ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

DOI https://doi.org/10.58442/3041-1831-2024-29(58)-94-107
UDC 372.851

Naila Ibrahimova,
PhD candidate,
Head teacher of Ganja State University.
Ganja, Azerbaijan.
https://orcid.org/0009-0002-7585-3916
nailaibrahimova@yandex.ru

OPPORTUNİTİES AND WAYS OF TEACHİNG STOCHASTİCS ELEMENTS İN SCHOOL MATHEMATİCS TRAİNİNG

Abstract. The strategies and approaches utilized in school textbooks and methodical literature to teach the elements of probability theory make it evident that, in order for students to fully understand the theory of probability, they must be able to identify the statistical indicators of events that occur in the course of their daily lives. In accordance with said idea, it would be good to start with the questions posed that require the solution of the activities of students' daily life and related to the corresponding situation. As a result, not every theorem presented as theoretical information in mathematics training needs to be proven. Quite a lot of time is spent on proving those theorems, but also the tasks of the course include the formation of useful habits, and not the skills of proving theorems. The process of introducing the content line “Statistics and Probability” into the school mathematics course is a typical and rather complicated task. There is such a thesis that in order to master the beginnings of probability theory, students should be instilled with knowledge and skills with new training methods, unlike traditional training. Considering this, teaching the younger generation essential skills is the only thing that bothers psychologists and educators in the modern day. Because the student must deeply feel the ideas about the vital problems surrounding him, self-identify them, evaluate them as an independent line in the direction of formation of logical thinking, development of activity of thinking. Due to the new inclusion of probability theory and statistics in school mathematics, the problem of implementing these materials in school textbooks has arisen. Also, the number of methodical literature related to the specific features of this course is not so large yet. Therefore, the creation of a technique for teaching probability theory and statistics in general education classrooms, as well as an analysis of the course's outcomes, constitute real topics.

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

Keywords: mathematics training; probability theory; students; school; stochastic elements; intra- and interdisciplinary integration.

INTRODUCTION / ВСТУП

Statement of the problem / Постановка проблеми. Education reform is being successfully implemented in the Republic of Azerbaijan. Subject programs for secondary schools have been developed and are being implemented. Mathematics is considered a fundamental subject for the basic study of other subjects and is of great importance in the formation of personality. Since logical thinking is developed through the study of mathematics, it understands the events that occur in life by analyzing and synthesizing them. On the other hand, it is associated with modern areas of specialization and is part of world culture.

Reforms carried out in the field of education substantiate the so-called ideas of constructing taught subjects in new content, using subject programs, integration into the global education system, widespread use of intra-subject and interdisciplinary connections, concentric teaching of mathematics and the concept of geometry, teaching elements of statistics and probability theory. The issues related to the problem being studied have such nuances that it is impossible for the younger generation growing up today to build their future activities without understanding it. For example, a student can determine the average numerical value, mathematical expectations, classify and systematize statistical information about events in life, must be able to identify graphs or other diagrams, tables, etc [2].

The goal of modern education is the development of such personality qualities that are necessary for him and society to engage in socially valuable activities. Currently, human activity has reached such a level of development that its effective implementation requires the use of thinking methods based on logical-variant thinking (the laws of formal logic and the assessment of all possible outcomes of observed events). Strong logical and stochastic knowledge is the real basis for the formation of such thinking skills from the point of view of mathematics education.

Logical knowledge is knowledge about the general principles of thinking used by people of any profession to carry out their activities.

Stochastic knowledge is knowledge about patterns associated with random events.

All real life events involving people are divided into two groups:

1) deterministic events, that is, events whose results can be unambiguously predicted in advance until the events are observed;

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

2) random events, that is, events whose consequences cannot be predicted in advance before the moment of observation of the events, but it is necessary to be able to quantitatively or qualitatively assess the degree of implementation of all possible consequences of such events. The diversity of human activity shows that random events occur much more often than deterministic events [8].

Analysis of (major) recent research and publications / Аналіз (основних) останніх досліджень і публікацій. A great contribution to the field of inclusion of probabilistic and statistical material in secondary school programs was made by B. Gnedenko [10], A. Kolmogorov [13], Yu. Tyurin [12] and other prominent mathematicians.

Based on the results of an analysis of a number of psychological, pedagogical, mathematical and methodological literature on the research topic, it was established that in developed countries much attention is paid to the education of a stochastic culture among students. Students become familiar with the elements of probability theory and statistics from the first grades of school and throughout the entire period of study they master probabilistic and statistical approaches to the analysis of common situations encountered in everyday life.

From conducted research, analysis of school textbooks and methodological literature, it is known that the development of logical or creative thinking in schoolchildren includes more visual and figurative features. This problem, in order to develop and shape human thinking, was dealt with by such teachers as A. Adygozalov [1], M. Asadov [4], A. Guseinov [5], F. Ibragimov [6] and others.

AIM AND TASKS / МЕТА ТА ЗАВДАННЯ

The ***purpose*** of the study is to reveal the essence of the direction of application of stochastic learning and, on its basis, to develop educational and methodological support for stochastic learning in secondary schools.

The following ***tasks*** arising from the purpose of the article were solved:

1. Analyze educational and methodological literature and research related to the issues of stochastic learning in a school mathematics course from the point of view of the problem.
2. Identify ways and possibilities for implementing the application of stochastic learning.
3. Determine the content of stochastic material studied in the mathematics course of grades V-IX.
4. To develop a methodological system of technology for teaching elements of probability theory and mathematical statistics in secondary schools.

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

5. Check the effectiveness of the developed methodological system through a pedagogical experiment and conduct a statistical analysis of the results obtained [3].

THEORETICAL FRAMEWORK / ТЕОРЕТИЧНІ ОСНОВИ

Currently, stochastic ideas and methods play an important role in science, technology, economics and production organization. Therefore, a modern person needs to have an idea of the basic methods of analyzing results and possible patterns.

Strictly deterministic laws can reveal the nature of the surrounding world only from one side. Until recent years, school education was focused on such laws. However, the stochastic nature of many real-world phenomena remained unnoticed by students.

As a result of the curriculum reform, the content of the school mathematics course was fundamentally changed, a number of irrelevant topics were excluded from the program, and the new topics included were divided into substantive areas, one of which was “statistics and probability”. This content is aimed at familiarizing students with the probabilistic nature of many real-world phenomena.

In the content of the stochastic line, three interconnected directions are naturally distinguished, each of which is manifested to one degree or another at all levels of the school:

1) training in the field of combinatorics with the aim of creating an apparatus for solving probabilistic problems and forming an important type of practice-oriented mathematical activity for the logical development of students;

2) the formation of skills related to the collection, presentation, analysis and interpretation of information;

3) formation of ideas about the probability of random events and the ability to solve probabilistic problems [10].

Introducing students to the elements of stochastics opens up wide opportunities for demonstrating the importance of mathematics in solving applied problems. Mastering the elements of probability theory and mathematical statistics allows you to study various situations that appear in word problems, show the universality of mathematical methods, and demonstrate the main stages of solving applied problems using stochastic means.

Thus, we can say with confidence that the following sharp contradictions have arisen in the teaching of mathematics:

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

- between the actual inclusion of the stochastic line in the school mathematics course and the insufficient development of the methodology for teaching it in secondary schools;
- between the high potential for the use of stochastics and its insufficient use in school education;
- between the need to implement stochastic learning in a secondary school and the limitation of the time allocated for its study by the current curriculum.

This situation in teaching mathematics shows the relevance of the research topic and allows us to determine its problem, express its object and subject.

Today, the subject curriculum used in secondary school mathematics education has set important goals and objectives. The possibilities of defining the subject curriculum in mathematics in five content areas, integration into the global education system, and the use of intra-subject and interdisciplinary integration are highlighted.

One of the main goals of mathematical education is the formation of the younger generation as individuals. The Law of the Republic of Azerbaijan on Education provides for sections of society that have the right to compulsory and independent education. Therefore, regardless of the structure, the function of obtaining higher education for every citizen must be implemented in full. This is why the creation and development of education and training has been achieved. Currently, our independent country has five levels of education, one of the main ones being general secondary education. The younger generation growing up in the general secondary education system is taught a number of subjects, one of which is mathematics. With the help of this subject, students' abilities are formed, such as personality formation, performing mathematical calculations, developing logical thinking, cognitive activity, conducting analysis and synthesis, observation, etc [6].

The subject curriculum in mathematics is structured in such a way that knowledge, skills and abilities are developed in students of grades I–XI, taking into account age characteristics. For example, if a 1st grade student uses the content line "Statistics and Probability" to convey information in a picture, then already in 5th grade the student independently collects and analyzes data and, as a result of the analysis, creates tables, graphs, diagrams, etc. That is why students of mathematics are interested in society, nature, the benefits of human work, etc. helps to form initial ideas about problems. In this area, research work carried out by psychologists, teachers, and mathematical methodologists also attracts attention.

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

One of the main issues of the school mathematics course is the logical perception of students, analysis, research, observation, and the ability to draw conclusions. It should be noted that it is impossible to simultaneously fulfill all the psychological factors specified in the educational process; these factors are performed from time to time. Mathematical memory and understanding are sufficiently developed among students in grades I–IV, and creative application and development of logical thinking are of great importance among students in grades V–XI.

The content area “Statistics and Probability”, included in the subject curriculum in mathematics, forms the basis of mathematics and other natural sciences. The study of statistical elements included in the mathematical education of grades I–XI is an integral part of both the thinking and daily activities of the younger generation. Therefore, teaching the basics of this area of content in school mathematics education is considered one of the necessary components of mathematical culture [1].

In general, teaching elements of statistics and probability theory is a part of mathematical science, which has both theoretical and applied significance. One of the main goals of teaching elements of probability theory in a school mathematics course is to ensure that this theory is used in one way or another in people’s everyday life. Due to this aspect, it contributes to the broad development of applied fields of statistics and probability theory (e.g. psychology, physics, chemistry, economics, etc.).

If we look at the development of mathematics education, we will see that in recent years new directions in this subject have emerged. They can be systematized as follows. The inclusion of stochastic elements in the school mathematics course once again confirms the expansion of the areas of application of probability theory. It is based on the use of elements of probability theory in solving current problems both in teaching mathematics and in teaching other natural sciences. Therefore, not only mathematicians, but also engineers, chemists, physicists, astronomers, biologists, etc. rely on this theory.

The laws that arise in nature and society are divided into two parts according to their forms of manifestation: deterministic and statistical.

Mathematical science, like other sciences, studies the patterns of events that occur in real life. For example, you can show the properties of geometric figures, established formulas for calculating their areas and volumes, or in the process of observations, the laws of motion of natural phenomena are given in the form of mathematical formulas. Such examples refer to deterministic laws [3].

In addition to the above, it is not possible to form a specific opinion about the events that occurred, despite the knowledge and skills obtained as a result of

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

summarizing the information received by students about most events observed in the lesson or outside the classroom. Because in our everyday life or in nature there are events that cannot be defined as the object of prediction.

Please note that in mathematics there are problems that cannot be avoided. Because these questions directly contribute to the development of students' mental thinking. One of them is the teaching of stochastic elements.

Teaching stochastic elements in mathematics education ensures the development of creative application and thinking skills in students, regardless of their age. Because the student follows other natural laws based on the laws of probability theory, events occurring in everyday life, statistical calculations and analysis.

If we pay attention to the activities of children from an early age, we will see that in the school mathematics course there is no need to develop probabilistic thinking in students. Because in everyday life, students become familiar with the elements of probability theory even before coming to school. Discovering these abilities in students should be one of the most important tasks of a teacher. Thus, there are students who have special mathematical abilities or are able from a young age to perceive, analyze and draw conclusions from phenomena occurring in nature. Therefore, teachers should not remain indifferent to such issues and encourage their further development [5].

In accordance with the content line, stochastic elements are taught to students on the basis of practical tasks from primary school age. Thus, students conduct tests on certain objects, analyze the results of the tests, and based on the analysis they can build games, tables, and graphs. It is clear that the main objective here is to develop students' creative thinking, judgment, etc. through experimentation on objects.

The famous psychologist S. Rubinstein [11] described the mechanism of development of schoolchildren's thinking as follows. S. Rubinstein noted that: "The problem of thinking begins with the situation. Here, if the problem is presented in the form of a task, that is, if the data, conditions and what needs to be found (indications of what to find) are presented separately, then thinking determines the relationship between the conditions and the requirements of a given problem. To summarize what has been said, the thought process when solving a problem consists of coordinating the relationships between the conditions and requirements of the problem" [11].

It is clear that the psychological idea put forward by S. Rubinstein [11], has a more obvious application in mathematics education. Because the specifics of mathematical education are structured in such a way that the task of teaching each subject is characterized by a situation, observations of objects and the

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

search for connections between objects. Of course, different methods should be used to implement the mentioned ideas. The role of experimentation, games and ICTs deserves special mention here. We can conduct research based on a number of important rules for organizing experiments and dividing connections between objects.

So, based on observations, to determine whether there are connections between two objects, you can change the location of these objects and statistically evaluate the events. On the other hand, perception can be changed by observing objects and thinking about them. In addition, they determine the relationships between these objects live, building models of these objects in class, that is, conducting practical experiments, and not imagining them in their minds. In all three cases, the student identifies events that occur between objects. That is, the student identifies different connections, and the same connections, between his analysis and the events taking place. In particular, it should be noted that thinking formed in this way is called visual-practical, practical thinking. The features of objects presented to students in an obvious and non-obvious form are regularly changed so that the student, with the help of visual-practical or practical thinking, can determine the connections between phenomena occurring in nature.

In such a continuous learning process, events happening to objects will have a clear representation in the student's mind. The student specifically studies the features of each object and performs an operation on them. In the latter case, the student's thinking will be logical or verbal. To determine connections through the three cases shown, selected objects are specially marked and analyzed through words. Judgment through words is based on logical rules.

Thus, from the conducted research we can come to the following conclusion that teaching the elements of probability theory predominantly forms three states in human thinking: visual-figurative, visual-practical, verbal-logical.

RESEARCH METHODS / МЕТОДИ ДОСЛІДЖЕННЯ

The following methods were used in the work:

- study, analysis, systematization of philosophical, psychological, pedagogical, methodological literature, educational programs, textbooks and teaching aids, dissertations on the research problem;
- analysis and evaluation of the experience of teaching stochastic elements in secondary schools in Azerbaijan;
- surveying secondary school students, interviewing mathematics teachers;
- statistical processing and analysis of experimental results.

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

RESEARCH RESULTS / РЕЗУЛЬТАТИ ДОСЛІДЖЕННЯ

In the process of studying the elements of statistics and probability theory, we come to the conclusion about a deeper assimilation of certain or vague concepts inherent in the speech form of cognitive activity, the analysis of important events that occur through observation of objects, bodies, geometric figures. In the process of studying mathematics, students gradually get used to such skills, and the knowledge gained is remembered for a long time.

Let us determine the level of student learning, including the difficulties they encounter, using a visual and practical form of stochastic elements in grades I–IX.

Teaching the elements of statistics and probability theory is applied in the lower grades through problem solving using the principles of visual-operational thinking. Prepared questions should be designed to develop students' knowledge and skills, creative research activities, and purposeful judgment abilities in the process of solving a problem. Similar problems can be attributed to different areas of mathematics. So, along with mathematical, geometric, non-standard problems, it can also be classified as combinatorial problems. When solving combinatorial problems intended for students in grades V–VI of secondary school, they can do it very easily without using any formulas. As students in the above grades progress to higher grades, they complete the solution by making logical judgments in solving combinatorics problems, conducting research, or analyzing what is happening. For example, how many ways can a notebook, pen, pencil, and pen be placed on a desk, and how many ways are there to use these things? Using existing teaching methods, students try to solve this problem using a form of visual and practical thinking. This creates students' interest in the subject. Constant use of this type of mathematical problems allows you to both master theoretical material and retain the acquired knowledge for a long time. In addition to the above, students encounter certain difficulties in solving combinatorial problems, which, according to observations, are caused by inattention. To do this, the condition of each problem to be solved must be carefully studied by students, divided into separate sections according to the state of the problem, the solution must be completed and finally combined into a single whole.

Transformations performed when solving combinatorial-element problems in teaching mathematics can be carried out in real and mental form based on visualization. Transformations when solving combinatorial problems are usually based on mathematical signs, symbols, inscriptions and visual aids. The above three forms can be applied for one issue. Therefore, it is necessary to

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

be careful both when solving tests of a testing nature and in tasks formulated to solve educational problems, so that each formulated task can be fixed in the mind with the help of visual means.

In the process of solving combinatorial problems, the property of visual-operational thinking is used in such a way that through this property it is possible to determine and change the relationships between observed objects, similar or different properties, location and structure of these objects, including touching a plane or space with a hand.

For example, students can express opinions based on their observations about pyramids and prisms, which are figures in space. Because it is more convenient to determine all the states of these figures by moving them from one place to another or changing their direction by running your hand along the contours. Therefore, when applying this kind of questions to practical exercises, he does not encounter any difficulties, but, on the contrary, is forced to continue until he receives an accurate result of solving the problem. Based on the knowledge gained from observing phenomena occurring on objects, the experiment can be carried out as follows: Suppose there are 7 black and 5 yellow balls in a bag. It is necessary to accidentally remove the ball from the bag or return it to the bag. To do this, you need to guess what color the ball is out of the bag. The results obtained during the experiment are compared with the expected colors. So, as a result of the experiment, a certain event occurred. Thus, it is known that a black or yellow ball was taken from the bag. In solving this issue, students have the opportunity to take an active part.

So, after students have formed initial ideas about the theory of probability by solving given simple problems, the classical definition of this theory and the types of statistical calculations can be explained.

The above-mentioned visual-practical, logical-verbal, visual-figurative forms of thinking are important when solving practical exercises for grades V-IX. Because the conditions of the problem being solved determine whether the selected objects correspond to the conditions of the problem. To solve problems posed in this way, students are specifically involved in laboratory work. Several statistical indicators of events occurring in each experiment are recorded. Based on the obtained records, comparisons are made based on the properties of probability theory. By completing tasks of this type, students will be able to present information, use a number of mathematical formulas, tables, graphs, etc. On the other hand, when solving such problems, intra- and inter-subject connections are used when students repeat previously studied topics [4].

To solve problems related to combinatorics, students must perfectly repeat and remember the elements of set theory that they studied in grades

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

V–VI. Because if they don't know information about a finite, infinite, empty set, they will have a hard time solving problems involving probability. Consequently, the concepts of sets constitute the alphabet of probability theory.

Thus, as a result of the formation of visual-practical, visual-figurative or logical-speech thinking in the process of solving a problem, the student completes the task using the method of creative application. In this case, it is possible to develop the mental activity of students and instill interest in the subject [9].

CONCLUSIONS / ВИСНОВКИ

The conducted research allows us to draw the following conclusions. Analysis of the tasks of introducing a stochastic line showed that during the transition to a market economy and the influence of random factors associated with changes in the socio-economic situation in the country, there is a need for specialists, the ability to work with dynamically changing modern technologies in external conditions has increased, and the ability to assess the situation has increased. and make informed decisions in uncertain situations. As a result, social orders for educational institutions have changed. As a result of these changes, new State Education Standards were adopted, defining the directions for preparing students for life in modern socio-economic conditions. Important changes have occurred in mathematics education; the need for the application of probability theory, mathematical statistics, the theory of random processes, and probabilistic statistical methods has increased.

The interpretation of probabilistic-statistical material could not be systematic in the literature of that time and was not included in the curriculum. Only in 2007, materials from probability theory and mathematical statistics were included in the State Education Standards for secondary schools. In accordance with this standard, students must learn to receive, interpret and transform information presented in tables and diagrams that reflect the properties and features of real processes and events in the learning process; Students should have an understanding of statistics, the probability of a random event, combinatorics, the law of large numbers and the role of mass events, practically certain and improbable events.

In the “Mathematics” course of secondary schools, a methodological system for teaching the subject “Mathematical Statistics” has been developed. It has been determined that when teaching the subject “Mathematical Statistics” it is necessary to pay attention to developing the following practical skills in students:

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

- read and understand the information presented in tables and diagrams;
- create tables and diagrams based on data;
- determine the statistical characteristics of a set of numbers.

Future Research Directions Prospects for further research in this direction / Перспективи подальших досліджень у цьому напрямі. The methodology for teaching the subject "Elements of Probability Theory" in grades 5–9 has been developed taking into account modern requirements. It has been determined that when teaching the subject "Elements of Probability Theory" it is necessary to pay attention to developing students' practical skills in assessing the probabilities of events using the simplest examples found in everyday life.

REFERENCES / СПИСОК ВИКОРИСТАНИХ ДЖЕРЕЛ

[1] A. S. Adıgözəlov, *Məktəbdə riyaziyyat təliminin nəzəri əsasları*. Bakı, Azərbaycan, 2018.
[2] C. Allahverdiyev, A. Hacıyev, H. Əhəmədova, *Ehtimal nəzəriyyəsi və riyazi statistika terminləri lüğəti*. Bakı, Azərbaycan, 2002.
[3] Ə. S. Bayramov, Ə. Ə. Əlizadə, *Psixologiya*. Bakı, Azərbaycan, 1989.
[4] M. X. Əsədov, *Orta məktəbin riyaziyyat kursunda məsələ həlli təliminin nəzəri və metodik problemləri*. Bakı, Azərbaycan, 2018.
[5] Ə. Ə. Hüseynov, S. Y. Qasımov, *Ehtimal nəzəriyyəsi və riyazi statistika.* Bakı, Azərbaycan: Çaşoğlu, 2006.
[6] F. N. İbrahimov, *Riyaziyyat təlimi haqqında pedaqoji düşüncələr*. Bakı, Azərbaycan: Mütərcim, 1999.
[7] Ə. M. Məmmədov, O. Rzayev, *Kombinatorika, ehtimal nəzəriyyəsi və riyazi statistikanın əsasları.* Bakı, Azərbaycan, 2011.
[8] M. H. Yaqubov, S. İ. Babayeva, «Çoxluqlar, birləşmələr, kombinatorikanın, ehtimal nəzəriyyəsinin elementlərinin tədrisinə dair», *Fizika, riyaziyyat və informatikanın tədrisi*, № 2, s. 3–8, 2019.
[9] E. A. Bunimovich, Probability and statistics. 5–9 grades. Moscow, Russia, 2002.
[10] B. V. Gnedenko, *Course on Probability Theory*. Moscow, Russia, 1965.
[11] S. L. Rubinstein, *Principles and ways of development of psychology*. Moscow, Russia, 1959.
[12] Yu. N. Tyurin, «Teaching the theory of probability and statistics at school», *Mathematics at school*, no. 7, p. 2–6, 2010.
[13] A. N. Kolmogorov, *Basic concepts of probability theory*. Moscow, Russia: Nauka, 1974.

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

МОЖЛИВОСТІ ТА ШЛЯХИ НАВЧАННЯ СТОХАСТИЧНИХ ЕЛЕМЕНТІВ У ВИКЛАДАННІ МАТЕМАТИКИ В ШКОЛІ

Ібрагімова Наїля Різван гизи,
кандидат наук, старший викладач
Гянджинського державного університету.
Гянджа, Азербайджан.
https://orcid.org/0009-0002-7585-3916
nailaibrahimova@yandex.ru

Анотація. Стратегії та підходи, які використовуються в шкільних підручниках і методичній літературі для викладання елементів теорії ймовірностей, свідчать про те, що для того, щоб учні могли повністю зрозуміти теорію ймовірностей, вони мають вміти ідентифікувати статистичні показники подій, які відбуваються в їхньому повсякденному житті. Згідно з викладеною ідеєю, доцільно було б почати з поставлених питань, які вимагають розв'язання діяльності повсякденного життя студентів і взаємодії з відповідною ситуацією. Як наслідок, не кожна теорема, подана як теоретична інформація під час навчання математики, потребує доведення. На доведення тих теорем витрачається досить багато часу, але до завдання курсу входить формування корисних звичок, а не навичок доведення теорем. Процес впровадження змістової лінії «Статистика та ймовірність» у шкільному курсі математики є типовим і досить складним завданням. Існує така теза, що для оволодіння початками теорії ймовірностей учням необхідно прищеплювати знання та навички за допомогою нових методів навчання, на відміну від традиційного навчання. Зважаючи на це, навчання підростаючого покоління необхідним навичкам – це єдине, що хвилює психологів і педагогів у наш час. Тому що учень має глибоко відчувати уявлення про навколишнє середовище, його життєві проблеми, самоудосконалювати їх, оцінювати як самостійну лінію у напрямі формування логічного мислення, розвитку активності мислення. У зв'язку з новим включенням теорії ймовірностей і статистики до шкільної програми з математики, виникає проблема впровадження цих матеріалів у шкільні підручники. Крім того, кількість методичної літератури, що стосується особливостей цього курсу, поки що не така велика. Тому створення методики викладання теорії ймовірностей і статистики у загальноосвітніх класах, а також аналіз результатів курсу є реальними темами.

ISSN 3041-1831 (print) Ідентифікатор медіа: R30-05068
ISSN 3041-184X (online) *Media identifier: R30-05068*
Вісник післядипломної освіти: збірник наукових праць. Серія «Педагогічні науки». Вип. 29(58). Категорія «Б»
Bulletin of Postgraduate education: collection of scientific papers. Educational Sciences Series. Issue 29(58). Category «B»
https://doi.org/10.58442/3041-1831-2024-29(58)

Ключові слова: математична підготовка; теорія ймовірностей; студенти; школа; стохастичні елементи; внутрішньо- та міждисциплінарна інтеграція.

TRANSLATED AND TRANSLITERATED / ПЕРЕКЛАД, ТРАНСЛІТЕРАЦІЯ

[1] A. S. Adigozelov, Theoretical foundations of mathematics education at school. Baku, Azerbaijan, 2018. (in Azerbaijani).
[2] C. Allahverdiyev, A. Hajiyev, H. Ahamedova, Dictionary of probability theory and mathematical statistics terms. Baku, Azerbaijan, 2002. (in Azerbaijani).
[3] A. S. Bayramov, A. A. Alizadeh, Psychology. Baku, Azerbaijan, 1989. (in Azerbaijani).
[4] M. Kh. Asadov, Theoretical and methodical problems of problem solving training in secondary school mathematics course. Baku, Azerbaijan, 2018. (in Azerbaijani).
[5] A. A. Huseynov, S. Y. Gasimov, Probability theory and mathematical statistics. Baku, Azerbaijan: Chashoglu, 2006. (in Azerbaijani).
[6] F. N. Ibrahimov, Pedagogical thoughts on mathematics education. Baku, Azerbaijan: Translator, 1999. (in Azerbaijani).
[7] A. M. Mammadov, O. Rzayev, Combinatorics, the basics of probability theory and mathematical statistics. Baku, Azerbaijan, 2011. (in Azerbaijani).
[8] M. H. Yagubov, S. I. Babayeva, "On the teaching of sets, combinations, elements of combinatorics, probability theory", Teaching of physics, mathematics and informatics, No. 2, p. 3–8, 2019. (in Azerbaijani).
[9] E. A. Bunimovich, Veroyatnost' i statistika. 5–9 klassy. Moskva, Rossiya, 2002. (in English).
[10] B. V. Gnedenko, Kurs teorii veroyatnostej. Moskva, Rossiya, 1965. (in English).
[11] S. L. Rubinshtejn, Principy i puti razvitiya psihologii. Moskva, Rossiya, 1959. (in English).
[12] YU. N. Tyurin, «Prepodavanie teorii veroyatnostej i statistiki v shkole», Matematike v shkole, № 7, s. 2–6, 2010. (in English).
[13] A. N. Kolmogorov, Osnovnye ponyatiya teorii veroyatnostej. Moskva, Rossiya : Nauka, 1974. (in English).

Стаття надійшла до редакції
06 червня 2024 року