SJIF Impact Factor: 7.001| ISI I.F.Value:1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 5 | Issue: 11 | November 2020 - Peer Reviewed Journal

COMPETENT APPROACH IN TEACHING PROBABILITY THEORY AND MATHEMATICAL STATISTICS

Toshboeva Saida Raxmonberdiyevna
Lecturer, Fergana State University

ABSTRACT
This article addresses competency issues, problems, and suggestions for teaching probability theory and mathematical statistics in higher education.
KEYWORDS: *competence, stochastics, fundamental principles, the principle of professional orientation of training.*

DISCUSSION

The current stage is characterized by high rates of scientific and technological progress, the emergence of fundamentally new progressive technologies, which determines the urgency of the quality of the educational process that meets the requirements of the modern world economy and international standards.

In the context of the practical implementation of modern methods of assessing the quality of education, the results of the international research PISA (Program for Internaitional Student Assesment) and in Uzbekistan, which revealed relatively low results of mathematical literacy of schoolchildren when using mathematical knowledge in non-standard situations that require creativity and intuition, as well as incompetence in solving problems using cognitive skills to solve interdisciplinary practical problems in which the solution is not clearly defined. The PISA conclusions link this problem, first of all, with traditional methods of checking the quality of education, which are limited mainly to checking knowledge, and not the ability to apply knowledge in a specific situation; and indicate the need to develop a competency-based approach in the formation of educational programs for higher pedagogical education.

When using the concepts of "competence-based approach", "competence" and " expertise" in pedagogical research, there are attempts to distinguish between their use. YES. Ivanov et al. [1] give the following interpretations of them:

•competence - a set of interrelated personality traits (knowledge, abilities, skills, methods of activity) assigned in relation to a certain range of objects and processes and necessary for high-quality productive activity in relation to them;

• expertise - possession, possession by a person of the appropriate competence, including his personal attitude towards her and the subject of activity;

• competence-based approach is an approach that focuses on the result of education, and the result is not considered the amount of information acquired, but a person's ability to act in various problem situations.

Modern trends in the development of society pose a system-oriented educational and upbringing goal for the higher school, the comprehensive implementation of which is aimed at training competent, creative specialists who are able to make informed and informed decisions in various situations, including random ones.

The existence in the world and society around us of an infinite number of both dynamic, statistical and random patterns, allows us to argue that modern specialists, who are the intellectual resource of society, must possess not only key competencies in the field of their professional activity, but also subject competencies in the field of random. [4]

The development of probabilistic thinking in students' learning process is complicated due to the difficulty of virtual perception of the mechanisms of random processes and patterns, as well as the lack of initial training in probability theory and mathematical statistics.

The educational process in higher education, including in probability theory and mathematical statistics, is subject to certain laws and principles of instruction. [5]

In modern didactics, a whole series of laws and laws of instruction are highlighted. The following regularities are formulated in the works of leading experts:

• conditionality of the learning process by the needs of society in highly qualified specialists of a wide profile, comprehensively developed and creatively active;

• the relationship of teaching and learning in a holistic learning process;

• the dependence of the content of training on its tasks, reflecting the needs of society;

• between subject links between different cycles of academic disciplines and between individual disciplines within a given cycle;

• The relationship between the educational and scientific activities of the student.

The most important regularity of the educational process in higher education is the regularity, which relates to subject relationships. Particular importance is given to the connection of fundamental disciplines with specializing majors. The requirements, which are based on the most important laws, are raised in the role of the principles of training. The patterns of learning are organically linked to the principles of learning, which are implemented both in the educational process as a whole and in its individual components.

Professional orientation in scientific and pedagogical literature is considered as a form of specific inter-subject communication and is characterized as a specialized relationship between general educational knowledge and professional knowledge (G.S. Gutonov, L.V. Melnikova, A.Ya. Kudryavtsev, N.N. Lemeshko, T. V. Voronin, T.N. Aleshin, etc.).

The principle of professional orientation involves the integration of general scientific and special disciplines at the university; general scientific knowledge with special knowledge and skills, as well as the formation of significant qualities of a future specialist. The essence of any teaching principle is revealed in the content of the contradiction to which it is directed. The principle of professional orientation resolves the contradiction between the requirements of society for the formation of a comprehensively developed holistic personality and the need for its preparation for active participation in a certain area of professional activity in accordance with personal interests, individual abilities, and social needs. [2]

The professional and pedagogical orientation of teaching mathematics is understood as the need for purposeful and continuous formation of the basics of professional mastery among students, based on active and in-depth knowledge of the school course of mathematics, its scientific foundations and methodological support, acquired on a favorable emotional background of a positive attitude to the profession of a teacher, to mathematics as to the subject.

Currently, in the didactics of higher education, six principles have been identified on which the concept of professionally-pedagogical orientation of education is based: fundamental, continuity, leading idea, binary, informatization, integrated approach (A.G. Mordkovich, G.L. Lukankin, N.I. Batkanova). [3]

Consider the possibility of implementing the principle of fundamentality in the process of teaching probability theory, the study of which is an organically integral part of the process of teaching mathematics.

The principle of fundamentality lies in the fact that the teacher must have fundamental mathematical training, providing him with mathematical knowledge that goes far beyond the school course of mathematics, and show erudition in the implementation of inter-subject relationships.

Students, as a rule, have a very meager baggage of school knowledge from the field of stochastics. In this regard, of particular interest are tasks that demonstrate the connection of probability theory with other sciences: physics, chemistry, biology, psychology, economics, etc., which clearly shows its interdisciplinary connections with other courses.

Obviously, for a better assimilation by students of the material throughout the entire course of study, special attention should be paid to the connection between learning and life, based on concrete examples. This will allow students not only to change their (by the way, quite common) attitude to probability theory as a science abundant in abstract concepts, but also to successfully apply their knowledge in practical activities.

Due to the fact that the course of probability theory is an important element of the methodological preparation of the future teacher, the variability of introducing basic concepts is of great importance. A comprehensive presentation of the material, a demonstration of various ways of introducing the same concept, and solving problems is necessary. For example: various definitions likely (classical, statistical and geometric); calculating the desired probability using various formulas and comparing the obtained values.

This approach to learning contributes to the formation and development of the student's ability to think abstractly, to freely navigate in various approaches to the study of material. When studying stochastics, it is useful to use algorithms to solve standard problems, as well as to form skills for self-compilation of algorithms, etc. In problems, it is necessary to draw students' attention to the relationship between scientific and practical

SJIF Impact Factor: 7.001| ISI I.F.Value:1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 5 | Issue: 11 | November 2020 - Peer Reviewed Journal

components, identify patterns that will allow us to build a mathematical model, and find an algorithm for solving.

As an example, consider the following task: In a batch of 10% of non-standard parts. Four pieces are selected at random. Write the binomial distribution law of the discrete random variable X - the number of non-standard parts among the four selected ones and construct the polygon of the resulting distribution. [6]

To solve this problem, the student must know about the law of distribution of a discrete random variable, i.e. what values does this random variable take? It takes values from 0 to 4:

X	0	1	2	3	4

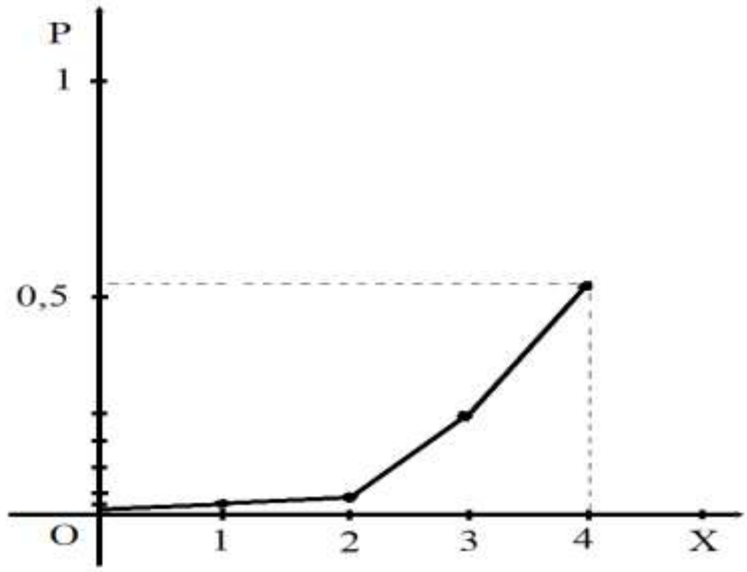
But knowing this is not enough to fully understand this random variable. We must determine with what probability these values are accepted. To do this, we calculate these probabilities:

$$P(\mathrm{X}=0)=C_4^0\cdot 0{,}1^4\cdot(1-0{,}1)^0=0{,}1^4=0{,}0001$$
$$P(\mathrm{X}=1)=C_4^1\cdot 0{,}1^3\cdot(1-0{,}1)^1=4\cdot 0{,}1^3\cdot 0{,}9=0{,}0036$$
$$P(\mathrm{X}=2)=C_4^2\cdot 0{,}1^2\cdot(1-0{,}1)^2=6\cdot 0{,}1^2\cdot 0{,}9^2=0{,}0486$$
$$P(\mathrm{X}=3)=C_4^3\cdot 0{,}1^1\cdot(1-0{,}1)^3=4\cdot 0{,}1\cdot 0{,}9^3=0{,}2916$$
$$P(\mathrm{X}=4)=C_4^4\cdot 0{,}1^0\cdot(1-0{,}1)^4=0{,}9^4=0{,}6561$$

Check: 0.0001 + 0.0036 + 0.0486 + 0.2916 + 0.6561 = 1

We write the desired binomial distribution law X:

X	0	1	2	3	4
P	0,0001	0,0036	0,0486	0,2916	0,6561



Let us construct a polygon of the obtained law, the distribution of a discrete random variable X-number of non-standard parts among the four selected ones.

After the student answers the questions of the examination card, the examiner asks the student additional questions. The teacher stops asking additional questions as soon as the student discovers not knowing the question asked. The probability that a student will answer any additional question asked is 0.9. It is required: a) to draw up the distribution law of a random discrete variable X - the number of additional questions that the teacher will ask the student; b) find the most probable number k0 of additional questions asked to the student.

Slution. a) Discrete random variable X - the number of additional questions asked - has the following possible values: $x_1=1$, $x_2=2$, $x_3=3$, …, $x_k=k$, … Let's find the probabilities of these possible values.

The X value will take the possible value x1 = 1, (the examiner will ask only one question) if the student does not answer the first question. The probability of this possible value is 1-0.9 = 0.1. So $P(X=1)=0{,}1$.

The X value will take the possible value x2 = 2 (the examiner will ask only two questions) if the student answers the first question (the probability of this event is 0.9) and does not answer the second (the probability of this event is 0.1). In this way, $P(X=2)=0{,}9\cdot 0{,}1=0{,}09$.

Similarly, we find

$P(X=3)=0{,}9^2\cdot 0{,}1=0{,}081$…… $P(X=k)=0{,}9^{k-1}\cdot 0{,}1$…

Let's write the required distribution law:

X	1	2	3	k	.

SJIF Impact Factor: 7.001| ISI I.F.Value:1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 5 | Issue: 11 | November 2020 - Peer Reviewed Journal

p	0,1	0,09	0,081	$0{,}9^{k-1}\cdot 0{,}1$	.

b) The most probable number k0 of questions asked (the most probable possible value of X), that is, the number of questions posed by the teacher, which has the greatest probability, as follows from the distribution law, is equal to one.

The two guns are fired alternately at targets until the first hit by one of the guns. The probability of hitting the target with the first gun is 0,3, the second – 0,7. The first gun starts firing. Draw up the distribution laws for discrete random variables X and Y - the number of spent shells, respectively, by the first and second weapons.

Solution: The events A_i and B_i are empty - the first and second shells hit the target, respectively. The first gun will use up one shell (X = 1) if it hits the target on the first shot, or it misses, and the second gun hits the target on the first shot:

$$p_1 = P(X=1) = P(A_1 + \bar{A}_1 B_1) = P(A_1) + P(\bar{A}_1 B_1) =$$
$$= P(A_1) + P(\bar{A}_1)\cdot P(B_1) = 0{,}3 + 0{,}7\cdot 0{,}7 = 0{,}79$$

The first gun will use up two shells if both guns miss on the first shot, and on the second shot the first gun hits the target, or if it misses, and the second gun hits the target on the second shot:

$$p_2 = P(X=2) = P(\bar{A}_1\bar{B}_1 A_2 + \bar{A}_1\bar{B}_1\bar{A}_2 B_2) =$$
$$= 0{,}7\cdot 0{,}3\cdot 0{,}3 + 0{,}7\cdot 0{,}3\cdot 0{,}7\cdot 0{,}7 = 0{,}21(0{,}3+0{,}49) = 0{,}79\cdot 0{,}21$$

Similarly, we get

$$P(X=k) = 0{,}79\cdot 0{,}21^{k-1}$$

The sought distribution law for a discrete random variable X - the number of shells consumed by the first weapon:

X	1	2	3	.	k	.
p	0,79	$0{,}79\cdot 0{,}21$	$0{,}79\cdot 0{,}21^2$	.	$0{,}79\cdot 0{,}21^{k-1}$	.

Control: $\sum p_i = 0{,}79/(1-0{,}21) = 0{,}79/0{,}79 = 1.$

Let us find the law of distribution of a discrete random variable Y - the number of shells consumed by the second weapon.

If the first gun hits the target during the first shot, the second gun will not fire:

$p_1 = P(Y=0) = P(A_1) = 0{,}3.$

The second gun will use up only one round if it hits the target on the first shot, or if it misses, and the first gun hits the target on the second shot:

$$p_2 = P(Y=1) = P(\bar{A}_1 B_1 + \bar{A}_1\bar{B}_1 A_2)\,) =$$
$$= 0{,}7\cdot 0{,}7 + 0{,}7\cdot 0{,}3\cdot 0{,}3 = 0{,}21(0{,}3+0{,}49) = 0{,}553$$

The probability that the second weapon will use up two shells

$$p_3 = P(Y=2) = P(\bar{A}_1\bar{B}_1\bar{A}_2\bar{B}_2 + \bar{A}_1\bar{B}_1\bar{A}_2\bar{B}_2 A_{\ 2}).$$

After completing the calculations, we find $p_3 = 0{,}553\cdot 0{,}21.$ Similarly, we get

$$P(Y=k) = 0{,}553\cdot 0{,}21^{k-1}.$$

The sought distribution law of the discrete random variable Y-the number of the projectile consumed by the second weapon:

SJIF Impact Factor: 7.001| ISI I.F.Value:1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 5 | Issue: 11 | November 2020 - Peer Reviewed Journal

Y	0	1	2	.	k	.
p	0,3	0,553	$0{,}553 \cdot 0{,}21^1$	.	$0{,}553 \cdot 0{,}21^{k-1}$	.

Control: $\sum p_i = 0{,}3 + \left(\frac{0{,}553}{1} - 0{,}21\right) = 0{,}3 + (0{,}553/0{,}79) =$
=0,3+0,7=1.

Thus, having analyzed the numerous views of scientists on the problem of competence and expertise, we can say that competence is not an indisputable and obvious phenomenon in educational culture. Competence is not just a set of knowledge and skills, but a whole system that binds them together. Whereas expertise is the ability of a person to self-actualize in any activity, including in the study of probability theory and mathematical statistics based on formed competencies. These concepts are multi-component, i.e. they include knowledge and activity and personal aspects.

LIST OF REFERENCES

1. *Ivanov D.A., Mitrofanov K.G., Sokolova O.V. Competence approach in education. Problems, concepts, tools: teaching aid. M .: APK and PPRO, 2005 .- 101 p.*
2. *Mordkovich A.G. Professional and pedagogical orientation of the special training of a mathematics teacher at a pedagogical institute: Dis. ... dr ped. sciences. - M., 1986. - 355.*
3. *A. Samsonova Interrelation of fundamental principles and professional orientation of teaching probability theory and mathematical statistics of future specialists // Modern high technology. - 2010. - No. 8. - S. 146-149;*
4. *Bunimovich E.A, Bulychev V.A. Fundamentals of statistics and probability: 5–9 cells: A manual for educate. institutions. - M.: Bustard, 2004 .- 288 p.*
5. *Kobzar A.I. Applied Mathematical Statistics. For engineers and scientists.*

a. *M .: FIZMATLIT, 2006.– 816s.*

6. *Gmurman V.E. Guide to solving problems in probability theory and mathematical statistics. M., High School 1979 .- 55-57s.*
7. *Chubarev A.M. Unbelievable probability. -M .: Znanie, 1976. -128 p.*
8. *Shcherbatyx S. V. In the world of stochastics (elective course): uchebnoe posobie. - E: EGU im. I.A. Bunina, 2011. - 148 p.*
9. *Khankulov U. Improving the pedagogical capabilities of teaching the elements of stochastic mathematics in academic lyceums. Autoref. Dis. ... doc. ped. fan.b. Toshkent 2018.*
10. *Gafurova M.A. Formation of mathematical competence in students by creating a new problem from the given problem. Khorezm "Ilm sharchashmalari" 2020 Issue 7, 5 p.*