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Teaching the Topic of Quadratic Equations Using Interactive Methods

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Abstract: Delivering specific theoretical knowledge to students in a short period, developing skills and competencies for certain activities, as well as monitoring students' activities and assessing the level of acquired knowledge, skills, and competencies, requires high pedagogical mastery from the teacher and a new approach to the educational process. This article presents some reflections and methodological recommendations for teaching the topic "Quadratic Equations and Their Roots" in the mathematics curriculum of general education schools.

Keywords: Quadratic equation, quadratic root, "Find Your Friend," "Mathematical Domino" game, brainstorming.

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1**. Introduction**: The main goal of pedagogical technologies in education is to place the student at the center of the teaching system, moving them away from merely memorizing educational material or repeatedly reciting it automatically, towards fostering independent and creative activities, thus transforming them into active participants in the lesson. Only then can students form their own perspectives on significant life achievements and issues, as well as the practical application of the topics being studied, and substantiate their viewpoints.

Pedagogical technology is inherently subjective. Regardless of the forms, methods, and tools used for its organization, it is essential that technologies: enhance the effectiveness of pedagogical activities; establish collaboration among teachers; ensure that students acquire deep knowledge of academic subjects; cultivate independent, free, and creative thinking skills in students; create necessary conditions for students to realize their potentials; and guarantee the predominance of democratic and humanitarian ideas in the educational process.

Currently, when discussing the application of new methods or innovations in the educational process, it refers to the implementation of interactive methods in the learning process.

Interactivity is the active engagement of two parties, meaning that the learning-cognitive process takes place as a dialogue (via computer communication) or through interactions between the student and

teacher. Interactivity refers to mutual activity, movement, and influence occurring in the communications between students and teachers. The main goal of an interactive method is to create the most favorable conditions for achieving active and free thinking in students.

Literature Review

[3] The article discusses the use of student-centered technologies in mathematics lessons.

[4] The article asserts that a historical approach to studying academic subjects can, to some extent, bring the educational process closer to scientific knowledge. It emphasizes that as the teacher introduces mathematical concepts while discussing their history and development (primarily through the contributions of our great ancestors), this can heighten students' interest in the subject and foster love for their homeland.

[5] The article analyzes the use of didactic games in the process of teaching mathematics. It notes that the organization of lessons is also linked to the teacher's creativity. The article discusses how students can reinforce the knowledge they gain in class and prepare to apply it in real life.

[6] The article highlights the particular importance of independent study in reinforcing students' knowledge in today's advanced era of science and technology. From this perspective, it emphasizes the significance of fostering self-confidence, independent learning, self-study, and self-improvement among students. It briefly discusses the aspects that need attention in organizing independent learning and the guidelines that should be provided to students.

[7] The article provides a brief overview of work-related word problems, their classifications, the stages of solving them, and the main principles encountered in such problems. It summarizes reflections on the confirmations to focus on when solving work-related arithmetic problems, providing examples of solutions to highlight how these confirmations and reflections can assist students and independent learners in mastering word problems without difficulties.

[8] The article presents several theoretical and logical foundations for developing students' creative thinking, emphasizing that solving exponential equations and inequalities without these foundations is impossible. It provides typical variants of exponential equations and inequalities, as well as guidance on tackling such problems.

[9] The article offers important information on what to focus on to avoid mistakes in gaining basic knowledge and generalizing solutions to inequalities when using advanced practices in the field of education. It includes solutions to examples related to rational, irrational, logarithmic, and trigonometric function inequalities through an algorithmic method.

[10-14] These articles are dedicated to analyzing the effectiveness of interactive technologies as a means of enhancing the quality of the educational process. It notes that the wide application of interactive methods in today's educational processes demands the humanization, democratization, and liberalization of education. The articles discuss how interactive methods aim to achieve high results in a short time without significant time and physical effort, requiring great skill and agility to teach theoretical knowledge, acquire skills and competencies in specific activities, form moral qualities, and effectively monitor and evaluate students' knowledge.

This paper presents some considerations and methodological guidelines for teaching the topic "Quadratic Equations and Their Roots" in the mathematics curriculum of general education schools.

2. Main Part. As we know from the school mathematics curriculum, the topic of "Quadratic Equations and Their Roots" follows the topics of "Absolute Value of a Number," "Equations and Inequalities Involving Absolute Values," and "Square Roots." Students will not encounter difficulties in mastering the topic of quadratic equations and their roots as long as they have a thorough understanding of absolute values, equations involving absolute values, and square roots. Before transitioning to this new topic, it is

beneficial to reinforce the previously covered material with the students using the "Brainstorming" method.

Questions:

1. What is the absolute value of a positive number?

2. What is the absolute value of a negative number?

3. Explain the geometric meaning of the absolute value of a number?

4. How are equations involving an unknown absolute value solved?

5. What are the roots of the equation $|x| = 7$?

6. Solve the equation $|x - 3| = 8$.

Students will take turns answering the questions listed above. During this process, the teacher can provide feedback and elaboration based on the correctness of the answers.

Using games like "Find Your Friend" and "Mathematical Domino" can also be effective for reinforcing the previously taught material. In the "Find Your Friend" game, students are given opportunities to recall the correct answers or come up with logical reasoning. This is particularly useful as comparing answers often reinforces knowledge. In the "Mathematical Domino" game, questions and answers are also provided; students solve examples and team up to match them correctly, ultimately spelling out the term "Quadratic Equation." This not only helps them review the previous topic but also familiarizes them with the name of the new topic.

Additionally, bringing historical insights from the contributions of our great ancestors to mathematics into the discussion can instill respect and admiration for them among students.

For example, the symbols > (greater than) and < (less than) were introduced in the work of the English scientist T. Harriot in 1631. The symbols ≤ (less than or equal to) and ≥ (greater than or equal to) were introduced by the French mathematician P. Bouguer in 1734. The notation for the absolute value of a number $|x|$ was discovered by the famous German mathematician K. Weierstrass in 1841.

Mathematical units found in Ancient Egypt and Babylon show that people were familiar with certain methods of calculation since ancient times. Around 4000 years ago, Babylonian scholars were able to develop multiplication, squaring, and even inverse multiplication tables, and they could estimate the square roots of natural numbers.

The scholars of Mirzo Ulughbeg's scientific school developed new methods of approximate calculations to create more accurate astronomical tables ("zij"). One of the leading scholars of Mirzo Ulugh Beg's academy, Giyosiddin Jamshid al-Kashi, accurately calculated 17 digits after the decimal point for the number π in his treatise on circles.

Once the teacher is confident that the students are ready to grasp the new topic, the new topic can be introduced.

New Topic Explanation:

A quadratic equation is referred to as an equation of the form $ax^2 + bx + c = 0$, where *a,b* and *c* are given numbers and *a* is unknown. The coefficients of a quadratic equation are usually referred to as follows: *a* is the leading coefficient, *b* is the second coefficient, and *c* is the constant term.

Theorem: The equation x²=d has two roots when d > 0, ikkita ildizga ega: x=√d and x=-√d

Example: If x²=36 then *x*=6 and *x*=−6. If the right side of the equation x²=d equals zero, then the equation x² = 0 has one root: x = 0.

If *d*<0, the equation x²= d has no real roots.

Example: The equation $x^2=-25$ has no real roots.

After students work independently on examples, we will begin the "Geomat" method. This method requires teamwork. Various images of continents with problems written on them will be distributed. This method enhances teamwork. The group that correctly solves the problems and identifies the names of the continents wins the game and earns a diamond.

Reinforcing the new topic: To reinforce the new topic, games such as "Who is Quick?," "Football," and "Fishing" were utilized.

"Who is quick?" Method. In this activity, the teacher attaches shapes of the sun and clouds to the board. Two groups are given printed materials that include rays of sunshine and raindrops. These printed materials contain problems and questions related to the topic. Each member of the group takes turns solving the problems and answering the questions, then they attach the rays of sunshine and raindrops to the board. The group that completes their task first and correctly wins a diamond. Throughout this activity, students who solve the problems correctly receive reward cards.

"Football" Game. In this game, the teacher brings a small ball to the lesson. The ball has numbers from 1 to 10 hidden on it. The teacher randomly throws the ball to the students. The student who catches the ball selects a number and receives a question. If the participant answers the question correctly, they receive a reward card, and the group that collects the most reward cards wins a diamond. The group that earns the diamond is considered the winner of this condition.

"Fishing" Game. In this activity, there is a poster with a river drawn in the center of the board, and on either side, there are sheets of paper depicting aquariums. Different types of fish are swimming in the river. Group members showcase their fishing skills. The rule of the game states that the fisherman who wants to catch fish must solve the problem or answer the question associated with the fish. The fisherperson who catches a fish receives a reward card. The group with the most reward cards wins a diamond, and that group is declared the winner of this game.

Before concluding the lesson, all participating students are evaluated and encouraged. The teacher summarizes the lesson and emphasizes the importance of acquiring more knowledge.

In conclusion, it can be stated that using the information provided in this article can effectively organize the review of the previously taught topic and the presentation of the new topic, "Quadratic Equations and Their Roots," in the mathematics curriculum for school students. Overall, various interactive methods can be employed to make the lesson more effective, productive, and engaging [3-14].

Foydalanilgan adabiyotlar

1. Educating teachers of science, mathematics, and technology : new practices for the new millennium / Committee on Science and Mathematics. Copyright 2001 by the National Academy of Sciences. Constitution Avenue, N.W. Washington

2. Djurayev R.X va boshqalar. Pedagogik atamalar lug'ati. –T.: "Fan nashriyoti", 2008 yil. – 94-bet

3. A. Sh. Rashidov Matematika darslarida ta'limning shaxsga yo 'naltirilgan texnologiyasi. Центр научных публикаций. 2021 yil. 3-son. 68-72 bet

4. A.Sh. Rashidov Ijtimoiy-gumanitar ta'lim yo'nalishi talabalari uchun matematik fanlar bo'yicha amaliy mashg'ulotlarni o'tkazish. Science and Education №9. C 283-291

5. О.О.Халлоқова. А.Рашидов Пороговое собственное значение модели Фридрихса. Молодой ученый, 2015 №15. С. 1-3

6. A. Sh. Rashidov Interaktivnyye metody pri izuchenii temy "Opredelennyy integrali yego prilozheniya". Nauchnyye issledovaniya. № 34:3. C 21-24

7. A. Sh. Rashidov Yoshlar intellektual kamolotida ijodiy tafakkur va kreativlikning o'rni. Pedagogik

mahorat 2021 yil №7. 114-116 bet.

8. A.Sh. Rashidov.Matematika fanlaridan talaba yoshlar ijodiy tafakkurini rivojlantirish. Fan va jamiyat №3. C 45-46

9. A.Sh. Rashidov замонавий таълим ва инновацион технологиялар соҳасидаги илғор тажрибалар. Центр научных публикаций. 2021 yil. 3-son. 68-72 bet 8-14

10. A.Sh.Rashidov. M.F.Faxridinova. O'quvchilarning bilimini baholashda xalqaro baholash dasturlari. "Fizika, matematika va informatsion texnologiyalarning innovatsion rivojlanishdagi o'rni" mavzusidagi Respublika ilmiy-nazariy anjuman. Buxoro. 222-227 bet.

11. A.Sh.Rashidov. S.A.Mehmonova. Matematik analiz fanini o`qitishda interfaol metodlar: "KEYS-STADI" metodi "Fizika, matematika va informatsion texnologiyalarning innovatsion rivojlanishdagi o'rni" mavzusidagi Respublika ilmiy-nazariy anjuman. Buxoro. 165-169 bet.

12. Х.Р.Расулов, А.Ш.Рашидов. Организация практического занятия на основе инновационных технологий на уроках математики. Наука, техника и образование 2020. № 8 (72). c.29-32

13. А.Ш.Рашидов. Масофавий таълим моделлари ва уларни такомиллаштириш истиқболларини эксперт баҳолаш усули орқали аниқлаш // Педагогик маҳорат– Бухоро, 2020. - №2. – 163-171 б.

14. А.Ш.Рашидов. Замонавий таълим ва инновацион технологиялар соҳасидаги илғор тажрибалар // Илм сарчашмалари. – Урганч, 2020 - №10. – 83-86 б.