Effectiveness Of Interactive Methods In Teaching Several Methods Of Factoring Polynomials

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ABSTRACT

This article analyzes the importance of using interactive methods in teaching the topic "Applying various methods of factoring polynomials" in mathematics lessons at general education schools. Recommendations are given on using interactive methods such as "State the rule correctly" and "Who is quick and skilled?" during the lesson to increase students' active engagement, ensure thorough understanding of the topic, and promote independent thinking. The application of various methods for factoring polynomials based on practical examples is highlighted.

Keywords:	polynomial, interactive method, short multiplication formula, grouping method, mathematical game, lesson effectiveness.

Introduction

In the modern educational process, teachers are required to organize lessons effectively, engage students actively, and achieve high results in a short period of time. Especially in mathematics, alongside theoretical knowledge, it is important to develop practical skills and competencies [1-2].

The implementation of interactive methods in the educational process enhances student participation in the lesson and encourages independent thinking on the topic. These methods help students develop communication skills, the ability to explain their understanding, justify their opinions, and solve problems.

This article presents methodological recommendations and practical approaches for using interactive methods in teaching the topic "Factoring Polynomials" in mathematics.

Main Part. The topic "Factoring Polynomials" is one of the important sections of the algebra course and is based on topics such as monomials, polynomials, Short multiplication formulas. Mastering this topic requires students to actively apply previously learned formulas and adapt various methods [3].

To organize the lesson effectively and engage students' attention in the topic, it is advisable to use the following interactive methods:

1. The game "State the rule correctly"

Through this game, students recall the previously studied topics:

1. An expression … is called a monomial.
2. … is called the degree of a monomial.
3. … is called a polynomial.
4. … are called like terms.
5. … are called polynomials written in standard form.

Students take turns answering the five rules listed above. During this process, the teacher can provide explanations and additions based on whether the answers are correct or incorrect [4-7].

2. The game "Who is quick and skillful?"

$(a+b)^2 =$	$(a+b)^3 =$	$a^3+b^3 =$	$a^2-b^2 =$
$(a-b)^2 =$	$(a-b)^3 =$	$a^3-b^3 =$	$a^2+b^2 =$

Students are given polynomials, and they use short multiplication formulas to factor them and find the correct matching expression, which they then stick onto a smiley face. This game energizes the lesson and reinforces knowledge through friendly competition.

3. Using historical information

During the lesson, presenting students with formulas developed by ancient scholars and information related to short multiplication formulas from the works of prominent figures such as Al-Karaji and Abu Kamil can increase their interest in the subject and encourage respect for national values [8].

4. Practical methods

In factoring a polynomial, sometimes more than one method can be applied. Let's look at this through some examples:

1) $a^3 - a$ factor the polynomial:

$a^3 - a = a(a^2 - 1) = a(a-1)(a+1).$

Here, two methods are used: factoring out the greatest common factor and applying the difference of squares formula.

2) $(a^2 + 1)^2 - 4a^2$ factor the polynomial:

$(a^2 + 1)^2 - 4a^2$

$$= \big((a^2 + 1) - 2a\big)\big((a^2 + 1) + 2a\big) =$$
$$= (a^2 + 1 - 2a)(a^2 + 1 + 2a)$$
$$= (a^2 - 2a + 1)(a^2 + 2a + 1)$$
$$= (a-1)^2(a+1)^2.$$

Since the terms do not have a common factor here, the difference of squares formula is applied first, followed by the sum and difference of cubes formulas.

3) $4x^2 - y^2 + 4x + 2y = (4x^2 - y^2) + (4x + 2y) = (2x - y)(2x + y) + 2(2x + y) = (2x + y)(2x - y + 2).$

Since the monomials do not have a common factor and no standard formula can be directly applied, the grouping method is used first, followed by the difference of squares formula [9].

The examples reviewed show that it is useful to follow the following sequence when solving polynomial factoring problems:

1. Factoring out the greatest common factor (if there is one);

2. Trying to factor the polynomial using short multiplication formulas;

3. Trying to apply the grouping method if the previous methods do not yield the desired result.

For example, prove the equation:

1. $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
2. $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

We expand the parentheses on the right side of equation (1):

$$(a + b)(a^2 - ab + b^2) = a^3 - a^2b + ab^2 +$$
$$a^2b - ab^2 + b^3 = a^3 + b^3.$$

The right side of the equation has been shown to be equal to the left side, thus proving equation (1).

Similarly, the correctness of equation (2) is proven.

Equations (1) and (2) are called the sum and difference of cubes, respectively. These formulas are also used in factoring polynomials.

For example:

1. $27 + b^3 = (3 + b)(9 - 3b + b^2)$;
2. $x^4 - 8xy^3 = x(x^3 - 8y^3) = x(x - 2y)(x^2 + 2xy + 4y^2)$.

Before concluding the lesson, the following examples are given to assess students' understanding of the topic.

Factor into factors:

1. $ax + ay - bx - x - by - y$;

2. $xyz + 4xz + 3xy + 12x$;

3. $a^5 - a^4b + a^3b^2 - a^2b^3 + ab^4 - b^5$;

4. $x^2 + y^2 + z^2 + 2xy + 2xz + 2yz$;

5. $3abc + ab(a + b) + bc(b + c) + ac(a + c) + ab + bc + ac$;

Conclusion

The topic "Factoring Polynomials" is an important theoretical and practical section of algebra. Using interactive methods in teaching this topic:

- increases students' interest in the lesson,
- develops their independent thinking,
- ensures effectiveness in reinforcing knowledge.

Additionally, enriching the lesson with historical information and prioritizing practical tasks helps students grasp the topic more deeply. When the teacher is well-prepared for the lesson, students' attitude towards mathematics becomes more positive [5-6].

By using the information presented in this article, the teaching process of the topic "Applying Various Methods of Factoring Polynomials" in the school mathematics curriculum can be effectively organized in terms of reviewing previous material, introducing new content, and reinforcing acquired knowledge. Overall, to make the lesson more effective, result-oriented, and engaging, various interactive teaching methods can be applied [4].

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