TEACHING OF STOCHASTIC ELEMENTS IN SCHOOLS OF UZBEKISTAN AND SOME FOREIGN COUNTRIES

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Abstract: This article analyzes the teaching of stochastic elements in schools in foreign countries and Uzbekistan.
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Introduction

Full-fledged existence of a citizen in the current complex and multicultural society is directly related to the right to receive information, with its availability and reliability, with the right to a choice of information that cannot be made without ability to make conclusions and forecasts based on analysis and its incomplete processing, and its contradiction. Because it requires at least the initial probability and statistical literacy of each person in its workplace. Without a good preparation, it is difficult to perceive and interpret adequately a variety of social, political and economic information, including the meaning of Bank loans and insurance policies, employment tables and charts of sociological surveys, the results of various elections and referendums, calculations of the "consumer basket"- living standards, and even forecast reports. At the same time, the orientation to the democratic thinking principles, towards the multi-optionality development of real situations and events that cause of the formation of a personality capable of living and working in a complex constantly changing world, which inevitably requires the development of probabilistic and statistical thinking of the younger generation. The solution of these difficulties should be taken by the course of school mathematics.

The process of rapid society computerization, the development of information technologies of in different levels and purposes bears the need for flexibility, variability, and critical thinking. These attributes are effectively developed in the process of solving combinatorial problems. Because of this reason, it is so significant to include combinatorial knowledge and skills in the intellectual baggage of modern person. It’s necessary to pay attention to the domestic and foreign experience of studying combinatorics skills of schools. In many foreign countries, students are familiar with the elements of probability theory and statistics from the first school years and throughout their studies they learn probabilistic and statistical approaches to analyzing common situations encountered in everyday life. In English schools are guided and accepted by the opinion that "small children do not understand nor have abstract concepts", because of that English schools consider specific objects with them only. The transformation or transition from primary school to the secondary school is accompanied

by a sharp turn from concrete action to formal mathematical apparatus, to more abstract learning. In that case the goal is to enable children to change their way of thinking abilities from the concrete to the abstract [1].

Even it did not remain without attention questions of combinatorics in the curriculum of mathematics in the United States. In the V–VIII grades of secondary schools in the United States, students are introduced to the set theory elements. To study of the combinatorics is given a different quantity of hours, but they are compulsory [2]. To lay a solid basis of mathematical knowledge, students of grades 0-5 should study and do the tasks in field of geometry and algebra including probability theory and statistics. The methodological recommendations of US schools note to the importance of understanding probabilistic patterns for the modern citizen, who will be oriented in the flow of information. It is supposed to widely use games and game situations to build probabilistic models and determine the winning probabilities. Among the tasks of probabilistic and statistical attributes, there are often those that are intended for group work or they include entire class. For example, students could be asked to draw a portrait of a student with an average given age. "What does he look like? How old is he? What is his height? What are his grades? How many siblings does he have? What TV shows won't he miss? What kind of music does he like?" – a teacher puts questions on each of which should be answered by a group of students. As a result of collective work, a portrait of the student is drawn, with which everyone can compare himself or herself in the class. In high school, probabilistic ideas and methods are used to formulate and solve problems of both an applied and theoretical attribute.

Students learn with the discrete random variables distribution, the normal distribution, and how to understand and use average samples, variation indicators, and correlation coefficients to analyze and compare samples. So Japanese schools start to study the propaedeutic course of statistics from the 2nd grade, i.e. from the moment when most students become 7 years old. For 5 years, Japanese students are developing skills in working with empirical data, tables and charts. In junior school, probabilistic and statistical material is studied separately from mathematics course. In the 1st grade of Junior school (where study continues 7 years), the elements of statistics are considered with the rules of dividing data into steps, histograms and their distribution into curves, frequency, their tables and graphs, as well as the mode, median and arithmetic mean as typical representatives of the sample. In the 2nd grade, students have to learn to calculate the random chances event, consistently systematizing and classifying the possible outcomes of a random experiment, find the number of permutations and combinations in simple cases, calculate probabilities, and use the statistical definition of probability to solve applied problems. During the 3rd grade students start to study general analyzing combination, correlation tables and charts. Due to such a large probability-statistical block that is compulsory in the secondary school program of Japan, probabilistic

concepts are firmly included in the daily circle of students representation. The volume of the probability-theoretic cycle is 2.5% of the total volume of mathematics. The current programs of probability theory and mathematical statistics at the French school were adopted in the late of 60s, and minor changes were made towards more accessible materials in 1981-85. In both educational and professional French schools, elements of probability theory and mathematical statistics are taught in the 2nd cycle of education, starting at the age of 16. But present day, French teachers are looking for and finding ways to teach students with the basics of probability theory in earlier ages (from the age of 13). Children preparation and their perceptions towards combnatorics ideas are required in the mathematics curriculum of Poland primary schools. The main thing of getting acquainted with these ideas is a system of tasks and exercises which is available to children and involving solution for manipulative activity. The material for these exercises could serve the surrounding objects, the students themselves, their toys, and other things. Methodological recommendations for teachers are scientific and methodological tips and popular articles that are prepared by A. Plocki. In the course of mathematics of classical and humanitarian lyceums are considered to study such topics known as “combinatorics problems” which are for 4th grade. “Tasks for calculating the number of segments and selecting pairs from finite sets. Examples of the graphs usage in field of combinatorics problems solutions. Tasks for the formation of words from the letters of the alphabet, positional number systems. Choosing a path between two points. Pascal’s triangle”.

In German schools, the basic concepts of combinatorics, simple problems, and Pascal's triangle are considered in the 11th grade. At the beginning of this century, Ukraine actively worked to reform its school education, which meant clarifying and supplementing the content of education. Thus, the traditional content of mathematics were supplemented with such themes as "Elements of set theory. Combinatorics", "The beginning of probability theory, elements of statistics". In the 5th grade program was included the theme of solving combinatorial problems. However, according to the current program in mathematics, the elements of combinatorics take place only in the course of algebra of 9th grade which is considered to the basic combinatorial rules. In recent decades, numerous scientific and methodological studies have appeared in Russia which devoted to the development of a new probabilistic (stochastic) content-methodical line (O. Bychkova, Zh.Kudratov, D. manevicha, V. Potapov, L. Terekhova, V. Firsova, etc.), the context of study is directed and considered to the elements of combinatorics. Today combinatorics is gaining its independent significance as a necessary component of secondary mathematical education, so there is a necessity to further search for improvement its approaches by taking into account previous experience. Constantly assuring the importance of anticipated results, students gradually develop their ability in field of mastering methods of making decision and improving strategy of thinking.

In our country, combinatorics, probability theory and statistical elements are included in the school mathematics discipline program as separated topics or chapters according to the new state educational standards of the competency criterion. This case is not a novelty for school mathematics discipline. Before in the schools also taught combinatorics, probability theory and mathematical statistics. Later these subjects were excluded from the educational program. Sometimes possible to meet elements of combinatorics and its related tasks in the school textbooks. In the mathematics textbook which is designed for 3rd grade students, the topic of combinatorial and its logical related topics are also included. For instance, according to the task we make an example [3]: "There are four students in the class and they're greeting each other by shaking their hands. How many greeted students can we count? Check your answer in the experiment". In the 4th grade mathematics textbook of primary classes have tables and diagrams where students can formulate their knowledge and skills through the discussion of the subject [4]. In the 6th grade textbooks of general secondary schools include themselves themes to study with tables and diagrams, data analysis, combinatorics elements, practical exercises and simple combinatorics rules. By the 7th grade, students get acquainted with the basic rule of combinatorics. By using the textbooks, students through study replacement combinatorics and solving combinatorial tasks of grouping themes can form their combinatorics skills [5]. For instance, we can meet such type of task "There are white bread, black bread and three types of sausages in the school canteen. How many types of sandwiches possible to make through using these products?." In the 8th grade algebra textbook includes itself concepts of data analysis, data visualization, medium value, mode and median. Besides, there are selection method, combinatorial tasks, basic rules of combinatorics and combinatorial tasks solving reflected in the textbook [6]. In the 9th grade algebra textbook is directed to form knowledge and skills of students and this textbook includes itself mathematical events, probability events, relative frequency events, random quantities and their numerical characteristics. By the 10th grade, students begin to acquaint with the collection concept, work on the set of collections and forming feedback according to their skills and study. In the 11th grade students start to have competence and skills through studying the chapter "Data analysis and Probabiliyty" where they learn combinatorics tasks, Newton's binomial, types of statistic data, medium value, mode and median, probability events and their randomness, event tasks and depiction them according to the Eyler-Venn diagrams. Through reviewing educational curriculums and textbooks possible to notice that text books and curriculums have same system but they are not categorized properly. At same time when National educational project was planned to implement combinatorics, probability theory and mathematical statistics elements in the school there were also topical issues in field of development relevant recommendations. The project is implemented by the Ministry of Education of the Republic of Uzbekistan in cooperation with international educational institutions in order to implement advanced educational technologies based on modern

approaches in the subjects of "Reading", "Mother tongue" and "Mathematics" in the schools of our country. The National Education Project is planned to introduce modern methods of teaching in the secondary schools and radically update the standards of education curriculum and teaching methods - "Reading" (1-4 grades), "mother tongue" (5-6 grades), "Mathematics" (1-6 grades). Is it necessary to teach the elements of stochastic in school? If we rely on the world experience of teaching mathematics, then the stochastic elements should be taught in school. This is evidenced by PISA where the results of the research conducted within the framework of the international program for knowledge assessing of students. There is given a necessity to know form of stochastic knowledge - it is noticed that mathematics is important for students competence in field of science. Therefore, if we rely on other international experiences in this area, then the implementation of the teaching of combinatorics, probability theory and mathematical statistical elements in secondary school in the following sequence is considered in accordance with a planned aim. In the elementary classes, it is not necessary to give combinatorics elements in the form of a separate subject. In this stage, work is done with the simplest elements of statistics. The term "combinatorics" is not included. It is recommended to give the simplest tasks in field of combinatorics within the composition of various themes. Doing simplest combinatorics tasks it's necessary to know limitations and how many different ways possible to choose in condition of same set items with their characteristics. The main purpose of giving such tasks to primary school students is to improve their thinking abilities, to develop mathematical observations in different possible situations, to increase their mathematical imagination and logical thinking skills by using counting. Therefore, the purpose of such kind of tasks to count all possible situations and opportunities through using sorting method. The aim of this method to analyze all possible conditions and discussions them after sorting or/and selection. When task solving process is going on through sorting method, it is very important to consider and take into account all possible situations, and not to overlook any circumstances in this process. Graphic organizers are simplifiers and facilitate the sorting process: it's recommended to use tables and opportunities tree graphics. The tabular method of solving combinatorial problems is useful in solving combinatorial problems involving the formation of two pairs of several objects. Sometimes, in solving of combinatoric tasks better to use depiction method or tree like scheme, so tree like scheme is helpful to take into account all possible conditions. These methods are convenient by their simplicity and demonstrability. 3rd and 4th grades students describe their numerical data in the form of a specific sequence or in the tables, in the bar chart they work with given data in tables or diagrams forms, and do small statistical processing with them: students in their educational activity trying to understand data, to read, to find the largest and the smallest totals by using column rows, to make conclusions according to their calculation findings, to answer to the questions according to the diagrams and tables. In grades of 5-6 is given the basic concepts of combinatorics: In solving many

practical problems, it is necessary to perform different grouping (sorting), actions, etc. on the elements of sets. The branch of mathematics that deals with problems in this area is called combinatorics. In particular situation that could be all cases of problems and their resolves are called combinatorial problems. At this age, students are encouraged to develop their knowledge and skills they acquired in primary school. The term of "combinatorics" is introduced into the rules of combinatorial problems by using multiplication and addition. More complex issues concerning these rules will be proposed. It's given attention to the selection of combinatorics, it includes also sorting and arrangement of combinatorial forms. There are no ready formulas to solve combinatorial tasks. In this stage students begin to discuss about combinatorial tasks, through using sorting, tabular and tree of capacities methods, it's also includes itself using of graphic organizers. It's known forming of combinatorics skills of students is the first step of implementation probability theory in school. In this step probability theory and its classical geometrical explanations are implemented by using deductive method. This aspect is also included itself random event. Occurred or non-occurred random events need to be explained by using different examples. In this step students have to gather information from surround environment, and they have to prepare questionnaires, and collected information should be sorted, analyzed and concluded by them. Depiction of information in form of table, column or circle types help to understand, to read and to make conclusions better and form better educational skills of students. Using the given rules in the table, there is a recommendation to fill of empty box, line or the column which are part of tasks. Besides, average numeral data line, the biggest total, the smallest total, and median and mode meanings are strengthening through doing the tasks which are connected to the real life.

As we can see, the problem of including elements of combinatorics in the secondary school curriculum is not new, and therefore it requires constant and close attention, both from the pedagogical community and from researchers of pedagogical issues. Familiarity with the combinatorics must obey not only the desire for professional training, but also it should bring to students a new point of view about reality phenomena, fostering them with the ability to see mathematics applications and new ideas that were considered for the solution of different kind of problems.

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