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ФОРМУВАННЯ ПОЧАТКОВИХ МАТЕМАТИЧНИХ ЗНАНЬ У ДІТЕЙ ЯК УМОВА УСПІШНОГО НАВЧАННЯ В НОВІЙ УКРАЇНСЬКІЙ ШКОЛІ

Анотація. Стаття присвячена проблемі формування математичної компетентності здобувачів освіти, зокрема питанню формування початкових математичних знань у дітей. Математична компетентність належить до ключових компетентностей здобувача освіти. Сьогодні оволодіння математичною компетентністю є показником якості освіти на міжнародному рівні та конкурентоспроможності країни в галузі фундаментальних наук і новітніх технологій. Тому необхідно формувати початкові математичні знання вже в дошкільному віці, а процесові формування математичної компетентності, яку вчителі НУШ здійснюють з першого року навчання дитини в школі, варто реалізовувати на принципах партнерства, наступності, перспективності. З-поміж методів викладання доречно застосовувати ті, які ґрунтуються на взаємодії всіх учасників освітнього процесу, сприяють якісній підготовці дітей до переходу з одного рівня освіти на інший. Зроблено висновок, що курс математики в системі неперервної освіти ґрунтується на відповідному змісті Базового компонента дошкільної освіти й реалізує наступність між дошкіллям та початковою школою у сфері логіко-математичного розвитку, а також забезпечує перспективність у навчанні математики в 5-му класі. З-поміж завдань початкової математичної освіти – формування елементарних математичних уявлень і понять, зокрема такі: набуття знань про множину, число, розмір, форму, простір і час; формування широкої початкової орієнтації в кількісних, просторових і часових відношеннях навколишньої дійсності; формування навичок і вмінь з лічби, вимірювання, обчислення; оволодіння математичною термінологією; розвиток пізнавальних інтересів і здібностей, розумовий розвиток дитини загалом. У Новій українській школі (НУШ) математична освіта набуває нових особливостей. Складниками предметної математичної компетентності здобувача початкової освіти є обчислювальний, вимірювальний, геометричний, алгебраїчний, інформаційно-графічний, логічний, комунікативний.

Ключові слова: компетентнісний підхід, математична компетентність, початкова математична освіта, здобувачі початкової освіти, Нова українська школа, дошкілля.

FORMATION OF PRIMARY MATHEMATICAL KNOWLEDGE IN CHILDREN AS A CONDITION FOR SUCCESSFUL EDUCATION IN THE NEW UKRAINIAN SCHOOL

Abstract. The article is devoted to the problem of the formation of mathematical competence of students, in particular the issue of the formation of initial mathematical knowledge in children. Mathematical competence is one of the key competences of the schoolchildren. Nowadays, the acquisition of mathematical competence is an indicator of the quality of education at the international level and the country's competitiveness in the field of fundamental sciences and the latest technologies. Therefore, it is necessary to form initial mathematical knowledge at preschool age, and the process formation of mathematical competence by the teachers of the New Ukrainian School (hereinafter, NUS), which are carried out from the first year of a child's education at school. It should be implemented on the principles of partnership, continuity, and perspective. Among the teaching methods, it is appropriate to use those that are based on the interaction of all participants in the educational process, contribute to the high-quality preparation of children for the transition from one level of education

to another. It was concluded that the mathematics course in the continuing education system is based on the appropriate content of the Basic component of preschool education and implements the continuity between preschool and primary school in the field of logical-mathematical development, as well as provides perspective in teaching mathematics in the 5th grade. Among the tasks of primary mathematical education is the formation of elementary mathematical ideas and concepts, in particular the following: acquisition of knowledge about set, number, size, shape, space and time; formation of a broad initial orientation in quantitative, spatial and temporal relations of the surrounding reality; formation of skills and abilities in numbers, measurements, calculations; mastering mathematical terminology; development of cognitive interests and abilities, mental development of the child in general. In the New Ukrainian School (NUS), mathematics education acquires new features. Computational, measuring, geometric, algebraic, information-graphic, logical, and communicative are the components of subject-matter mathematical competence of a student of primary education.

Keywords: competence approach, mathematical competence, elementary mathematics education, pupils of elementary school, New Ukrainian School, preschool.

INTRODUCTION

The problem formulation. Nowadays, the problem of teaching mathematics to students is gaining more and more importance. This is caused not only by the rapid development of mathematical science in connection with its penetration into the most diverse fields of knowledge, but also by competence-oriented and practically oriented approaches to the education of children, which are oriented towards the Concept "New Ukrainian School" (New Ukrainian school) and other educational documents (Basic curriculum for students 1 – 4 classes of secondary schools; Basic component of preschool education in Ukraine; Derzhavnyi standart pochatkovoi zahalnoi osvity [State standard of primary general education). In addition, the mastery of mathematical competence of the student is an indicator of the quality of education at the international level and the competitiveness of the country in the field of fundamental sciences and the latest technologies. International recommendations based on PIZA, TIMSS, PIRLS testing data emphasize the need to pay more attention to the practical side of mathematics education, teach students to apply knowledge in life situations, etc. (PISA: mathematical literacy, 2018; OECD, 2019), because of the important role of mathematics in human life 21st century due to the need to use calculations and compile algorithms in the process of solving many life problems of a different nature (financial and economic, environmental, health-preserving, etc.). Therefore, it is necessary to form initial mathematical knowledge from an early age, and the process of forming mathematical competence, which the teachers of NUS implement from the first year of a child's education at school, should be carried out on the principles of partnership, continuity, perspective. Among the teaching methods, it is appropriate to use those that are based on the interaction of all participants in the educational process, contribute to the high-quality preparation of children for the transition from one level of education to another. It should be noted that mathematical competence belongs to the key competences of an education seeker (New Ukrainian school; PISA: mathematical literacy, 2018; OECD, 2019), which involves identifying simple mathematical dependencies in the surrounding world, modeling processes and situations using mathematical relations and measurements, awareness the role of mathematical knowledge and skills in a person's personal and social life, as well as the formation of skills to concisely and clearly formulate an opinion, argue, prove the correctness of statements, etc. (OECD, 2019).

Analysis of recent research and publications. Scientists have actively been investigating various aspects of the problem of mathematical competence of students. It is seen in the works of M. Bogdanovich, N. Budnaya, L. Zaitseva, L. Koval, Ya. Korol, O. Korchevska, V. Kushnir, I. Osadchyo, S. Rakov, I. Romanyshin, R. Romanyshin, S. Skvortsova, L. Cherkaska, T. Chernetska, V. Shvets and other authors analyzed the peculiarities of teaching mathematics in elementary school, highlighted the issue of the effectiveness of student activation during learning with the algorithmization of the learning process, the use of practical tasks, and also the authors emphasize the strengthening of the applied orientation of the school mathematics course, the formation and development of logical-mathematical abilities, etc. However, certain issues of continuity in mathematics education, the formation of initial mathematical knowledge as a condition for their further successful learning remained outside the attention of scientists.

AIM AND TASKS RESEARCH is to characterize the individual means of forming primary mathematics education as a prerequisite for the successful education of students of the NUS.

RESULTS OF THE RESEARCH

The mathematics course is an important component of education and upbringing of students of primary education at the NUS, a fundamental part of mathematics education. The goal of the educational field "Mathematics" is (Curriculum. Mathematics. 1st class. Explanatory note) the versatile development of the student's (pupil's) personality, the formation of mathematical and other key competencies necessary for effective life activities and continuing education in primary school. The most important expected results of the educational field "Mathematics" are the student's ability to regulate their activities arbitrarily; to build an internal action plan; to predict the result; to show cognitive attitude to reality, interest in research; to think critically; to monitor their activities; to be aware of the role of mathematics in understanding the surrounding world and achieving personal success in life; to recognize problems that can be solved by means of mathematics; to carry out an analysis of the educational and practical situation; to create mathematical models of a process or situation; find possible ways to solve a mathematical problem. It is advisable to use knowledge and methods of action to solve educational, elementary economic and practical problems at the reproductive and creative levels; build reasoning using mathematical vocabulary logically; transfer the acquired experience of mathematical activities to new situations; express evaluation and value judgments regarding the process and results of training; strive for self-improvement (Curriculum. Mathematics. 1st class. Explanatory note).

It is important to emphasize that the mathematics course in the continuing education system is based on the relevant content of the Basic component of preschool education and implements the continuity between preschool and primary school in the field of logical-mathematical development, as well as provides perspective in teaching mathematics in the 5th

grade. According to the Basic component of preschool education (Basic component of preschool education in Ukraine), among the tasks of forming elementary mathematical ideas and concepts are the following: acquiring knowledge about set, number, size, shape, space and time; formation of a broad initial orientation in quantitative, spatial and temporal relations of the surrounding reality; formation of skills and abilities in numbers, measurements, calculations; mastering mathematical terminology; development of cognitive interests and abilities, mental development of the child in general.

It is essential for children to realize that mathematics is not separated from reality, as we encounter it at every step, in everyday life, understanding this is a great skill for students of education, and applying it is a great achievement, which leads to the development of personality in all spheres of life in the future. It is important to convey to students that mathematics is not only calculations; it is primarily logical thinking, the ability to forecast and plan, reasoning, communication, etc.

Preschool education coincides with the child's dynamic development, during this period his intellectual abilities are formed; most innate tendencies develop, including the ability to learn. That is why it is so important to direct all educational activities to the comprehensive stimulation of the child's cognitive and social development, since it is during these years that his psyche is most receptive. Children's mathematical education should be considered broadly. It must be combined with the intensive development of thinking and the formation of emotional stability of the individual.

Therefore, mathematical skills need to be developed before the child goes to school. Children have to deal with mathematics, as well as with language, from an early age (numbers, clocks, rhythms, etc. surround them from a young age). Parents can help their child understand the content of mathematics. The principle they should remember is that the most important thing is the child's personal experience, and the activities that the child most willingly engages in are not only entertainment, but a means by which he learns about the world. If an adult wants a child to master something, he must organize such situations in which he will accumulate certain knowledge, experience, emotional experiences, and skillfully direct their internalization. These can be tasks and games, manipulation of specially selected objects, which the child singles out from among others, arranges, for example, in a row, determines the place of each of them, connects them in different ways, adds and subtracts, distributes and separates, etc.; selected play situations with adults and other children.

However, it should be remembered that primary mathematical education involves the process of forming initial mathematical knowledge and skills, it is carried out in such a way that training gives not only a direct practical result (counting skills, performance of elementary mathematical operations), but also a wide developmental effect. So, by primary mathematical education, we mean qualitative changes in the forms of a child's cognitive activity, which are formed as a result of the formation of elementary mathematical ideas and logical operations connected with them, but it should be limited to counting, recognizing the shape of numbers, adding and subtracting within a dozen.

Mathematical education acquires new features at NUS. Computational, measuring, geometric, algebraic, information-graphic, logical, and communicative are the components of subject-matter mathematical competence of a student of primary education. Thus, the basis of the measuring component of subject mathematical competence is knowledge of basic quantities (length, mass, volume, time) and an understanding of the essence of the process of their measurement, knowledge of measurement units and the relationship between measurement units of a certain quantity, the ability to measure quantities and record the results of their measurement, skills in performing arithmetic operations with quantities; knowledge of groups of interrelated quantities (price, quantity, cost, etc.), understanding of their relationship and the ability to find one of the quantities of the group by the other two; knowledge of geometric quantities (perimeter and area) and the ability to measure and find them using the appropriate rules and formulas. The geometrical component of subject-matter mathematical competence consists in forming in students of education an idea of geometric figures on a plane and in space, knowledge of the names of plane and spatial figures and their elements, knowledge of the essential features of polygons, rectangles and squares (definition of concepts) and the ability to construct and depict geometric figures, draw a line, ray, segment, rectangle and square on paper in a cell. The basis of the algebraic component of the subject mathematical competence is knowledge of the essential features of algebraic concepts (expression, equality, including equations and inequalities), mastery of mathematical symbols, the ability to find the meaning of expressions, read and write equalities and inequalities, establish the truth or falsity of equalities and inequalities, the ability solve linear equations with one variable (simple and complicated), the ability to find individual solutions of inequalities with a variable. The ability to read information from diagrams, tables, diagrams, and the ability to present information in the form of diagrams, tables, diagrams form the basis of the information-graphic component of subject mathematical competence. The logical component involves acquiring the skills to determine the features of objects (objects, geometric figures, etc.), to determine common and distinctive features, to determine essential and non-essential features; the ability to compare objects, generalize objects by a common feature, classify objects into groups; an idea of the definition of a concept, the ability to "bring it under a concept"; the ability to establish the truth or falsity of judgments, conclusions; the ability to build true conclusions (Curriculum. Mathematics. 1st class. Explanatory note).

The basis of the communicative component of subject mathematical competence is knowledge of mathematical terminology, the ability to apply it in speech correctly, the ability to justify one's opinion competently, to construct true statements and conclusions using logical conjunctions. An important component of the communicative component is the formation of learners as language ecologists, speakers of the organic Ukrainian language, individuals who know the norms of the modern Ukrainian literary language.

As the results of our observations showed and noted by authoritative researchers in the field of speech ecology (Bilavych, Dovhyi, & Holovchak, 2019; Bilavych, Pantiuk, Savchuk, & Holovchak, 2019), participants in the educational process (preschoolers, primary school students) in mathematics classes/lessons most mistakes are made in stressing words. Under such conditions, we advise educators/teachers, as well as parents, to pay special attention to the normativity of stressing words. It would also be appropriate to compile a dictionary of accents "Let's accent Ukrainian correctly!", where to enter words where children violate the rules of the accent more often. It is advisable to work with these words in almost every class/lesson, arranging "Accentological minutes", which purpose is to remember the stress in words *(в**и**падок, кілом**е**тр, нов**и**й, стар**и**й, дециме**т**р, чис**е**льник, дробов**и**й, доб**у**ток, легк**и**й, важк**и**й, товст**и**й, сер**е**дина,*

*берем**о**, робл**ю**, валов**и**й, вісімдес**я**т, чотирн**а**дцять, одинадцять, д**о**шка, нест**и**, везт**и**, озн**а**ка, вир**а**зний, чит**а**ння, навч**а**ння, вид**а**ння, прав**о**пис, пер**е**пис, копійк**и**, ластівк**и**, вчительк**и**, порядк**о**вий, предм**е**т, пр**и**ятель, п**о**друга, черств**и**й, дочк**а**, жил**а**, бул**о**, двірн**и**к, цемент, квартал, легк**и**й, вісімдес**я**т, вісімс**о**т, відповіл**а**, розповіст**и**, котр**и**й, докум**е**нт, каж**у**, зробл**ю**, з**а**гадка та ін.)* (Bilavych, Dovhyi, & Holovchak, 2019, p. 322).

The importance of the knowledge results of elementary mathematical education is obvious, mathematical abilities and skills are based on mathematical knowledge, which is presented in the form of ideas, concepts, laws, dependencies, regularities. The logic of the formation of mathematical and other key competences unfolds from teaching students mathematical activities to the generalization of methods of action, mathematical facts, and the formulation of mathematical concepts. The educator/teacher should take into account the fact that the content part of the mathematics curriculum contains opportunities for the implementation of a problem-oriented approach. The content of mathematics education develops from simple (partial) to complex (general), and this creates opportunities to build teaching methods based on comparing the new with the previously learned, which is the basis for creating a problem situation; the result of its solution is the "discovery" and formulation by students of the guiding basis of action. The dynamics of the development of the content of mathematics education allows the educator/teacher to organize a generalization of mathematical methods of action from a narrow empirical (for individual partial cases) to a generalization of a higher order - theoretical (for general cases), under such conditions it is possible to integrate not only individual topics of the mathematics course, and other educational courses (Curriculum. Mathematics. 1st class. Explanatory note). In other words, intra-subject integration is carried out, which we consider as highlighting the relationships of related topics, unifying and structuring mathematical concepts, facts and methods of action, increasing the intensity of interaction between the elements of the system, orderly functioning of its components.

Such interdisciplinary integration can be implemented not only in the system of educational tasks for the mathematics lesson, but also through the use of mathematical knowledge, abilities and skills in the process of studying other educational fields. For example, in the process of studying the signs and properties of objects, comparison, generalization and classification in the subjects of problems in mathematics lessons, it is appropriate to use the knowledge of students about the flora and fauna of our planet, Ukraine, and their native land. When studying numbers as symbols for writing numbers, it is appropriate to apply an analogy with letters, which are also symbols for speech sounds. The study of quantities and their measurement, in particular mass, volume, etc., makes it possible to organize appropriate conversations, during which children's knowledge about the nature of Ukraine in general, and their native land in particular, is updated. When solving problems with the values "*price, quantity, value", "labor productivity, working time, total output"*, it is worth updating knowledge from the field of social sciences, etc.

CONCLUSIONS AND PROSPECTS OF FURTHER RESEARCH

Mathematical competence is one of the key competences of an education seeker. Nowadays, the mastery of mathematical competence is an indicator of the quality of education at the international level and the country's competitiveness in the field of fundamental sciences and the latest technologies. Therefore, it is necessary to form initial mathematical knowledge already in preschool age, and the process of forming mathematical competence should be carried out on the principles of partnership, continuity, perspective. Among the teaching methods, it is appropriate to use those that are based on the interaction of all participants in the educational process, contribute to the high-quality preparation of children for the transition from one level of education to another. The mathematics course in the continuing education system is based on the relevant content of the Basic component of preschool education and implements the continuity between preschool and primary school in the field of logical-mathematical development, as well as provides perspective in teaching mathematics in the 5th grade. Among the tasks of primary mathematical education is the formation of elementary mathematical ideas and concepts.

Mathematical education acquires new features at NUS. Computational, measuring, geometric, algebraic, information-graphic, logical, and communicative are the components of subject-matter mathematical competence of a student of primary education.

Further research is needed on the issue of training future primary school teachers for the development of the primary education student's cognitive interest in mathematics.

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