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## **ANALYSIS OF ERRORS - A FACTOR IN THE FORMATION OF CREATIVE SKILLS**

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### **Abstract**

This article teaches that errors are not only an obstacle to learning, but also a way of developing the student and creative thinking. It describes the causes, factors, analysis of errors, ways to eliminate errors, principles, strategies, importance and practical recommendations.

**Keywords:** Errors, difficulty, factor, analysis, learning, research, self-awareness, self-assessment, creative thinking, success.

### **Introduction**

There are various methods for forming students' creative thinking skills. One of these methods is the analysis of the mistakes made by students. By analyzing their mistakes, students search, re-read, ask adults or peers, teachers for information about what they do not know. As a result, they develop self-analysis, self-awareness, self-assessment, self-confidence, determination, critical, analytical and creative thinking skills.

### **Research object and methods used:**

The stages of observation of primary school students and primary school students, analysis of errors and analysis of errors through pedagogical diagnostic work were studied.

### **Results and their analysis:**

The development of creative thinking in primary school students is increasingly recognized as an important component of modern education. Creative thinking not only develops the ability to solve problems, but also develops cognitive flexibility, speech culture and emotional intelligence. In this regard, several scientists in our republic have conducted scientific research on creativity, B.R. Adizov, G.N. Ibragimova, Sh.T. Boltayeva

M.Abdullaeva T.Aliboyev, Sh.Akhmedov, B. Rakhimov, Q.Tolipov, Sh.S.Sharipov, Ya.Haydarov, A.Shermuratov's scientific research sheds light on the specific aspects of developing creative abilities in students in the formation of professional and innovative training of future specialists, factors affecting creative qualities, social activity of the individual, forms and conditions for the formation of critical, creative thinking, didactic support, and the content of pedagogical creativity.

Among the scientists of the Commonwealth of Independent States, L.M.Azaryans, D.B.Bogoyavlenskaya, L.I.Bozhovich, V.N. Druzhinin, D.B.Elkonin, D.I. Feldstein, Y.A.

Flerina, P.M. Granovszhaya, V.N. Kozlenko, A.N. Leontyev, N.S. Leytes, A.M. Matyushkin, N.M. Sokolnikova, N.P. Sakulina, V.I. Slobodchikov, Y.L. Soldatova, L.S. Vygotsky, L.B. Yermolayeva and others have conducted scientific research on the problem of creativity, thinking, intelligence, and creative thinking in a person.

Among foreign scientists, such pedagogues, psychologists, and philosophers as J. Guilford, H. Gardner, J. Renzulli, Ken Robinson, and P. Torrens have conducted scientific research on creativity.

There are various definitions and approaches to creativity. K. Rogers defines creativity as innovation, J. Guilford believes that creativity and creative potential are a set of abilities and factors that influence creative thinking, according to Ken Robinson, “creativity is a set of original ideas that have their own value” (Azzam, 2009), and H. Gardner explains the concept in his research as follows: “creativity is a practical action carried out by an individual, which must embody certain innovations and have a certain practical value”, E. Torrens considers creativity as the problem of insufficient knowledge in finding solutions, the process of identification and formation of assumptions in the face of difficulties, and finding solutions. (E. Torrens, 1996)

In our study, a specific direction was chosen in the formation of students' creative thinking skills. In schools, students should be encouraged to develop their creativity The first step in developing a child's ability to learn is to identify the factors that influence it.[4] One such factor is the errors that students make.

In traditional education, mistakes have been viewed as obstacles to academic success. Mistakes are an inevitable part of life. Instead of seeing mistakes as a negative thing, we should accept them as a factor in development. Making mistakes is an integral part of the learning process. Mistakes help children learn about the world and themselves, reveal their abilities, and force them to be creative. Mistakes give you unique information about the student, that is, they indicate where the student has not mastered the subject well, has not understood it, or has a problem with it. Mistakes determine the intellectual level of the student. An error is the difficulty of what the student needs to learn.

American mathematician Raffaella Borasi said: “... mistakes cannot be negative phenomena, they can be avoided, because sometimes a mistake can even provide an opportunity for valuable experiments and discoveries, which could have been missed.” [1]

The famous American inventor and innovator Henry Ford (1863-1947) said: “A mistake gives you the opportunity to start over, only smarter.”

“All important ideas in science,” A. Einstein noted, “are born on the basis of dramatic contradictions that occur between reality and our attempts to understand it.” [11]

According to the German philosopher F. Hegel (1771-1831), “contradiction is the source of spontaneous movement.” Conflict is understood as the interaction of opposing tendencies and aspects of things, events, and processes, which requires, implies, and at the same time, negates.

“Some say that mistakes are of no importance, but they are of great importance, they show you things you didn’t know...they push you to be smarter, stronger, better,” says American entrepreneur Robert Kiyosaki.[4]

Swiss psychologist K. G. Jung said, “Man needs difficulty.”

American enlightener Benjamin Franklin said, “Where there is no difficulty, there is no result.”

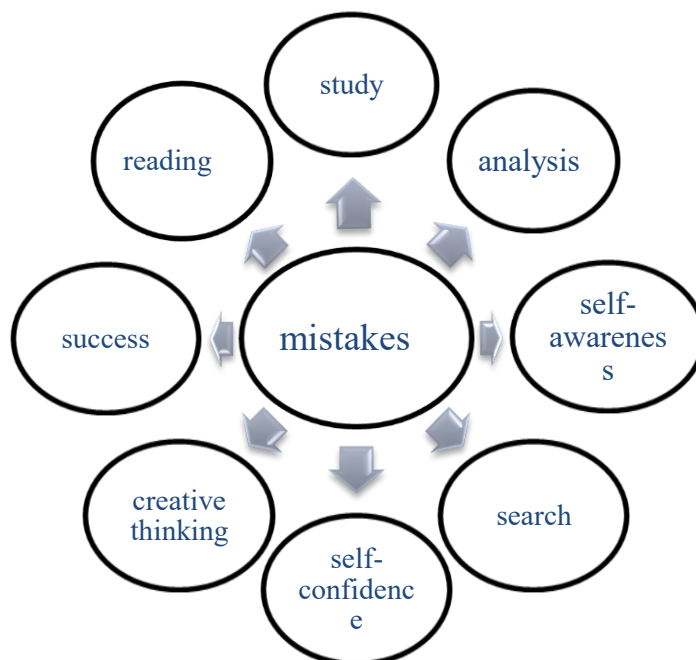
It follows that if we help our students understand their mistakes and explain ways to overcome them and help them overcome their mistakes, then later the child will have the ability to understand and overcome mistakes, and will not need your help. [1]

Mistakes are an opportunity to grow, learn, analyze, think and increase resilience. Mistakes are new solutions, a process of becoming stronger, creative thinking.

Analyzing mistakes is an approach that invites students to deeply engage with their own mistakes and the mistakes of others, to understand them not as failures, but as opportunities for growth and learning. [6]

American entrepreneur, engineer, and statesman Elon Musk once said: “Mistakes make a person stronger.”

American inventor Thomas Edison said: “I didn’t fail: I just found 10,000 ways that didn’t work.” These words of the scientist express the basic philosophy of error analysis. Mistakes are not an obstacle to learning, but rather the beginning of learning, that is, mistakes pave the way for learning, enrich the student’s knowledge, teach them to find solutions, solve problems, and think creatively and critically.



One of the distinctive features of primary school students is their high desire to learn, curiosity. In the process of learning, they also make many mistakes. This is natural, of course. Their psychological and physiological characteristics require this. Mistakes are



a sign that the student has not fully studied or understood a certain topic, carelessness, lack of interest in science, lack of attention, and poor knowledge of the rules.

It is advisable to conduct pedagogical diagnostic work when analyzing the mistakes made by students. Pedagogical diagnostics is aimed at studying the student's learning, learning difficulties, and social and family factors that affect this.[10]

The mistakes made by students in the learning process depend on internal and external factors, and pedagogical diagnostic work carried out by experienced teachers closely helps in analyzing mistakes and eliminating them.

<b>Factors that lead a student to make mistakes</b>	
<b>Internal</b>	<b>External</b>
Fear, anxiety	Lack of knowledge
Instability of attention	Ignorance of rules
Low intelligence	Disinterest in science
Low memory	Pen
Fatigue	Low speed (reads and writes slowly)
Low self-esteem, lack of self-confidence	High demands

When a student makes a mistake, it is important to determine the cause of the mistake before punishing or giving a low grade. This will make it easier to find a solution to the problem and help the child understand the real reasons for the mistake.

For example, when a child's fear disappears, he feels calmer, his attention is stabilized, his thinking is positively affected, and it is easier to learn.

Generally, students who have low self-esteem tend to make more mistakes. Low self-esteem makes them more stressed and more prone to depression. [3]

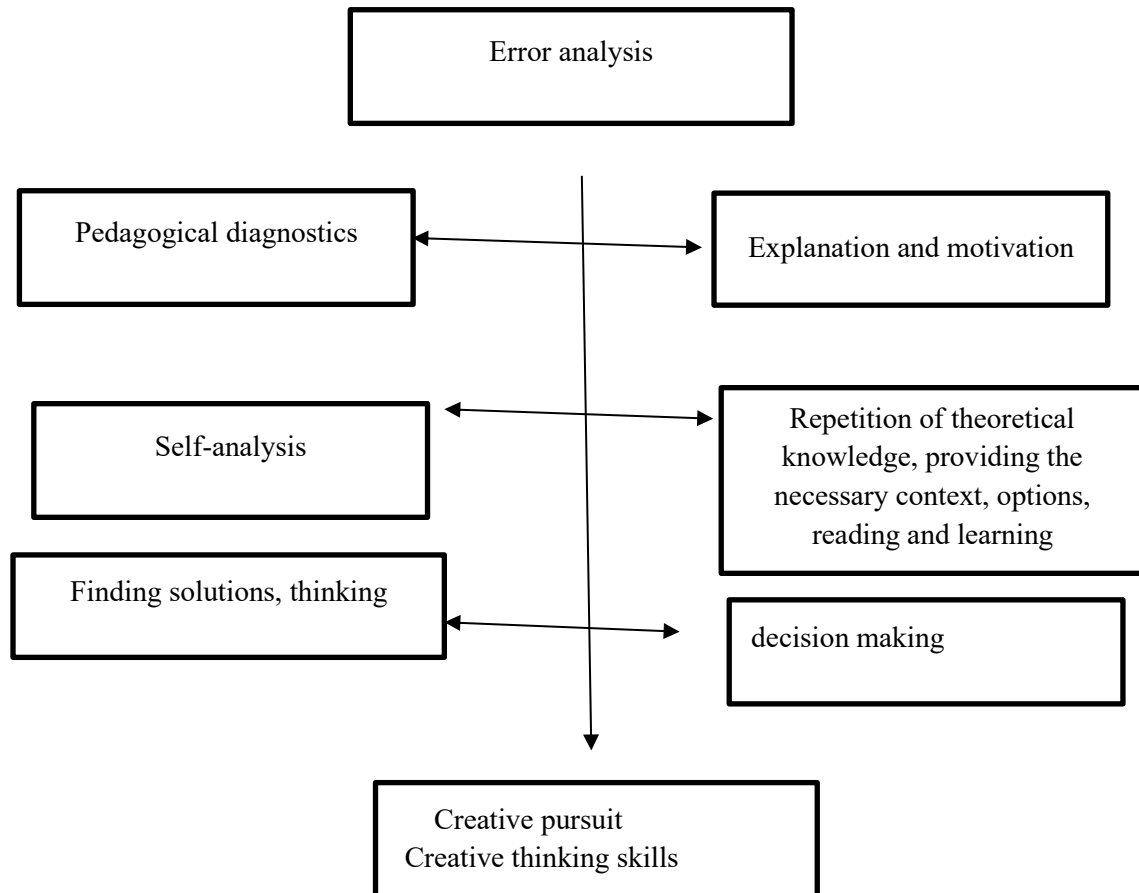
Other possible causes of student mistakes are poor attention and inattention (Stein, Silbert, & Carnine, 1997).

Therefore, the mistakes made by elementary school students are not only due to low knowledge, but also to social and psychological factors.

Error analysis is based on J. Piaget's cognitive theory. Cognitive theory attempts to explain human behavior by studying the mental processes involved in learning and trying to understand it. According to J. Piaget, cognitive theory includes three components:

- 1) The brain uses schemata (mental structures) as building blocks to acquire knowledge;
- 2) The brain uses adaptive processes such as assimilation and accommodation to move between stages.
- 3) Children experience universal developmental stages in relation to cognition.[18]

Students use their cognitive abilities in the process of analyzing their errors; they review their errors, repeat theoretical information, compare, analyze and synthesize, work on their errors, find solutions, and seek creative solutions.

**Error analysis consists of the following stages:****1. Pedagogical diagnostics**

Before analyzing errors, it is advisable to determine the reason why the child made a mistake, that is, to conduct pedagogical diagnostics. The level of knowledge, psychological state, level of development of students, shortcomings in the learning process and internal and external factors contributing to making mistakes are analyzed, and the student is given a pedagogical diagnosis.

**2. Explanation stage and motivation (Creating an environment for analyzing errors)**

Mistakes are important for learning. It is natural for children to make mistakes, everyone makes mistakes, adults also make mistakes, you should not be upset about it. You should not be afraid of mistakes, you should accept them as natural.

It is important to identify your own shortcomings, analyze yourself and develop a plan to eliminate mistakes, create a situation in the classroom to eliminate mistakes.

It is very important to motivate the child. Because motivation increases the child's self-confidence, arouses their interests, and develops their abilities. Motivation takes the child out of despair and is an incentive to overcome difficulties. It is important to support them with motivational words such as "I am very happy that you made a

mistake", "You can correct your mistakes", "You are strong", "You can do it", "I believe in you", "You will definitely succeed". When a child has a strong inner state, a strong spirit, a strong will, and a strong will, they can overcome any difficulties and learn from their mistakes.

### **3. The stage of self-analysis**

Enable the child to analyze himself. Self-analysis is a catalyst for self-improvement and self-love.[11] In self-analysis, students analyze their strengths and weaknesses and ask themselves the following questions:

When did the mistake happen?

Where did I make a mistake?

Why did I make a mistake here?

Why did I make a mistake?

In this way, they begin to find the mistake and look for solutions, search, think creatively, and reflect.

### **4. The stage of repeating theoretical knowledge and presenting options (explanation)**

The child is recommended to read the necessary books, make effective use of useful contexts, and several solutions to eliminate errors are offered, the child is given the opportunity to choose. Students access the content they need, read and learn. They learn what they do not know by asking their teacher. The student analyzes, compares, contrasts, and searches for solutions.

### **5. Finding solutions and thinking stage**

The child is recommended to read the necessary books, use useful contexts effectively, and several solutions to eliminate errors are offered, and the child is given the opportunity to choose. Students access the content they need, read and learn. They learn what they do not know by asking their teacher. The student analyzes, compares, contrasts, and searches for solutions.

### **6. Decision-making.**

Allowing the child to make the decision himself. This increases his independence, self-confidence, and broadens his worldview.

As American professor Brent Rosso said, "Show me the target, but don't tell me how to shoot." [15] It is important to form the skills of analyzing errors in children, but it is necessary to allow them to make decisions themselves. Then they will develop creativity, independence, and self-confidence.



## 7.Result

As a result, the student realizes his mistakes, works on himself, enriches his knowledge, strengthens his sense of self-confidence, and develops life skills such as overcoming difficulties, finding solutions, and creative thinking.

### Analyzing mistakes has the following advantages:

Advantages of error analysis:	
<b>Error analysis</b>	encourages students to learn more than just basic concepts
	Eliminating mistakes prevents future mistakes
	This process teaches students to make decisions and analyze results
	This approach prepares students to solve problems and overcome difficulties
	Growth, self-awareness, self-improvement, personal development is a process
	This process increases students' metacognitive skills, increases their motivation to learn
	This thinking suggests creative solutions and encourages creative thinking outside the box

Error analysis is based on the following principles:

#### 1. The principle of an individual approach to students when analyzing errors;

Each student in the class makes different mistakes, which requires an individual approach to each student. An individual approach to the student leads to an increase in educational effectiveness. Based on an individual approach, each student develops the ability to analyze errors and work on himself, strengthens the teacher-student relationship.

#### 2. The principle of a motivational approach to students when analyzing errors;

Students who receive low marks for homework or tests have low morale. In such cases, students need psychological help, support, and motivation. Students are encouraged to make mistakes, which is natural for them, and can be eliminated, with motivating words that raise the child's morale. Motivation raises the child's mood and increases his self-confidence and independence.

#### 3. The principle of an interdisciplinary integrated approach to error analysis;

Students make mistakes in all subjects. Integration between subjects is important in analyzing errors. For example, they can analyze their mistakes in their native language in reading lessons, and their mistakes in mathematics lessons in homeroom lessons.

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**4. The principle of taking into account the individual psychological age characteristics of students when analyzing errors;**

Psychological characteristics of primary school students: they love praise, sweet words, pampering, encouragement, gifts, motivation, It is in these ways that they can develop the skill of analyzing errors. And they do not like criticism at all.

**5. The principle of cause and effect in analyzing errors.**

The analysis of errors is not due to the incomplete mastery of the subject, but because there is a problem in the child's family life, according to Maslow's theory,[9] (physiological needs are not satisfied), or the child is hungry, or his shoes are torn, or he does not like it. Therefore, it is important to study the cause and effect of errors.

**6. The principle of creating an environment for analyzing errors in the classroom or in the team:**

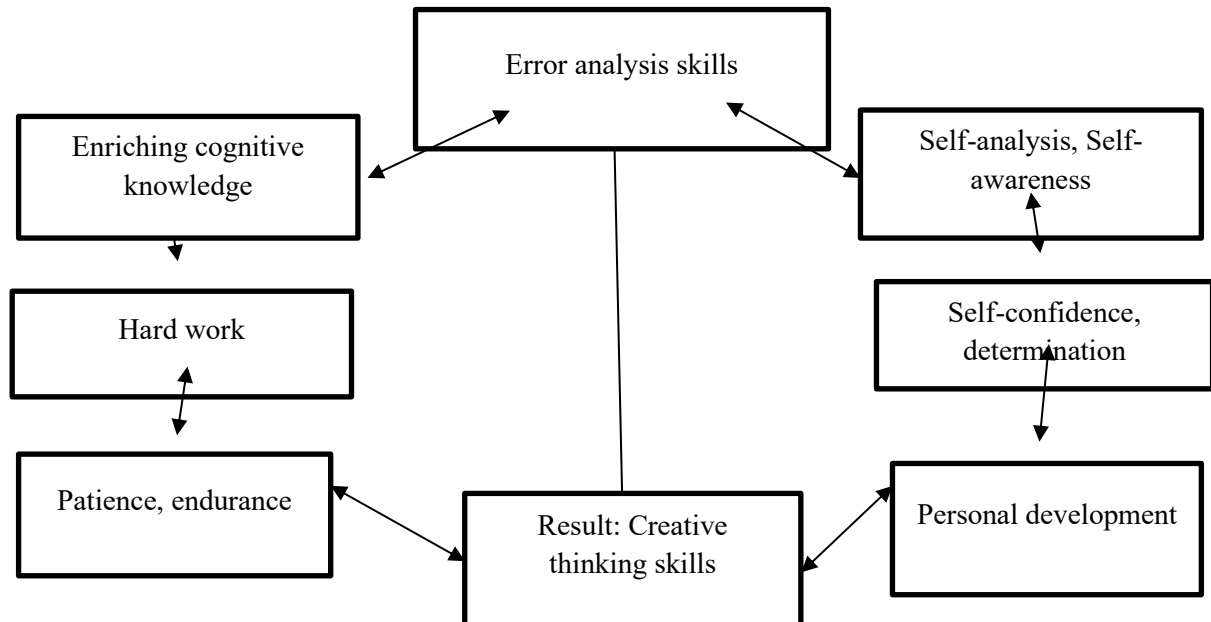
Usually, students are ashamed of the mistakes they make, so they try to hide them. Changing students' attitudes towards mistakes in classes, creating an environment for analyzing errors in the classroom is one of the important factors: in this case, students are not afraid of their mistakes, they analyze themselves, evaluate themselves, help each other, as a result of teaching they actively participate in education, their thinking and worldview expand, their strengths develop, and skills to overcome difficulties are formed.

From the above points, it is clear that by analyzing their mistakes, a student learns to find his own shortcomings and fill this gap himself, to analyze himself. As a result, cognitive abilities develop, their worldview expands, they become analytical and creative, critical thinking skills are formed.

If students have such skills, this thing will remain in their subconscious, and when it remains in their subconscious, it will become a habit. A habit is an automatically repeated action, the execution of which is initiated by some signal (habit trigger) and is performed and completed with a feeling of pleasure. [8]

If a child makes a mistake again, he will not be discouraged, because in his mind there is a mechanism for analyzing mistakes. On the contrary, he will learn from his mistakes and draw appropriate conclusions, will be able to self-analyze, understand himself, learn to control himself and make the necessary decisions in non-standard situations, and as a result, he will develop the ability to think creatively.



**The importance of analyzing mistakes:**

Mistakes are not an obstacle, but an opportunity to become better. For children, mistakes are a learning and development process. It is important to teach children not to be afraid of mistakes, but to use them as valuable experiences and lessons. Support, discussion, and analysis of failures are key components of forming a positive attitude towards the learning process and personal development. We believe that analyzing mistakes develops students' intellectual sphere, forms the skills of solving theoretical and practical problems, and creative thinking.

As the great Italian educator Montessori (1870-1952) said: "Every child has the right to make mistakes. Let them correct them." [17]

While analyzing mistakes, the child also analyzes himself. "Where did I go wrong?", "Where am I wrong?", "How can I correct these mistakes?" - looks for his shortcomings and tries to correct them, faces certain difficulties, works on himself, self-educates, tries to self-evaluate. As a result, we came to the conclusion that the student's cognitive knowledge increases, creative thinking skills develop. Because creativity allows you to make mistakes. Creativity follows the trial and error method.

American entrepreneur, engineer, inventor Elon Musk expressed the idea: "Mistakes make a person stronger."

It is not good to fight, scold, humiliate children who make mistakes in class, in front of their friends, or to point out their shortcomings to their parents. Because this affects their psyche and emotions. Children do not like criticism. Children of this age have not yet developed the ability to analyze mistakes. The role of Montessori schools in this regard is invaluable.

True education is to help, not to condemn. "Real education does not tire the child, but gives him energy," said Italian educator Maria Montessori [17]

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The golden rules of the famous Montessori school:

- It is important for the child to be active. In his growth, adults should be in second place, not leaders, but helpers;
- Free movement and the child's choice;
- Older children should teach their younger ones what they know. This habit forms the ability to care for others;
- The child should make his own decisions;
- Classes should be held in a specially prepared environment;
- The duty of adults is to be able to interest the child. Then the child himself will develop;
- In order for the child to fully reveal his inner talent, he just needs to be given the opportunity to think, act and feel freely;
- It is enough not to deprive the child of nature, but to make friends; Do not criticize him, do not suffocate him with any prohibitions or restrictions;
- Every child has the right to make mistakes. Let him correct them himself. Students should be given the freedom to experiment and make mistakes.

Is the child given the right to make mistakes in our education? What if he is not given it?

The child is afraid of making mistakes. He gets stressed. He hides his mistakes. He withdraws from the teacher or the team. He is ashamed of his mistakes. He does not want to learn.

What if he is given the right to make mistakes. In this, first of all, the student will have freedom and courage. A window will open in his thinking and he can freely express his thoughts. Freedom is the process of recognizing his mistakes, analyzing them, finding solutions, thinking creatively and learning. The child can freely analyze his mistakes with his teacher and peers, ask for advice, and exchange ideas. There is an opportunity to learn. So, we need to allow children to make mistakes.

We know that neuropsychology and neuropedagogy are currently developing, in 2019, American scientists Robert C Wilson, Anitai Shenhai, Mark Straccia, Jonathan D Cohen, in their article "The Eighty Five Percent Rule for optimal learning"[14], that is, "The optimal 85% benefit of learning", scientifically substantiate the theory that the most correct way to learn is to be 85% correct and 15% wrong. That is, they scientifically substantiated the neurobiological reasons for learning, we can never learn if we do not make mistakes. The amount of our mistakes should not exceed 15%. This article has a large scientific basis, a lot of experiments were conducted, calculated with integral and differential calculus, and caused a big stir. The article states that if the information being studied is 85% and the errors are 15-30%, learning will be quick and easy, if the errors are 0, there will be no learning at all, and if the percentage of errors exceeds 50%, the brain will not accept learning. It follows that when teaching students to analyze their errors, taking into account their individual age characteristics, the level of complexity of the subject being studied should not exceed 15% to 30%. That is, the child It is necessary to make him learn and analyze his mistakes not all at once, but gradually, little by little,

so that he is motivated to learn. If we increase the load on the child, the child's brain will not accept this and he will not want to learn at all.

It follows that the teacher must monitor the mistakes made by his students and develop strategies for correcting them. The percentage of errors must be taken into account. When analyzing errors, it is necessary to gradually form the student's ability to analyze his mistakes, taking into account the pedagogical and psychological characteristics of the student, without increasing the number of errors. If the number (percentage) of errors increases, the child will not want to learn, that is, the brain will not accept such a norm.

### Conclusion

So, in the process of forming the skill of analyzing their mistakes in students, according to Robert C Wilson's theory, students should not all at once in one day, but gradually, at a rate that their brain can handle, without scaring the child, creating an environment for analyzing mistakes, motivating the child, analyzing mistakes, repeating theoretical information, and looking for solutions. While analyzing mistakes, the student develops the skill of creative thinking in the process of finding solutions, not as a failure, but as an opportunity to learn. By solving problems and finding different solutions, he thinks creatively, critically, analytically, reflects, and puts forward new ideas. At the same time, by having creative thinking, students have the opportunity to understand and master the given concepts holistically. As a result, their ability to think independently, make decisions, and think creatively is formed. Through creative thinking, students can learn the processes of problem analysis and come up with new ideas for solving problems. [2] Analysis of errors - this develops the student's ability to turn failures into opportunities, teaches resilience, and overcome difficulties.

Developing creative skills in elementary school students through analysis of their mistakes ensures that they will become individuals who can achieve academic success in the future, have life skills, and meet global requirements.

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