# Competence-Oriented Task as Means of Quality Improvement of Mathematical Education

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***Abstract* - Integration of Kazakhstan into the world educational space makes it necessary to align with the requirements of the state and society to orient the education of the younger generation on the development of competencies that promote the concept of "education through life". Significant changes in the priorities in school education in the world in recent years require a reorientation to a competence approach, continuous self-education, mastering new information technologies, the ability to cooperate and work in groups.**

**The purpose of our research is to improve the quality of school mathematics education with the help of competence-oriented assignments.**

**For the analysis of the analyzed targets, the analysis of the native and chemical methapods is analyzed; the systematic analysis of the mathematical encounters and the reconstruction of the infectious information with the help of hypotheses and analgesia, comparison and hypnotism, analysis and synthesis, modeling and mental ex- periment; Diagnostic methods with the goal of designing the formation of coarse mnogoapektnyh central design of the person; the isolation of the criteria for the design of a diagonal quality - a system of colors that characterize the structure of the complex of personalities in the world; methods of observation, caution, a systematic analysis of the results.**

**When solving competency-oriented tasks, students are able to use and notice the general in the private, to reveal the significance of established facts and patterns, to form and develop the basic mental operations.**

**The methods for solving competence-oriented tasks should not only promote the development of skills and skills that meet the program requirements, but also the development of creative cognitive activities. These include tasks that familiarize schoolchildren with non-standard methods of reasoning, but do not require the extension of the curriculum material.**

**The nature of the representation of competence-oriented tasks takes into account the psychological characteristics of students' perception of information. In particular, it is desirable that the conditions of the problems allow rather simple graphic or "subject" illustrations.**

**In conclusion, we note that competence-oriented tasks should include entertaining tasks that are diverse in terms of the story, in the formulation of questions, in the methods of solutions. It is desirable to include in the system tasks, the solution of which is divided in time and whose purpose is the development of certain skills and abilities, the consolidation of methods of reasoning, methods of solving problems, the development of spatial representations, the formation and development of mental operations, such as: analysis, synthesis, comparison, classification, etc.**

***Keywords:* Education model, competence, competence education, competence-oriented tasks, mathematical models.**

The new attitude to education as to one of the components of spheres of culture, is perceived as a key to the solution of problems inherent not only in the education system, but also directed at overcoming of common cultural crisis of the modern world.

One of the major social institutes reflecting the condition and tendencies of development of the society, and in a certain degree influencing its development, is the school. At the present stage of education development school faces a task - not only to arm pupils with a certain volume of knowledge, skills, butalso to teach schoolchildren to apply the theoretical knowledge to practical life, to independently supplement the knowledge, to be guided in a prompt flow of scientific information.

In the law of the Republic of Kazakhstan «About Education» No. 319-III from July 27, 2007, in particular in chapter 3, problems of the modern education system are designated. We consider as most important of them:

1) creation of the necessary conditions for receiving quality education directed atformation, development and professional formation of the personality, on the basis of national and universal values, achievements of science and practice;

2) functioning of the national system of assessment of education quality, which would meet the needs of the society and economy [1, page 17].

The solution of these tasks is possible in the conditions of realization of new approaches to tutoring, development of such model of education in which all possibilities to arm modern schoolchildren with the necessary in real life knowledge, abilities, skills, competences would be created.

Introduction of the new model of education provides a

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change in attitude to the formed knowledge, abilities, skills, in other words - to the results of tutoring. From now on the teacher should not only acquaint pupils with the bases of sciences, but also teach to use the gained knowledge, and also develop skills of independent searching for new knowledge.

The model of education oriented at the result, gives an opportunity to each pupil to choose his\her personal trajectory of development and this way creates conditions for self-development. Achievement of education goals will lead to development of the personality, ready to be improved and study during all the life. Formation of schoolchildren's readiness for education during all the life is the purpose of a global scale which the whole world community sets for itself.

As the volume of knowledge and skills in itself cannot be the result of tutoring today, there is a need to consider an issue on new approaches to measurement of educational achievements of pupils, which include knowledge, abilities, skills (KAS) and competences. The most effectivemeans of formation, and then measurement of level of competences formation, in our opinion are the tasks.

Thus, we consider the role of tasks in the conditions of competence education at school as the key role.

According to many researchers, the value of the content of school education for pupils can be raised, if its results ensure a possibility of solution of significant for them problems.

In the conditions of updating of the role of independent study as the main kind of pupils activity, the tasks gain special importance. Some types of tasks can become a part of methods of definition of educational achievements of pupils. Projection and creation of such methods is one of the links of the organization and control of the educational process.

Atask is a pedagogical form aimed at mastering by pupils of the planned results. Each task is created for a definite purpose, and therefore as it is fairly noted, has the mission and the characteristics [2]. The principal mission of tasks is motivation of pupils to active self-educational involvement, development of pupils, mastering ofthe necessary knowledge, abilities, skills to the demanded level of competence. The main types of tasks are a problem, question, exercise, creative task, task in a test form, test task, educational problem, course and degree works, and others [2].

Tasks appear as common concept in relation to problems, questions, tasks in a test form, exercises, etc. They possess different possibilities and lead to various didacticresults, but together they organize a system.

"Projection" means «development of the project or creation of the plan of future actions» [3]. The use of concept "projection" with reference to tasks is connected with the fact that projection includes, firstly, not only designing of new tasks, but also selection of available tasks for test creation. Secondly, their systematization according to the purpose and aim of a particular segment of the educational process. Thirdly, the interior structure of the drawn-up system of tasks can change according to different options of the organization of complete educational process and its reorientation depending on situations and available conditions.

Taking into account stages and levels of mastering ofthe training material, tasks of various levels of difficulty for schoolchildren are created, and conditions for tracking of educational achievements of pupils at each level are ensured. Reaching of each level of mastering assumes performance by pupils of certain cogitative operations (the analysis, synthesis, comparison, etc.). Therefore, the content of each task will depend on the level differentiation.

An option of use at the third stage of mastering as a creative task of the combined tasks which consist of two various forms of tasks is possible. For example, a situational task and alongside to it there aretasks in a test form. As implementation of creative tasks needs a large amount of time, which depends on many circumstances (the speed of thinking of the pupil, existence of experience in solution of similar problems, etc.), it is preferable to give such tasks for home. That will allow each pupil in accordance withpersonal possibilities to carry out tasks in the convenient for him\her time. Terms for implementation of creative tasks can be regulated by the teacher according to the level of preparation of pupils of a class, their load, etc.

During the preparation of tasks it is useful to be guided by M.Zh.Dzhadrina's approach, which essence is presented in Bloom's [4] works, in the article [5] and in table 1.

TABLE I. STAGES AND LEVELS OF MASTERING (ACCORDING TO M.ZH.DZHADRINA)

| ***Mastering levels*** | ***Acquisition of new knowledge and its application in a typical situation*** | ***Transformation of the gained knowledge and its application in atypical situations*** | ***Independent acquisition of new knowledge*** |
|---|---|---|---|
| Knowledge | - reproduces necessary basic knowledge;<br>- perceives new facts, terms, concepts, laws, theories, principles. | - knows ways and modes of use of concrete information;<br>- knows the organization and structure of the considered subjects, phenomena. | - selects the necessary knowledge of various levels of generalization;<br>- knows degree of significance of the selected information for a solution of an objective and reaching aims. |
| Understanding | - fixes the received new | - establishes connection | - establishes correlation |

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| | | | |
|---|---|---|---|
| | information;<br>- retells in his\her own words, shows similarities and differences of the received information, distinguishes them among others. | between various information, data and analyzes, interprets them. | between the selected information and judges the significance of the data concluded in them for future consequence . |
| Application | - applies the acquired knowledge in a similar situation, gives similar examples. | - transfers available information to another form;<br>- makes subjectively new information, offers his\her own option for use of available information. | - projects, constructs, creates new information (a plan, scheme, model, etc.), being guided by a concrete law, principle, theory. |
| Ability | - is able to explain, compare, classify, draw conclusions. | - is able to analyze, estimate, differentiate, generalize available information;<br>- integrating the necessary knowledge, constructs subjectively a new model of information. | - is able to analyze, estimate, differentiate, generalize available information;<br>- integrating the necessary knowledge, constructs subjectively a new model of information. |

In our opinion, it is necessary to understand description of a concrete situation which is more or less typical for a certain kind of activity as the competence – oriented task, directed at the solution of concrete personal significant problems of pupils.

The content of the competence – oriented task, as a rule, is defined by the needs and interests of a concrete group of pupils, is oriented at available cultural experience and represents a possibility to master new experiencecreatively. This description includes an account of conditions of activity and desirable result.

Projection of competence -oriented tasks is carried out both on the content of training material, and on the expected result (see literature 7, 8). The logic of creation of tasks assumes:

- a statement of a personal significant problem which will help the pupil to be convinced of the need of this knowledge;

- a selection of texts (these can be plain texts in which information is set either explicitly, or implicitly; these can be complicated texts; these can be tests of different types and genres: fragments of works of art, biographies, texts of entertaining character, personal letters, documents, papers from newspapers and magazines, business instructions, advertisements, commodity labels, maps, etc.; in them various forms of submission of information can be used: charts, figures, maps, tables, graphs, etc.);

- existence of problems and tasks to texts, which have problem character, assumes synthesis of information, correlation of the text content with the life experience and are oriented on product obtaining, for example, development of the project.

An important condition is the various character of tasks which allows pupils not only to reproduce knowledge, but also to estimate the presented information, to formulate a hypothesis, to draw a conclusion, to state a point of view, to offer different options of solutions, to use available knowledge for a task solution.

In all cases realization of competence - oriented tasks is directed at reaching of educational results which are beyond the subject, and applicable in different types of activity. Situational problems, as a type of competence – oriented tasks, are applicable in subjects of any type and can be used for schoolchildren of any age, thus they differ inthe character of problems which solution it is necessary to discover.

In a general view the task consists of the informational block and a series of problems to it. The informational block can be presented in the form of a text, system of signs (symbols), table, chart, graph, figure, scheme, sound (video) information and their combination. The problems are directed at detection and assessment of: 1) concrete knowledge; 2) groups of skills (including ability to correlate a considered situation with personal life (research) experience; 3) the relation of the subject to the task and a mode of its solution.

The content of the task has the following structure:

A motive - problem block. The purpose of this block consists in orientation of the pupil at understanding and realizing of an urgency of the task both in respect of self-development, and in respect of interaction with other participants of the educational process. The main categories in this case are: interest, personal and social significance, importance; usefulness, etc.

A block of resource providing of the process of search (creation) of a solution. This block is intended to most fully supply the pupil with informational resources which ensure deep penetration into the essence of a problem. It should discover substantial aspects of an objective as much as possible. In case a detailed description of a condition of a

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problem takes place, including attraction of documentary sources, they usually speak about "a case", as a mode of an account of a content of a task. A so-called "instructive" model according to which the pupil is given possible sources of the required information can be another option.

The didactic block (tasks and problems demanding realization and the answer). The content of this block allows to render concrete the form as much as possible, the type of that "product" (intellectual, creative, research, etc.) which should become a result of the process of the solution of the task. "The product" itself can represent both the answer to a problem (degree of development of the answer is defined by the corresponding criteria), summarized information, and an option (simulated or real) of a way out from a problem situation (for example, communicative).

The problem of designing of tasks as gages of educational achievements of pupils is connected with a formulation of requirements to their content. The studied works of scientistsfrom different years showed that in this problem there are unresolved questions which concern measurement of the results of tutoring in the conditions of introduction of a new educational paradigm. Owing to the analysis made, we formulated and specified the requirements to the content of tasks.

So, tasks as gages of educational achievements of pupils in the conditions of competence education at school should:

1) meet all-didactic requirements;
2) ensure correspondence of each task to the studied material of a course;
3) create conditions for the most rational forms of a feed-back;
4) ensure integration of knowledge of various subjects;
5) promote formation of functional literacy (literacy in natural sciences, mathematical literacy, computer literacy, etc.);
6) have practical orientation.

The tasks in subjects of a natural and mathematical cycle can be added if necessary with such elements, as:

- formular means;
- figures, graphs, delineations, schemes.

Problems as a form of tasks, are offered in text form more often, and existence of a formular means, case histories for them is not obligatory.

Problems and exercises can also have a similar structure where formulas, case histories can be used as required.

The structure of test tasks looks this way:

1) task number;
2) instruction on implementation of the task;
3) task text (words, terms, sentences);
4) true and false answers (distractors);
5) formular means;
6) figures, graphs, delineations, schemes.

Depending on the form of test tasks - with the choice of one or with the choice of several true answers, an open form, for establishment of correspondence and for establishment of the correct sequence - the structure of test tasks will change. For example, test tasks of the closed form, for establishment of correspondence and for establishment of the correct sequence should consist of the task number, the instruction on implementation of the task, the task text, true and false answers. And only in test tasks of an open form there will be no true and false answers. In the same way as in problems, a formular means, figures, delineations, schemes are ued in test tasks as required.

In recent years in many countries and in Kazakhstan in the educational process tasks in a test form are more often applied. It is connected with the fact, that both in the international comparative research, and at entrance examinations to higher educational institutions knowledge is checked by means of testing. The advantage of tasks in a test form compared to other forms of tasks is that its results are easily given in to computer handling. All the remaining forms of tasks can be not always checked by means of the computer program. It is a question of tasks of a creative level where there can not be a sample approach, and each case of realization is individual.

When the requirements to the construction and content of tasks, the principles of selection of a content of systems of tasks are specified, the structure of each form of tasks is defined, we should speak about an assessment of quality of the constructed or selected tasks. Scientists suggest solving the problem of assessment of quality of tasks by means of various mathematical models. And in completion of this process correctional work is carried out, and the system of tasks passes the following stage of approbation. This process is cyclic and is carried out until the complete perfecting of the system of tasks.

Summing up the aforesaid, we can offer an algorithm of projection of the systems of tasks. This algorithm can look this way:

1.Definition of target function of the system of tasks.
2.Choice of a content of each task.
3.Choice of a form of tasks.
4.Designing of the new task.
5.Selection of ready tasks as required.
6.Systematization of tasks by a principle of increasing difficulty.
7.Approbation of the system of tasks.
8.Assessment of the quality of tasks.
9.Correction of tasks.

Tasks which were used at knowledge centred model of education, in structure do not differ from the competence – oriented tasks. The unique difference is in their content which is in direct dependence on the results of tutoring. Due to the change of relation to the results of tutoring the content of tasks should have the integrated and practice oriented character, which will allow schoolchildren to create skills of transposition of theoretical knowledge to practice, use of subject knowledge for a solution of vital problems. The quality of results of tutoring can be reached only in the

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presence of measuring instruments of educational achievements of pupils of high quality and at scientifically reasonable use of them in the educational process of school.

When tutoring mathematics development of competences will be carried out at the expense of a procedural part of tutoring more than at the expense of a content. At projection of the educational process on mastering mathematics, it is necessary to connect the established competences, expected results with the training material of separate themes and sections.

During the analysis of work of I.Osmolovskaya [6] it was revealed that the author considers the competence as ability to solve problems, thus notices that selection of stages of solution of problems gives an opportunity to assume in the content of the training material tutoring to a solution of problems which can be designed by means of:

- educational representations in which concrete stages of a solution of problems are completed;
- educational representations forming modes of activity;
- educational situations the operation in which forms experience of a solution of problems.

At implementation of the representation the student solves an educational or life situation and shows a level of assimilation of a training material and by that –the level of reaching of a certain expected result of tutoring. Educational situations, an operation in which forms experience of a solution of problems, are usually practical situations, role-playing games in fixed and extracurricular activities.

Taking into account the foregoing, as examples of educational representations for working off of separate stages of a solution of problems it is possible to offer:

- representations in which a text describing a certain situation on which it is necessary to formulate a problem is provided;
- problems with missing or surplus data;
- problems of research character or research representations;
- representations demanding on the basis of a statement of a problem to define the purpose of the forthcoming activity;
- tasks directed at an assessment of work done by pupils from a position of reaching of a goal.

Let's give examples of such representations, beforehand having noted that the competence-oriented representations include: representations with a practical directedness, with an economic content, directed at the integration of knowledge of pupils and also situational representations.

Task 1: It is possible to make 21000 copies of school note-books from 1 t of waste paper. Processing 410000 t of waste paper, how many cubic meters of wood is it possible to save, if it is possible to make 574 copies of school note-books of $1\ m^3$ of wood? Collecting waste paper, how many note-books can you save in 1 academic year? [7]].

Task 2: The smoke from 25 cigarettes contains 125 mg of nicotine poison. How much poison will a person take in 1 day, if during this time he smokes 20 cigarettes and from each of them gets $\frac{1}{5}$ part of nicotineto its organism? [9].

Task 3: From 100 g of a pumpkin it is possible to receive 8 mg of vitamin C. How much pumpkin is it necessary to have to receive 100 mg of vitamin C? [9].

Task 4: A liter of atmospheric air weighs about 1,3 g. How much does the air weigh in the room, with the length of 8,5 m, breadth of 4,7 m and height of 3,2 m? [9].

Task 5: 1 CBM of air weighs about 1,3 g. How much does the air in your classroom weigh? [9].

Task 6: If duration of a lesson is 45 minutes, then how many minutes makes its $\frac{1}{3}$ part, $\frac{1}{5}$ part? [9].

Task 7: There are 1800 pupils at school. One day 120 pupils did not come to classes. Which part from the total number of schoolchildren at school do they make? [9]

Task 8: The delineation of an object is fulfilled in the scale of 1:40. The distance between two points on this delineation is equal 4,8 cm. If you fulfill the same delineation in the scale of 1:75, what will the distance between the two points be equal? [9].

Task 9: How much money is required for paint purchase for the repair of a computer class, if:

| | |
|---|---|
| length of the premises | 6 m |
| breadth | 4 m |
| height | 3 m |
| square of window and doorways | 18 sq.m |

also painting is supposed to bein two stratums.

Task 10: The initial price of the copier is 9000$. After 5 years, the rice will be 1000$. Find copier price in 3 years. [8].

Task 11: Dependence of the price on the transported distance for the first transport is $y=150 + 50x$ (per each km x, y – price of transporting). And for the other transport is $y=250 + 25x$. Which transport and at what distance more advantageous to transport goods? [8].

Task 12: The cost of goods was reduced at first by 10 %, then by 5 %. Recomputation was done and the cost of goods was loweredby 15 % more. By how many percent is the initial price of goods lowered? [10].

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