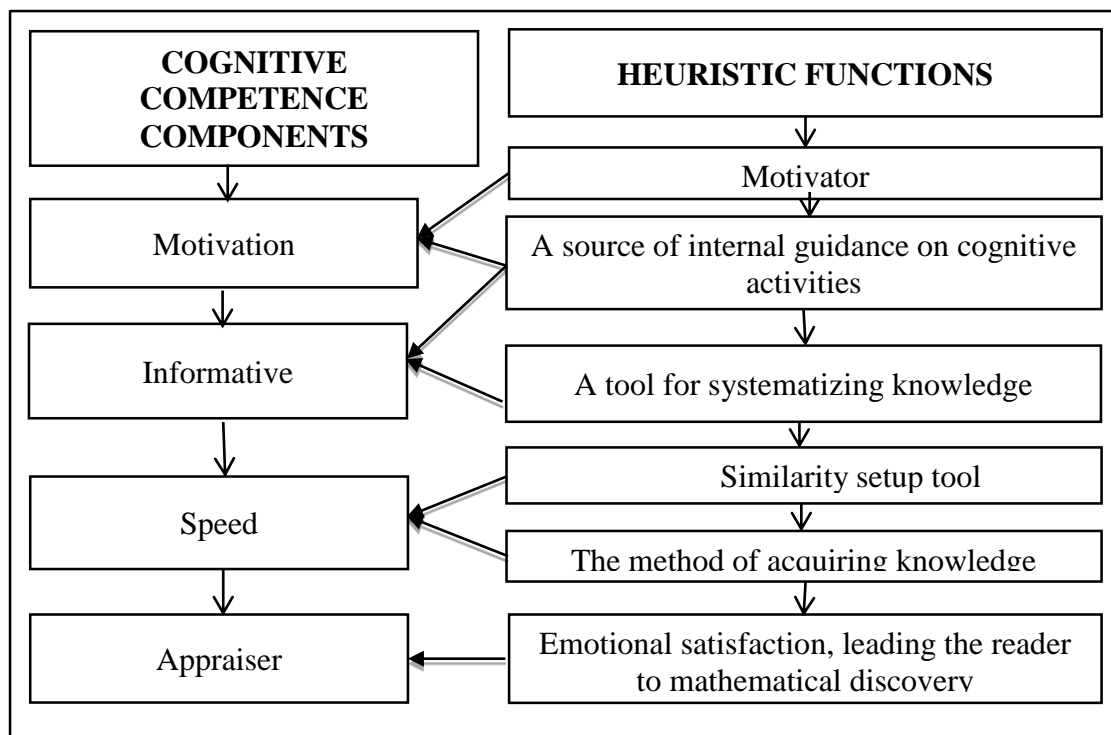


Figure 1.1. The relationship between the components of cognitive competence and the functions of heuristics

Acquiring the ability to acquire new knowledge plays a central role in the development of cognitive competence. To study heuristic methods and techniques in terms of managing students' thinking activities, Yu.N. Dedicated to the case of Kulyutkin [68,69] .. Yu.N. Kulyutkin noted that it is heuristics that finds control mechanisms that allow some simple operations to be "linked" to complex strategies. One such strategy is to choose an individual learning trajectory. This means that the study of heuristics is necessary to shape the readiness for independent learning.

Normative-legal documents and publications of methodological significance

On the Action Strategy for the further development of the Republic of Uzbekistan. Decree of the President of the Republic of Uzbekistan No. PF-4947. February 7, 2017.

Resolution of the President of the Republic of Uzbekistan dated September 26, 2017 No PP-3290 "On further improving the system of targeted training of candidates for admission to higher education institutions." Collection of Legislation of the Republic of Uzbekistan.

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