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FORMING SUBJECT-MATTER COMPETENCY IN HIGH SCHOOL STUDENTS

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Abstract. *The article deals with the urgent issue of training high school students for external independent testing, the necessary condition for which is formation of their subject-matter competency, in particular, the mathematical one. The essence of competency-based approach, concepts “competence”, “competency” are revealed. The author singles out the effective forms, methods, technologies of organizing high school students’ educational activity in mathematics lessons aimed at quality preparation for external independent testing.*

Keywords: *competency-based approach, competency, competence, subject-matter competency, external independent testing.*

Reforming education in Ukraine involves the updating of the content of education with a focus on key competencies, which will enable students to solve various tasks in all spheres of life. The concept of competency in education arose as an understanding of the fact that the formation of the school graduate’s competency should be considered a task and a mission of education. This competency should provide them with an opportunity of self-realization in society, and contribute to the formation of civil society.

Competency is a prerequisite for graduate’s successful self-realization in society and the development of society per se. The main task of education is training a competent citizen of a society (graduate) who is able to discover, develop, maintain, successfully realize their potential in the face of complex requirements posed today.

The analysis of the latest studies on the research problem has shown that the main feature of the competency-based approach is the emphasis shift from the load of normatively determined knowledge, skills and abilities to formation, development of students’ ability to practically act, apply individual techniques, experience of successful actions in various activity fields (I. Burhun).

The competency-based approach doesn’t imply student’s mastering of certain knowledge and skills, but acquiring them in the complex. It includes humanistic, moral, ethical, cultural, aesthetic, motivational and other components, aimed at creativity, action, initiative, performance, result (S. Rakov).

A. Khutorskoi proposes to divide the concept of “competency” and “competence”, to use them in parallel, but giving them different content. Competence is a set of interrelated qualities of the individual (knowledge, skills, abilities, activities), which are given according to the appropriate range of subjects and processes and are necessary for a top-quality productive action related to them. Competency is the person’s possession of an appropriate competence, which contains their personal attitude to the subject of activity [4]. That is, the competence, according to A. Khutorskoi, should be understood as a given requirement, the norm of student’s educational preparation, and competency – as their real formed personal qualities and minimal activity experience [4].

A. Belkin, V. Nesterov suggest considering competence as “a set of professional powers, functions that create necessary conditions for effective activity in the educational process”, and competency as “a set of professional and personal qualities that ensure the effective implementation of competences” [2, p. 4].

There is a formula of competency: 1) knowledge as dynamic information to be found, selected, analyzed, translated into own experience; 2) the ability to apply this knowledge in a particular situation, an understanding of how to obtain the knowledge; 3) an assessment of oneself, of the world, one’s place in the world, the method of applying the knowledge.

A. Lukianchenko argues that competency is not just a sum of knowledge, skills and abilities, but a psychosocial trait that gives the student strength and confidence in their success, the ability to effectively interact with the environment.

According to experts from the Council of Europe, competencies imply the ability of the individual to perceive and respond to individual and social needs; complex of attitudes, values, knowledge, abilities, skills.

A. Khutorskoi distinguishes the key competencies (refer to all subjects), general subject-matter competencies (refer to the cycle of subjects or educational branches), subject-matter competencies (refer to each subject). Subject-matter competencies form the basis for the formation of key competencies.

The aim of the paper is to reveal, to theoretically substantiate the necessity of forming the subject-matter competency in high school students as a condition of preparation for the external independent evaluation.

According to the State standard of basic and complete general secondary education, subject-matter (branch) competency is acquired by students in the learning process experience specific to a particular subject of activity associated with acquiring, understanding and application of new knowledge. The competency-based approach contributes to the formation of key and subject-matter competencies.

According to H. Potapova, subject-matter competency is the student's ability to apply a set of knowledge, abilities, skills from a certain area of knowledge in accordance with the life situation; the ability to act on the basis of the knowledge and skills acquired.

The subject-matter competency is comprehension of the place of each science in the system of mankind's knowledge, understanding of the dialectics of obtaining new theoretical knowledge and its usage in practice, independent operation of the subject knowledge and its critical comprehension from the standpoint of practice, other sciences. According to L. Huzeiev, the subject-matter competency is the ability to analyze and act from the point of view of certain areas of human culture [2]. Consequently, the subject-matter competency is a component of general-branch competencies that relates to a particular subject.

The European reference system contains eight key competencies, including mathematical competency and basic competencies in the field of science and technology. Mathematical competency is the ability to see and apply mathematics in real life, to understand the content and method of mathematical modelling, the ability to construct a mathematical model, to study it by mathematical methods, to interpret the obtained results, to evaluate the calculations error.

In determining mathematical competencies, both specific mathematical competencies and the contribution of mathematical competencies into the key, industry, subject-matter competencies should be identified. S. Rakov considers it necessary to include into the subject-branch mathematical competencies the procedural (ability to solve typical mathematical problems), logical (possession of deductive method of proof and disproof of statements), technological (possession of modern mathematical packages), research (possession of methods of researching socially and individually meaningful tasks), methodological (ability to evaluate the feasibility of using mathematical methods for solving individual and socially important problems).

The main objective of mathematical education in Ukraine is the formation of the students' scientific outlook, mastering the methodology of mathematical knowledge, the provision of intellectual development of the individual, continuity in the system of general secondary education. For successful participation in modern social life, a person must possess certain techniques of mathematical activity and skills of their applications to solve practical problems. A certain mathematical training and readiness to apply it is required by the study of many educational subjects of general secondary education institutions. Significant requirements for the possession of mathematics in solving practical problem are put forward by the modern labor market, obtaining high-quality professional education, continuing education at the next stages.

The main objective of the “Mathematics” educational branch is to form students’ mathematical competency at a level sufficient to provide life in the modern world, to successfully master the knowledge of other educational branches in the process of school education, to ensure the intellectual development of students, the development of their attention, memory, logic, culture of thinking and intuition.

The tasks of this educational field are: to reveal the role and opportunities of mathematics in the cognition and description of real processes and phenomena of reality, ensuring the recognition of mathematics as a universal language of natural sciences and the organic component of the common human culture; to develop students’ logical, critical and creative thinking, the ability to clearly and reasonably articulate and express their judgments; to provide students’ mastering of mathematical language, their understanding of mathematical symbols, mathematical formulas and models as those that make it possible to describe the general properties of objects, processes and phenomena; to form the ability to logically substantiate and prove mathematical statements, to apply mathematical methods in the process of solving educational and practical problems, to use mathematical knowledge and skills while studying other educational subjects; to develop abilities to work with the textbook, to work on mathematical texts, to search and use additional educational information, to critically evaluate the obtained information and its sources, to highlight the key thing, to analyze, to draw conclusions, to use the information received in the personal life; to form the ability to evaluate the correctness and rationality of solving mathematical problems, to substantiate statements, to identify logically incorrect considerations, to make decisions in the conditions of incomplete, superfluous, accurate and probabilistic information.

The objectives of the educational field that determine the content of mathematical education in the high school are: increasing students’ competencies in relation to the identical transformations of expressions (power, logarithmic, irrational, trigonometric), solving the relevant equations and inequalities; the completion of the formation of the concept of numerical function as a result of the study of power, indicator, trigonometric functions, the formation of skills of their investigation and their use for the description and study of phenomena and processes; acquaintance with the ideas and methods of differential and integral calculus, formation of elementary skills of their practical application; the formation of practical competency for the recognition of random events, the calculation of their probability, the application of basic statistical-probabilistic models during the solution of educational and practical problems and processing of experimental data in the process of studying the natural cycle subjects; the formation of a system of knowledge of spatial figures and their main properties, ways of calculating the areas of their surfaces and volumes, as well as the ability to apply the acquired knowledge when solving

educational and practical problems; the formation of the idea of axiomatic construction of mathematical theories.

According to O. Novykova, the main forms of organizing students' educational activities are lessons with the elements of using information technologies, Internet lessons, Internet contests, press conferences, project defense, lessons-discussions, disputes, workshops, seminars, "brainstorming", video lessons, lectures using the slide method. The essence of the heuristic slide method is to add to some slides of the presentation, which accompanies the teacher's narration, the programmed mistakes, that must be corrected on the side of the student at the end of the lesson. This method helps to develop students' critical thinking, creates an atmosphere of active constructive dialogue between a teacher and a student.

One of the methods of working with information is to use additional sources for finding answer to the problem set in the task, to do Internet tasks, the methodological basis of this training activity is previously learned experience, autonomy.

A special role is played by individual homework, performed by students on their own, the purpose of which is to identify the quality of the material acquired by the student, students' creative potential, the method of mathematical abstraction, which allows to reduce the number of tasks requiring direct reproduction of the material from the textbook.

O. Novykova also offers, in our opinion, an effective version of methodological support for the formation of subject-matter competency, namely: monitoring of the quality of mathematical education, quizzes, testing, preparation for external independent testing, use of thematic route maps, solving Internet tasks, creative tasks, participation in the contests of Internet, Minor Academy of Sciences, project method, case method, heuristic slide method, mathematical abstraction method, etc.

Interactive forms and methods of teaching, the use of information and communication technologies and multimedia tools are an integral part of the work of a modern maths teacher. Formation of all key competencies needs to be done at each lesson. However, it is necessary to vary the content of tasks, forms and methods of work in certain lessons, to direct the learning process to form one or another competency. Consequently, due to the content and form of work in certain lessons, one should try to form objective competencies and through them key competencies.

It is advisable, that in the lessons students should be encouraged to self-assess their response, to select a reviewer for their response, to determine the purpose of their activities and the purpose of the lesson, to reflect on the educational activities.

Let us consider the peculiarities of students' preparation for external independent testing in mathematics.

Students' successful accomplishment of the tasks of external independent testing on mathematics is based, first of all, on their successful mastery of the theoretical material of the mathematics course, as well as methods for solving the problems implied by the program in mathematics.

At the initial stage of preparation, it is necessary to familiarize students with the program, features and specifications of external independent testing in this academic year. We analyze the results of testing of the past years, single out those topics which caused most difficulties, keep them in mind.

Then we carry out the systematization and generalization of theoretical material and methods of solving tasks on the content lines of the school course of mathematics: numbers and expressions; equation and inequality; functions; elements of combinatorics, probability theory and statistics elements; geometry (planimetry, stereometry).

Mainly, we offer a list of the main supporting facts of the school course of mathematics in the form of tables, which contain the main theoretical positions on each topic and the main algorithms and techniques for solving problems with related topics. In the lesson we work collectively, first repeat the theory, solve typical tasks on this topic. We necessarily consider the tasks that were offered in the past years. Particular attention is paid to the revision of the basic geometric and algebraic formulas. For this purpose, mathematical dictations are written on formulas, oral notes. One a week, students are read a lecture, which reveals the content of a particular theme, and supporting notes are compiled. Students independently work out the information they receive, and at the next lesson we work out the skills and abilities to solve the main tasks. The tasks for self-solution in the form of home tests and test tasks are given as a homework. As a self-control, students can be given correct answers or be check in the next lesson. Also, we practice preparing for external independent evaluation online, several students during and after the lesson can try their hand and evaluate the result. This stimulates students to get even more points next time. All students at home independently undergo on-line testing, and then show the teachers their results.

To control knowledge, we use the tests of two types: "choose the answer from the proposed ones" and "write the correct answer". The tasks of control works are being carried out in the form maximum close to external independent testing, necessarily involving tasks with one correct answer, the task of establishing conformity.

In geometry, special attention is paid to revising the formulas of the areas and volumes of geometric figures, the main theorems. For each topic there is a selection of tasks based on the principle of "from easy to complex". In parallel with the collective form of training we use an individual form. Students who prepare themselves for external independent testing in advance are provided with tutorials on the issues of interest.

Therefore, the goal of external independent testing is to increase the level of Ukrainian citizens' education and to provide the implementation of constitutional rights of citizens to equal access to quality education, to monitor compliance with the State standard of basic and complete secondary education and to analyze the state of the educational system, to foresee its development. Thus, we claim that the targeted formation of the subject-matter competency (including mathematical competency) in school graduates is a prerequisite for their effective preparation for the external independent testing, since the formation of mathematical competency is a mission of mathematical education.

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