PEDAGOGICAL SCIENCES

IN X CLASSES OF SECONDARY SCHOOLS *"DATA, FORECASTS"* TECHNOLOGY OF ASSİMİLATİON OF MATERİALS FOR THE EDUCATİONAL UNİT

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Abstract

In the article, the level of skills intended to become the subject of students in the teaching process of the materials of the "Information, forecasts" educational unit, which is included in the content of the Mathematics subject in the X classes of general education schools, is presented. In the formation of the aforementioned skills, attention is directed to the technology of the content elements that carry the "opportunity stone crushing function" in the "Information, forecasts" teaching unit and their transformation into action in the students' cognition (adequate to the "movement-opportunity-new quality" paradigm). Based on the "System-structure" dialectical approach of the transformed elements in the "Information, forecasts" educational unit "Summary and selection. Random selection and types. Presentation of information", "Binomal openings", "Bernoulli trials. Binomial tests" it is considered appropriate to make it into a system on topics. It should be noted that the system of tasks (question, problem, study) that serves as a means of organizing and managing the educational process for mastering the content elements presented by the students should contain verbs that are required to be performed in the topics. Examples of such assignments are included in the content of the work.

Keywords: Information; corpus; random selection; simple random selection, systematic random selection, cluster random selection; stratified random selection; quantitative type (categorical) data; discrete numerical data; body-cloud scheme; continuous numerical data; binomial openings; binomial tests.

The actuality of the subject. There are recommendations that are useful to be adopted for guidance in the teacher's activity in the currently used textbook complex and various educational literature about the teaching units, basic standards, sub-standards, and defined topics in the subject of mathematics. This is very useful in terms of teaching the process of teaching mathematics according to the curriculum model. It is not denied that continuous improvement of the teaching process in the subject is logical, most didactic problems are eternal. Of course, as the experience of using the curriculum is formed, the methodical system of the teaching process adequate to it should be improved. Based on this logic, "Data, forecasts" We claim the relevance of the study of the topic "Methodical system of teaching the specified subjects for the realization of sub-standards for the educational unit (X class).

Scientific-methodical interpretation of generalizations based on information obtained on the basis of research.

In order to clarify the logic of the presented scientific interpretation, let us note that, in addition to referring to the forms and methods of scientific cognition in the summarization of the materials obtained on the research topic, "training and teaching activity", "learning and mastering", "content and content line", "main standard with expected result", "main standard with sub-standards", "system-whole-part-element relationships" were focused on (for more information, see[2]).

Scientific sources indicate that "training" and "educational activity" are one of the main concepts of pedagogy. Although training is an important characteristic of educational activity, it does not cover all aspects of it. Training, in the broadest sense of the word, involves the acquisition of new knowledge, skills and habits. However, learning and learning are essentially different phenomena. Appropriation is an integral part not only of the learning process, but of every field of activity [1;150].

The analysis of the materials obtained from scientific sources also leads us to the conclusion that training is a way of implementing education, and the fact that spiritual learning, memorizing what has been learned, and acquiring the experience of creative activity based on it depends on the way of learning (the dialectics of the content and form of cognitive action). Forming a model of educational implemen tation in didactics is a perennial problem. [5]

Based on the idea of L. Bertalanfi to get to the essence of many pedagogical concepts, to give an honest scientific interpretation, in our opinion, it is a successful approach, the "system-structural approach" is a branch of dialectics that has gained the "status" of development independence since the thirties of the 20th century [9; 8].

The technology of education implementation (methodology in the traditional approach) has its own system[10]. The expected result in the mentioned technological system is determined by the state of movement of the selected content. A technological system is available for each educational unit. It is not accidental that the selection of the educational unit is brought to the center of attention in the design of the mentioned system.[2-3]

In the process of teaching the topics covered in the "Information, Forecasts" educational unit, students are expected to become subjects of the following skills:

◊determines the selection according to the corpus;

◊applies selected research to the corpus;

◊explains the types of choices on examples;

◊shows opening regularities of binomial power on examples;

◊binomial expresses the coefficient of the limits in the opening with a combination;

◊relates the coefficient of the limits in the binomial opening to pascal's triangle;

◊presents the basic conditions of Bernoulli's trials;

◊presents Bernoulli's trials on examples;

◊Creates a connection between Bernoulli tests and coefficients of binomial openings.[4; 345]

Mastering the materials of the educational unit "Information, Forecasts" students' active mathematical vocabulary with the following concepts - set, selection, random selection, discrete data, continuous data, binomial, binomial power, binomial opening, Pascal's triangle, complex numbers, real numbers, imaginary numbers, from *n* degrees, allows to be enriched with *n* number of roots and considerations related to them.[8]

It is recommended to take advantage of virtual tools (important links for course teaching) and various worksheets as an additional resource in teaching the materials of the mentioned "Data, forecasts" educational unit [11-17].

"Generality and selection. Random selection and its types", which is included in the "Data, forecasts" educational unit. It is recommended to allocate 5 lesson hours for the teaching of the topic "Presentation of information" [8]. The students are presented with the following information about the concepts of "totality" and "choice", which have their own place in this topic.

It is brought to the attention of the students that the basic concepts of statistics and probability help to evaluate the processes in the modern world more correctly. When conducting research in both fields of activity, the corpus covering the object and the selected samples from the corpus, or in short, the selection, are taken as the basis. According to the research conducted on the basis of selected samples in statistics, the opinion about the corpus is carried out. It is thought about the example selected according to the probability of the corpus. When conducting statistical surveys, samples are usually formed by random selection. In this case, each sample included in the corpus has the same chance of selection. Randomization techniques also vary. [6; 162]

In the process of teaching the subject, students are presented with four types of selection techniques and the main features of each are explained. These are simple random, systematic random, cluster random, and stratified random. It is explained to them that in a simple random selection, each element of the n -element selection has the same chance of being selected. In systematic selection, if k% selection is planned, every element $\left[\frac{100}{k}\right]$-of the corpus is used. Cluster selection also consists of multiple clusters. A random selection is made from the clusters and all elements of the selected cluster are examined. In stratified sampling, the population is first divided into strata, and then random selections are made from each stratum. The teacher brings to the students' attention that sometimes it is not possible to make random selections for research. For example, dietitians have to choose any diet menu not by random selection, but among those who want to participate voluntarily. [7; 286-287]

"Generality and selection. Random selection and its types. In the process of teaching the topic "Presentation of information", students are taught "correct choice" and "wrong choice" by their cognitive activity. It becomes clear to the students that polling organizations do not have the financial and technical means to get the opinion of every person involved in the topic. For this reason, they have to be satisfied with learning the opinion of small groups. It is very important to correctly identify the participants in the survey. For example, it is impossible to get a true idea of how many times a week the entire city population does sports based on the number of people who come to the sports center. Or, thinking about whether any person will be elected as a member of the parliament by conducting research in the collective where he works or in the area where he lives, will result in a wrong prediction.[4; 346]

Students should know that statistical data are divided into two groups: quantitative and qualitative. Quantitative data is expressed in numerical values. Quality data is divided into categories. This data is also called categorical data. Quantitative data-numerical data are divided into two types: a) discrete, interrupted numerical data; b) continuous numerical data. Discrete numerical data refers to data determined by counting. Continuous numerical data receive values that vary in a certain range, usually as a result of measurement [6; 163].

It is necessary to bring to the students' attention that it is important to choose a suitable graphic form when presenting data. Therefore, when presenting categorical and numerical data, the correct graphic form should be chosen. In order to form the experience of being able to choose appropriate presentation forms for categorical information in students, it is important that they be involved in practical activities based on examples.

Students should recognize that there are appropriate forms for presenting numerical data. To present a limited number of discrete numerical data, it is appropriate to use presentation forms such as frequency tables, bar graphs, histograms, and tree-branches. The representation form of continuous numerical data is similar to the representation form of grouped discrete data. Sometimes continuous

numerical data is treated as discrete numerical data (and vice versa). That is, it is difficult to determine the exact border between them. The formation of students' skills at the desired level is conditioned by the application of task examples containing specific situations.

It is enough to devote 2 hours of study to the subject of "binomial openings". In the process of teaching the subject, regularities in binomial openings are explained with discussions, students are given time to write several openings independently. Care is taken to ensure that every student understands the combination of coefficients. They are introduced to "Pascal's triangle" and their attention is drawn to its interesting features. It is said that Pascal's triangle was named after Blaise Pascal, a French mathematician, physicist and philosopher who lived in the 16th century. 1 stands at the vertices of Pascal's triangle. All lines forming a triangle start with a unit and end with a unit. Each number in each subsequent row is equal to the sum of two adjacent numbers in the previous row. The number of numbers in each subsequent row is one more than the previous one. In Pascal's triangle, the numbers are arranged symmetrically. According to the straight line through the vertex, the numbers on the left and the numbers on the right are the same.

In the process of teaching the topic "Binomal openings", students should learn to write a generalized formula for a binomial opening. They should know that the following a, b equation is true $n \geq 0$ for any number and number:

$$(a+b)^n = C_n^0 a^n b^0 + C_n^1 a^{n-1} b^1 + C_n^2 a^{n-2} b^2 + \cdots + C_n^{n-1} 1 b^{n-1} + C_n^n a^0 b^n.$$

"**Σ"(**Students should learn to write this formula in short form using sigma):

$$(a+b)^n = \sum_{k=0}^{n} C_n^k \, a^{n-k} b^k$$

Students should understand $(a+b)^n$ that the opening of the binomial has a $n+1$ number of limits. The (k+1)-th term of the binomial series is given by

$T_{k+1} = C_n^k a^{n-k} b^k$ where k = 1, 2, ..., n. In the process of teaching this topic, students should acquire the experience of utilizing the following considerations as the subject:

- In the binomial expansion of degree n, there are n+1 elements;
- The formula $T_{k+1} = C_n^k a^{n-k} b^k$ can be used to find any term of the binomial expansion;
- The sum of the exponents of any term of the binomial expansion is always equal to n;
- The sum of the binomial coefficients is equal to 2^n: $C_n^0 + C_n^1 + \cdots + C_n^{n-1} + C_n^n = 2^n$

In addition to the above, students should also know that the coefficient of the sum of the power of the binomial and the binomial coefficient are different from each other. Based on the example, it can be visualized that $(x+2)^5$ the coefficient of the third sum in the division is 40, and its binomial coefficient is.$C_5^2 = 10$.

It is mentioned in scientific and methodical sources that "Bernoulli tests. It is enough to devote 3 hours to teaching the subject "binomial experiments". In the mathematics textbook used in X classes of general education schools [7; 301] In order to clarify the Bernoulli scheme, it is recommended to involve the students in the training work as follows: The teacher suggests $\frac{3}{4}$ to the students that the probability of winning the game (green ball coming out) and the probability of losing (red ball coming out) will be $1-\frac{3}{4} = \frac{1}{4}$. Let's calculate the probabilities based on the number of wins and losses in 4 games.

1)P(probability of winning all 4 games)= $\frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{81}{256}$;

2)P(probability of defeat in all 4 games)= $\frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{81}{256}$;

3) Options for winning 3 out of 4 games and the probability of each:

(Q,Q,Q,M) P(winner in all except fourth)= $\frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{1}{4} = \frac{827}{256}$;

(Q,Q,M,Q) P(winner in all except fourth)= $\frac{3}{4} \cdot \frac{3}{4} \cdot \frac{1}{4} \cdot \frac{3}{4} = \frac{827}{256}$;

(Q,M,Q,Q) P(winner in all except fourth)= $\frac{3}{4} \cdot \frac{1}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{827}{256}$;

(M,Q,Q,Q) P(win all but fourth)= $\frac{1}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{827}{256}$.

The number of possible options for a player to win three out of four games can also be calculated with overalls $C_4^3 = \frac{4!}{3!} = 4$. The probability of the variants is equal to $\left(\frac{3}{4}\right)^3 \left(\frac{1}{4}\right)^1$. The probability of this event can be calculated as follows.

P(winner in 3 out of 4 games)= $C_4^3 \left(\frac{3}{4}\right)^3 \left(\frac{1}{4}\right)^1 = 4 \cdot \frac{27}{64} \cdot \frac{1}{4} = \frac{108}{256}$.

Involvement of students in the investigation of other situations in a similar manner benefits the efficiency of the teaching process. Let's visualize our idea:

4) The probability of winning two out of 4 games is P(Q,Q,M,M)= $\frac{3}{4} \cdot \frac{3}{4} \cdot \frac{1}{4} \cdot \frac{1}{4} = \left(\frac{3}{4}\right)^3 \left(\frac{1}{4}\right)^1 = \frac{9}{256}$.

Number of possible ways to win two out of four games: $C_4^2 = \frac{4!}{2!\cdot 2!} = 6$.

That is, the probability of winning in each of the 6 cases is $\frac{9}{256}$.

P(win two out of 4 games)= $C_4^2 \left(\frac{3}{4}\right)^2 \left(\frac{1}{4}\right)^2 = 6 \cdot \frac{9}{16} \cdot \frac{1}{16} = \frac{54}{256}$.

4) Probability of winning one out of 4 games

P(Q,M,M,M)= $\frac{3}{4} \cdot \frac{1}{4} \cdot \frac{1}{4} \cdot \frac{1}{4} = \left(\frac{3}{4}\right)\left(\frac{1}{4}\right)^3 = \frac{3}{256}$.

P(winner in one of 4 games)= $C_4^1 \left(\frac{3}{4}\right)\left(\frac{1}{4}\right)^3 = 4 \cdot \frac{3}{4} \cdot \frac{1}{64} = \frac{12}{256}$.

Continuing the management activity in the teaching process, the teacher says that we found the probabilities of the team winning the game 4,3,2,1,0. If

these probabilities are calculated correctly, their sum should be equal to one:

P(4 wins)+P(3 wins)+ P(2 wins)+P(1 win)+P(0 wins)=1.

Let's check: $\frac{81}{266}+\frac{108}{266}+\frac{54}{266}+\frac{12}{266}+\frac{1}{266}=1$.

In order to generalize the information directed to the students, the teacher explains that the described problem is called binomial tests. Because in such matters, it is possible to express the situations with the limits of the appropriate binomial opening. For example, the issue we are considering

$(a+b)^4 = C_4^0a^4 + C_4^1a^3b + C_4^2a^2b^2 + C_4^3ab^3 + C_4^4b^4$corresponding to the binomial opening. Binomial trials are also called Bernoulli trials.

If we express this opening with the variables p (winner) and q (loser) corresponding to the situation in question, it can be seen that each threshold corresponds to the real situation in the binomial opening.

$(p+q)^4 = C_4^0p^4 + C_4^1p^3q + C_4^2p^2q^2 + C_4^3pq^3 + C_4^4q^4$.

Where p is the probability of a successful event (green subtraction) and p=$\frac{3}{4}$,q is the probability of a failed (red subtraction) event, and $q=\frac{1}{4}$.

At this point of the educational process, it is desirable that the following conclusions are produced by students: “Bernoulli test and probability: if the probability of a successful event in N independent trials is p, then m is the probability of a successful event, n-M is the probability of an unsuccessful event

P(n in the trial, m successful)= $C_n^mp^mq^{n-m}$. The Binomal test or Bernoulli test is only true if the following conditions are met: 1) each test has only two results.; 2) the number of trials is known; 3) trials are independent; 4) each trial is equally likely”.

In order for students to master Bernoulli's test, it is important to perform specially selected sample tasks under the guidance of the teacher. The following tasks can be considered:

1. Each of the 5 questions has 4 answer options. Calculate the probability that Nargiz answers 4 out of 5 questions correctly. Explore the relationship between opening a binomial and finding the probability.

2. Calculate the probability that three of the children in a family of four are boys and one is a girl.

3. A coin was tossed 10 times. What is the probability of the coin falling heads at least 8 times?

4. The probability that a basketball team will win the game is $\frac{2}{3}$. What is the probability that this team will win three of the next 5 games?

5. The company places coupons on baby food boxes in a sales campaign. A winning coupon is placed in three out of every 20 boxes. What is the probability that a customer who buys 5 boxes of baby food will receive a winning coupon on 2 boxes? Use a calculator.

By the way, let's note that it is recommended to take advantage of the following self-contained criteria for the purpose of evaluation for the "Information, Forecasts" educational unit:

1. Defines the technique of selection from the whole.

2. Selects an appropriate graphical form to present the information.

3. Writes the opening of the power of the binomial.

4. Calculates the coefficients of the binomial opening.

5. Solves problems related to probability according to the Bernoulli scheme [8].

The result.

1) In the process of teaching the topics covered in the educational unit "Information, forecasts", the selection and application of task types should be kept in focus so that students become subjects of verbs based on expected results;

2) In the process of teaching materials for the "Information, Forecasts" educational unit, the inclusion of necessary terms in the content of students' active mathematical vocabulary should be considered as an important didactic requirement;

3) It is recommended to use virtual tools (important links for teaching the course) and various worksheets as an additional resource in teaching materials for the "Data, Forecasts" educational unit;

4) Since the materials of the "Information, Predictions" educational unit belong to the "Algebra and Functions" content line, in the real pedagogical process both the whole (with the content covered by the mathematics subject as a whole) and the parts belonging to each content line (the sub-categories of the other four content lines) dialectical unity ("system-structure" approach-whole-part relations) between elements) should be expected;

5) The expectation of the "opportunity-movement-quality" paradigm in selecting tasks and making them into a system has a positive effect on the efficiency of the educational process.

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