

РЕЗЮМЕ. Статья посвящена изучению роли творческих элементов в повышении качества дистанционного обучения студентов технического профиля. В рамках педагогического эксперимента, проведённого на базе Северо-Кавказского горно-металлургического института (ГТУ) в 2020-2024 гг., была апробирована олимпиадная учебная среда и использована мотивационная ARCS-модель Джона Келлера. Эксперимент охватил 800 студентов 1-2 курсов. Результаты показали статистически значимый рост мотивации, гибкости и оригинальности мышления у студентов экспериментальной группы. Сделан вывод о целесообразности внедрения творчески ориентированных методов в дистанционные курсы инженерного образования.

SUMMARY. The article examines the role of creative elements in enhancing the quality of distance learning for technical university students. A pedagogical experiment was conducted at the North Caucasus Mining and Metallurgical Institute (GTU) during 2020–2024, involving 800 first- and second-year students. The ARCS motivation model by John Keller and an educational olympiad environment were implemented. The results demonstrated a statistically significant increase in students' motivation, cognitive flexibility and originality in the experimental groups. The findings confirm the effectiveness of integrating creative learning strategies into distance engineering education.

**MATEMATIKA TA'LIMIDA UZVIYLIKNI TA'MINLASHDA
O'QUVCHILARNING INTELLEKTUAL KO'NIKMALARINI
SHAKLLANTIRISHNING AHAMIYATI**

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Tayanch so'zlar: aqliy rivojlanish, taqqoslash, analiz, sintez.

Ключевые слова: умственное развитие, сравнение, анализ, синтез.

Key words: mental development, comparison, analysis, synthesis.

Kirish. Zamonaviy ta'lim tizimida matematika fanini o'qitishda uzviylikni ta'minlash dolzarb masalalardan biri. Ta'lim jarayonining asosiy maqsadi nafaqat bilimlar yig'indisini berish, balki o'quvchilarni mustaqil fikrlashga, o'z-o'zini rivojlantirishga va yangi bilimlarni mustaqil egallashga o'rgatishdan iborat. Shu nuqtayi nazardan, matematika ta'limida o'quvchilarning intellektual ko'nikmalarini shakllantirish muhim ahamiyat kasb etadi. Intellektual rivojlanish – bu o'quvchilarning aqliy faoliyatini, tahlil, sintez, taqqoslash, umumlashtirish kabi fikrlash operatsiyalarini samarali bajarish qobiliyatidir.

Asosiy qism. Ta'lim bosqichlari orasida, xususan, matematika ta'limida uzviylikni ta'minlash masalasi o'quvchilarda intellektual ko'nikmalarni rivojlantirish muammosi bilan bevosita bog'liq ekanligi o'z-o'zidan ravshan. Zamonaviy ta'limning maqsadi shundan iboratki, o'quvchilarga nafaqat u yoki bu bilimlar yig'indisini berish, balki ularni ilmiy va ixtiyoriy boshqa axborotni mustaqil o'zlashtira olishga o'rgatishdan iborat. Bundan tashqari o'zining o'quv-biluv harakatlarini ratsional qurish uchun ko'nikma va malakalarga o'rgatish, ya'ni ularning muvaffaqiyatli intellektual rivojlanishi uchun sharoit yaratib berish kerak. Albatta, barcha bolalar boshlang'ich intellektual imkoniyatlari bilan bir-biridan farq qiladi. Shuni ta'kidlash kerakki, hozirgi ijtimoiy-madaniy va iqtisodiy sharoitlarda bu farqlar yanada kattalashadi. Barcha bolalar har xil, ammo ular to'laqonli intellektual rivojlanish oldidagi xaq-huquqlari nuqtai nazaridan tengdirlar" [1].

Umumiy rejada ta'limning asosiy maqsadi–o'quvchini rivojlantirish deb, odatda aqliy rivojlanish nazarda tutiladi [2]. Pedagogika va psixologiyaning qabul qilingan fikriga ko'ra aqliy rivojlanish bilimlar, ko'nikmalar va aqliy harakatlar to'plami bilan xarakterlanadi. Psixologik lug'atlarda [3] aqliy rivojlanish – bilimlar, ko'nikmalar yig'indisining darajasi va ularni o'zlashtirish jarayonida shakllangan aqliy harakatlar; ma'lum bir hajmdagi yangi bilim va ko'nikmalarni o'zlashtirishini ta'minlovchi fikrlash jarayonida ularni mustaqil qo'llay olish deb ta'riflanadi.

Aqliy rivojlanishning o'ziga xos tomoni shundan iboratki, nafaqat bilimlar fondini boyitish, balki puxta shakllangan va mustahkamlangan aqliy operatsiyalar, usullarni egallashdan iborat. Bu operatsiyalarni intellektual ko'nikmalarga kiritish mumkin. Taqqoslash, analiz, sintez, abstraktlashtirish, umumlashtirish, klassifikatsiyalash shu operatsiyalarga misol bo'ladi. Bu yerda taqqoslash, analiz, sintez, abstraktlashtirish, umumlashtirish, klassifikatsiyalashga ta'riflar berib o'tadigan bo'lsak:

1-Ta'rif: Noma'lumlardan ma'lumlarga tomon izlash metodi analiz deyiladi.

Analiz metodi orqali fikrlashda o'quvchi quyidagi savolga javob berishi kerak: "Izlanayotgan noma'lumni topish uchun nimalarni bilish kerak?" Analiz metodini psixologlar bunday ta'riflaydilar: "butunlardan bo'laklarga tomon izlash metodi analiz deyiladi" [4].

Fikrlashning analiz usulida har bir qadamning o'z asosi bor bo'ladi, ya'ni har bir bosqich bizga ilgari ma'lum bo'lgan qoidalarga asoslanadi. Fikrlarimizning dalili sifatida quyidagi 1-misolda ko'rib chiqishimiz mumkin.

Teorema. Ikki son yig'indisining o'rta arifmetigi shu sonlar o'rta geometrigidan kichik emas.

$$\forall(a,b) \geq 0 \quad \frac{a+b}{2} \geq \sqrt{ab}$$

Isboti.

$$\frac{a+b}{2} \geq \sqrt{ab} \rightarrow \text{analiz}$$

$$a+b \geq 2\sqrt{ab}$$

$$a-2\sqrt{ab}+b \geq 0$$

$$(\sqrt{a}-\sqrt{b})^2 \geq 0$$

Misol. Quyidagi tenglama analiz metodi bilan echilsin:

$$\frac{\lg 2(x+1)}{\lg(x-3)} = 2$$

Bu tenglamaning echimini topishning o'zi noma'lumdan ma'lumga tomon izlanish demakdir. Bu tenglama $x > 3$ va $x \neq 4$ larda ma'noga egadir.

$$\begin{aligned} \lg 2(x+1) &= 21\lg(x-3), & x^2 - 8x + 7 &= 0 \\ \lg 2(x+1) &= 1\lg(x-3)^2, & x_1 &= 7 \\ 2(x+1) &= (x-3)^2, & x_2 &= 1 \\ 2x + 2 &= x^2 - 6x + 9 \end{aligned}$$

Bu erda $x > 3$ bo'lgani uchun $x_2 = 1$ echim bo'la olmaydi, shuning uchun $x_1 = 7$ yagona echimdir.

2-Ta'rif. Ma'lumlardan noma'lumlarga tomon izlash metodi sintez deyiladi [4].

Sintez metodida fikrlashning bir bosqichidan ikkinchi bosqichiga o'tish go yoki ko'r-ko'rona bo'ladi, bu o'tishlar o'quvchiga noaniqroq bo'ladi.

Sintez metodida biz berilganlarga asosanib nimalarni topa olamiz, degan savolga javob beramiz.

Fikrlarimizning dalili sifatida quyidagi misolni ham sintez metodi orqali yechamiz.

1-Misol. $x_1 = 7$ va $x_2 = 1$ yechimlarni qanoatlashtiruvchi logarifmik tenglama tuzilsin. Bu erda quyilgan savolning o'zi ma'lumdan noma'lumga tomon izlashni talab qilyapti, shuning uchun bu savolga sintez metodi orqali javob beriladi. Bu erdagi bajarilishi kerak bo'lgan matematik jarayon ildizdan tenglamaga tomon olib boriladi.

1) $x_1 = 7$ va $x_2 = 1$ yechimlarni qanoatlantiruvchi tenglamani quyidagicha tuzish mumkin:

$$(x-7)(x-1) = 0, \quad x^2 - 8x + 7 = 0$$

Ayniy almashtirish bajarish bilan quyidagi tenglamani hosil qilamiz:

$$\begin{aligned} x^2 - 6x - 2x + 9 - 2 &= 0, & \lg 2(x+1) &= 2 \\ 2x + 2 &= x^2 - 6x + 9, & \lg(x-3) & \end{aligned}$$

$$2x + 2 = (x-3)^2,$$

$$\lg(2(x+1)) = 2 \cdot \lg(x-3); \lg(x-3) \neq 0.$$

Biz sintez metodi yordamida ma'lum bo'lgan $x_1 = 7$ va $x_2 = 1$ ildizlarni qanoatlantiruvchi $\frac{\lg 2(x+1)}{\lg(x-3)} = 2$

ko'rinishdagi noma'lum tenglamani hosil qildik.

Bu aqliy operatsiyalarni kollej o'quvchilarida shakllantirish ularning kelgusi ta'lim bosqichida muvaffaqiyatli o'qishi yoki o'z kasbi bo'yicha samarali faoliyat yuritishga zamin tayyorlaydi. Quyida kollej o'quvchilarida yuqorida aytilgan aqliy operatsiyalarni shakllantirish uchun matematika kursida mavjud masalalardan foydalanish metodikasidan namunalar keltiramiz:

2-Misol. $\left(\frac{1}{3}\right)^x \geq 27$ tengsizlik berilgan. Sxema bo'yicha

analizni bajaring:

Analiz: tengsizlikning daraja ko'rsatkichi noma'lumdan iborat, tengsizlik uchun tengsizlik ko'rsatkichli tengsizlik bo'ladi; tengsizlikning xarakteri-qat'iy emas, demak mantiqiy strukturasi "yoki" (diz'yunksiya) katta hamda teng bo'lishi mumkin;

27 soni 3 sonining uchinchi darajasi;

Kamayuvchi ko'rsatkichli funktsiya (asosi $0 < \frac{1}{3} < 1$)

konstanta bilan taqqoslangan, shuning uchun tengsizlikni ikkala qismini bir xil asosga keltirish kerak. Keyin ko'rsatkichli funktsiyani xossasini ishlatgan holda ko'rsatkichlarni o'zaro taqqoslash lozim.

3-Misol. $\left(\frac{1}{3}\right)^x \geq 27$ tengsizlik berilgan. Sxema bo'yicha

sintezni bajaring.

Sintez: 1) $\frac{1}{3}$ va 3 sonlar o'zaro quyidagi tenglik

bilan bog'langandir

$$\left(\frac{1}{3}\right)^{-1} = 3, 27 \text{ va } 3 \text{ esa } 3^3 = 27 \text{ tenglik bilan}$$

bog'langandir, demak $\frac{1}{3}$ va 27 ni $27 = 3^3 = \left(\frac{1}{3}\right)^{-3}$ tenglik

bilan bog'lash mumkin;

$$2) \left(\frac{1}{3}\right)^x \geq \left(\frac{1}{3}\right)^{-3} \text{ Asosi } 0 < \frac{1}{3} < 1 \text{ bo'lganligi uchun}$$

darajaning ko'rsatkichlari kichik yoki teng belgilar bilan solishtiriladi: $x \leq -3$ (x noma'lum darajaning ko'rsatkichida joylashgani uchun ixtiyoriy haqiqiy son bo'lishi mumkin);

3) javob: $(-\infty; -3]$.

4-Misol. "Abstraktlashtirish" mantiqiy usulni bajarilish sxemasini ishlatgan holda, berilgan tengsizliklarning yechish metodini taklif qiling: $4^x - 2^{x+1} - 8 > 0$, $36^x - 5 \cdot 6^x - 6 \leq 0$, $\pi^x - \pi^{2x} \geq 0$

Abstraktlashtirish:

Har bir ko'rsatkichli tengsizlikda daraja ko'rsatkichlari bilan farq qiladigan ikkita qo'shiluvchi mavjud, o'zgartirishlardan keyin (darajadagi ifodalarni bitta asosga keltirish) struktura bo'yicha kvadrat tengsizliklarga o'xshaydigan tengsizliklar hosil bo'ladi. Abstraksiyaning asosi sifatida belgilangan xossa-ko'rsatkichli tengsizlik strukturasi bilan o'xshashligi.

$$\begin{aligned} 2^{2x} - 2 \cdot 2^x - 8 > 0 & \quad a^x = t \\ 6^{2x} - 5 \cdot 6^x - 6 \leq 0 & \Rightarrow t > 0 \\ \pi^{2x} - \pi^x \leq 0 & \quad a^{2x} = t^2 \end{aligned} \Rightarrow at^2 + bt + c > 0$$

Shunday qilib, berilgan ko'rsatkichli tengsizliklarning yechish metodi kvadrat tengsizlikga keltirish va ma'lum algoritm bo'yicha yechishdir.

3-Ta'rif. O'rganilayotgan matematik obyektidagi narsalarning o'xshash va farqli tomonlarini aniqlovchi metod taqqoslash metodi deyiladi [4].

Taqqoslash metodi ham ilmiy izlanish metodlaridan biridir. Taqqoslash metodini matematika darslarida o'rganilayotgan mavzu materiallariga tadbiq qilishda quyidagi prinsiplarga amal qilinadi:

1) taqqoslanayotgan matematik tushunchalar bir jinsli bo'lishi kerak;

2) taqqoslash o'rganilayotgan matematik obyektidagi narsalarning asosiy xossalari nisbatan bo'lishi kerak.

5-Misol. Uchburchak figurasi bilan to'rtburchak figurasi taqqoslaganda ularning o'xshash tomonlari: uchlari, burchaklari; ularning o'zaro farqli tomonlari:

a) uchburchakda uchta uch va uchta tomon;

b) to'rtburchakda to'rtta uch va to'rtta tomondan iboratligi aniqlanadi.

Bu misolda taqqoslashning ikkala prinsipi ham bajarildi, ya'ni uchburchak va to'rtburchak figuralari bir jinsli tushunchalar bo'lib, ikkalasi ham ko'pburchakning xususiy hollaridir hamda taqqoslash metodi ikkala figuraning asosiy xossalari nisbatan amalga oshirildi.

Xulosa. Matematika ta'limida uzviylikni ta'minlash o'quvchilarning intellektual rivojlanishiga bevosita bog'liqdir. O'quvchilarda analiz, sintez, taqqoslash, umumlashtirish kabi fikrlash ko'nikmalarini shakllantirish ta'lim sifatini oshiradi, ularni keyingi bosqichdagi o'qish va kasbiy faoliyat uchun tayyorlaydi. Shu bois, matematika o'qituvchilari ta'lim jarayonida bu metodlarga alohida e'tibor qaratishlari lozim.

Adabiyotlar

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- REZYUME.** Maqolada matematika ta’limida uzviylikni ta’minlash masalasi o‘rganilgan.
- РЕЗЮМЕ.** В статье рассматривается вопрос обеспечения преемственности в математическом образовании.
- SUMMARY.** In this article the issues are viewed of the sequence of mathematical education.

METHODS FOR IMPROVING THE EFFECTIVENESS OF EXERCISES PERFORMED IN CLASS, USING PRIMARY SCHOOL AS AN EXAMPLE

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Tayanch so‘zlar: pedagogik texnologiyalar, didaktika, o‘qitish usullari, pedagogik o‘zaro ta’sir, empirik tadqiqot.

Ключевые слова: педагогические технологии, дидактика, методы обучения, педагогическое взаимодействие, эмпирическое исследование.

Key words: pedagogical technologies, didactics, teaching methods, pedagogical interaction, empirical research.

Introduction. The most important structural component of pedagogical technologies is teaching methods, which represent a system of regulated methods of purposeful interaction between the subjects of the educational process (teachers and students). In modern pedagogical science, there is no consensus on the interpretation of this concept, which reflects the multidimensionality and polysemy of this didactic category.

Thus, Yu.K. Babansky defines a teaching method as a way of organised joint activity between a teacher and students aimed at achieving didactic goals. A similar position, but one that focuses on the subject of learning, is taken by T.A. Ilyina, for whom a method is, first and foremost, a way of organising the cognitive activity of students.

Methods. Etymologically (from the ancient Greek μέθοδος – ‘method of investigation, means of cognition’), the teaching method implies a specific path or algorithm. In pedagogical interpretation, it is the procedural basis for interaction between teacher and student, ensuring the transmission, acquisition and application of knowledge, and the formation of skills and competences.

Thus, the teaching method can be viewed as a gnoseological and organisational tool that integrates teaching and learning activities into a single purposeful process for solving educational tasks.

In didactics, it is common practice to classify teaching methods based on the dominant source of knowledge transfer and assimilation. According to this criterion, there are three main groups: verbal, visual and practical methods [1]. It should be noted that in modern pedagogical research, there is a tendency to differentiate between such methods of organising educational activities as working with printed sources (books) and using video materials, which is due to the specifics of the information carriers used and the forms of their perception. This analysis considers the established trichotomy.

1. Verbal methods. This group combines teaching methods based on verbal communication, which historically involved a largely monological interaction between the teacher and the audience. These include storytelling, explanation, instruction, lectures, conversation and discussion, as well as independent work with educational literature. Within the group, there is a qualitative difference in the degree of student activity: from passive perception of information

(narration, lecture) to dialogical and polylogical forms (conversation, discussion) that stimulate cognitive interest and develop the ability to argue a position and critically evaluate different points of view. Working with texts is aimed at developing analytical skills, logical thinking and mnemonic processes, contributing to a deeper understanding of the material.

· Storytelling is a method of monological presentation that focuses on specific facts, events or phenomena. Its main function is educational, with accompanying functions being developmental, formative, motivational and corrective.

· Explanation is a verbal method, the essence of which is to reveal the systemic connections, patterns and cause-and-effect relationships of the object being studied. It contributes to the formation of logical and theoretical thinking skills and the construction of evidence-based reasoning in students.

· Instruction – a method of clearly directing students' activities, used to set goals, regulate procedures and guide the learning process in a specific direction.

· Lecture – a method of systematically presenting material in a problem-oriented and content-rich manner, which can combine monologue with elements of heuristic dialogue. Its purpose is to activate cognitive activity, stimulate independent thinking, and pose problems for further reflection.

· Discussion – a method of collective discussion of a scientific or practical problem, aimed at finding the truth through the collision and analysis of different positions using correct polemical techniques.

· Conversation – a dialogical method of organising learning, the essence of which is a controlled exchange of opinions and judgements between the teacher and students, as well as between the students themselves, which contributes to the development of dialogical speech and reflective abilities.

2. Practical teaching methods are a set of ways to organise learning activities that focus on directly learning about the real world, building and improving subject-specific skills and abilities, and deepening and clarifying theoretical knowledge through practical application. This group traditionally includes exercises, laboratory work, practical work, and educational games.