

Заключение

В работе были проведены расчеты геометрических параметров — коэффициента толерантности (t), уточнённого коэффициента (τ) и октаэдрического фактора (μ) — для широкого набора органических катионов и галогенидов олова (Sn^{2+} и Sn^{4+}). Установлено, что соединения на основе Sn^{2+} демонстрируют более благоприятные условия для формирования трехмерной перовскитной структуры по сравнению с Sn^{4+} , для которого, как правило, наблюдаются отклонения от идеальных геометрических параметров. Также было отмечено, что даже при нарушении эмпирических критериев возможна реализация стабильных структур с изолированными октаэдрами, как в случае $(\text{NH}_4)_2\text{SnCl}_6$. Полученные результаты подтверждают потенциал олова в качестве нетоксичного заменителя свинца в перовскитных солнечных элементах и могут служить основой для дальнейшего подбора стабильных и экологически безопасных композиций.

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METHODOLOGICAL ASPECTS OF TEACHING MATHEMATICS IN DEVELOPED EDUCATION SYSTEMS

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Abstract

Developmental education is a type of education based on the laws of personality development, the developmental impact of which is not an indirect effect, but a direct result. It considers the child as a person living today and creates the most favorable conditions for his development. It is necessary to constantly improve the ability of children to think independently, to educate themselves and to develop themselves.

Today, one of the criteria for a school graduate is a high level of education that provides a sufficient basis for continuous education. And in order for a school graduate to meet these requirements, students must lay the foundation for a holistic approach to studying the processes taking place in the world around them during the general education school course.

Keywords: mathematics teaching methodology, new technologies, game technologies, Internet resources.

The main goal of the modern education system is not only the acquisition of ready-made knowledge by the student, but also the development of his/her ability to think, search, research and work creatively. From this point of view, developmental teaching systems are one of the most effective directions in teaching mathematics. Developmental teaching technology turns the student into an active subject of the learning process, creating conditions for the disclosure of his/her intellectual and creative potential.

Modern teaching is impossible without the use of information and telecommunication technologies. This is especially relevant for subjects in the natural science cycle, since they form a single picture of the world.

For a teacher using information and communication technologies (ICT), they provide:

1. Time saving in the lesson;
2. Deep immersion in the material;
3. Increased motivation to learn;
4. An integrative approach to learning;
5. The ability to use audio, video and multimedia materials simultaneously.

Design technologies. It is impossible to imagine the modern educational space without the use of design technologies in the learning process. Project activities in the work of the teacher are divided into subject-educational activities and general educational projects, which are carried out outside the classroom.

Game technologies. Game technologies at school include any interaction between the teacher and students based on a specific plot. The main feature of game technology is that the didactic goal is transformed into a game task. The main advantage of game technologies is the application of subject knowledge in practice, which is carried out through a specially designed story.

However, the implementation of game technologies is difficult and ineffective unless they are properly implemented. When used correctly, they give high results not only in primary and middle grades, but also in higher grades. For example, in mathematics lessons, I do not use game technologies separately, I use them as an element of extended technology. For example, during the consolidation of the material, I offer students an imitation exercise, which allows them to consolidate their knowledge and skills in a creative environment.

Knowledge of information technologies is one of the main competencies of a mathematics teacher. Technical information tools are also constantly being improved. The use of information technologies in the classroom helps to improve the quality of education, develop students' interest in the subject.

The use of computers in mathematics lessons develops children's educational and intellectual skills: analysis, comparison, generalization; reading and organizational skills: working according to the algorithm, evaluating the results of their own work; reading and information: working with information sources.

The use of information technologies is changing the role of the teacher: he is no longer just a provider of information in the classroom, but an organizer and adviser of students' own cognitive activity.

The use of ICT in mathematics allows you to model various situations in the educational process, which leads the child to quickly adapt and develop basic competencies.

The use of Internet resources increases the level of lessons, motivates students, and improves the quality of education. Today, there are many sites dedicated to teaching methods. Therefore, the use of ICT in teaching mathematics increases efficiency, makes the learning process more visual and intensive, contributes to the development of students' general reading skills, improves the quality of education, and facilitates work in the classroom.

Problem identification. In the modern education system, there are a number of problems in teaching mathematics. First of all, it is noticeable that students' interest in the subject is decreasing. Many students perceive mathematics lessons as difficult, because the connection of topics with everyday life is not sufficiently demonstrated. As a result, mathematics for them remains a set of formulas and problems.

The second problem is the dominance of traditional teaching methods. In most cases, teachers spend a lot of time explaining ready-made rules and formulas, and little attention is paid to students' independent search and thinking. This inhibits students' creativity and independent thinking.

The third problem is the lack of mathematical language skills. Although many students are able to solve problems, they have difficulty proving and explaining them, and using mathematical terms appropriately.

Another important problem is non-personalized teaching. Since each student has different abilities and perception characteristics, teaching with a single model leaves some students behind and hinders the development of capable students.

In addition, the potential of information and communication technologies is currently not fully utilized. Although the use of visual programs and electronic resources helps students to visually understand problems, in practice it is still not enough.

The use of the developmental learning system to solve the above problems is proving to be effective. This method forms the student not as a ready-made learner, but as a self-seeker of knowledge. Involving students in research work, creative tasks, and problems based on real-life situations increases their interest. The effective use of information technologies and the implementation of interdisciplinary connections also allow us to combine mathematics with life.

The concept of developmental learning was first deeply studied in the works of L.S. Vygotsky and his students D.B. Elkonin and V.V. Davydov. This system is aimed at revealing the student's internal potential, developing theoretical thinking, and self-mastery of knowledge.

Features of developmental learning in mathematics

- Increasing student activity
- Tasks that lead to thinking
- Discovery of a new topic through research
- Instilling creativity

The main features of developmental learning:

1. Developmental learning is understood as a new, active, action-based learning method that replaces the explanatory-illustrative method.

2. Developmental learning takes into account and uses the laws of development depending on the level and capabilities of the student.

3. Pedagogical interaction anticipates, stimulates, directs and accelerates the development of the student's hereditary abilities.

4. Developmental learning is aimed at developing not only intelligence, but all areas of the personality.

5. The content of developmental education is based on the logic of theoretical thinking from a didactic point of view (the leading role is given to theoretically meaningful generalizations and deductions).

6. Developmental education is implemented as a focused learning activity in which the child consciously sets goals and objectives and creatively achieves them.

7. Developmental education is implemented through solving learning tasks.

The theory of developmental learning, developed under the supervision of D. B. Elkonin and V. V. Davydov, is based on a psychological study whose initial goal is to "establish what psychological neoplasms may arise during the period of primary school age," and they named the following neoplasms as such: educational activity and its subject, abstract theoretical thinking, voluntary behavior control (reflection). V. V. Davydov put forward a number of general provisions that should underlie the process of forming theoretical thinking in students: the acquisition of knowledge of a general and abstract nature precedes familiarization with more particular and specific knowledge; students should discover in the educational material a genetically original, essential, universal relationship and reproduce it in special objects, graphic and letter models that allow these properties to be studied in their pure form. The psychological basis of the methodological system of developmental learning is the theory of educational activity; educational activity "determines the emergence of basic psychological neoplasms... determines the general mental development of primary school students, the formation of their personality as a whole." V. V. Davydov proved that the developmental nature of educational activity is associated with the fact that its content is theoretical knowledge, ascending from the abstract to the concrete. The following functions of developmental learning are distinguished:

- it promotes the emergence of psychological neoplasms in schoolchildren within educational activity, the level of formation of which determines the success of their education in secondary school;
- it leads to significant changes in the educational activity itself;
- it forms general mental actions in the process of educational activity: analysis, synthesis, comparison, generalization, etc.;
- it forms and develops such personality traits as coding, forecasting, transfer.

At the teacher level:

1) identifying the level of theoretical knowledge and practical skills of teachers on the problem under study will allow to correctly build methodological work with teachers;

2) theoretical and technological training of the teacher (special courses, lectures, seminars, business games, self-education) implies mastering the issues of theory and methodological aspects. It is carried out through in-depth study by teachers of the content of academic subjects, analysis of their capabilities, mastering methodological knowledge, understanding their own experience and the practice of colleagues;

3) the construction by the teacher of the process of mastering the system of theoretical concepts through the use of a special typology of lessons allows the teacher to organize subject-practical activities so that the younger student, relying on the theory of the Russian language, consciously carries out spelling actions, thus forming the skill of literate writing;

4) reflection as knowledge and analysis by the teacher of the bases of his own actions and identification of the main directions of future activities is applied at all stages of monitoring, helps the teacher himself to improve and successfully (taking into account individual and age characteristics) teach the student.

Recently, the question has been asked more and more often: "Is it necessary to transform the content and methods of teaching in primary school if in the 5th-6th grades of basic school all the efforts of teachers in developing education of schoolchildren go to waste?" For what reasons does this happen? Most often, the answer is: "Basic school teachers do not undertake to work with new teaching and methodological kits, and what was learned in primary school is proposed to be studied in the 5th grade as new. Thus, the motivational component of educational activity is lost: interest in the content being studied decreases, there is no support for existing ideas and experience, there is no sense of progress in knowledge, there is no experience of a situation of success."

The most important characteristic of the system of educational tasks that are used in developing education are their educational and control functions. Within the framework of traditional education aimed at practicing knowledge, skills and abilities, priority in the system of educational tasks is given to the control function, which has a significant impact on the motivational sphere of students; cognitive motivation recedes into the background, which negatively affects the developmental function of learning.

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