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DEVELOPMENT OF LOGICAL THINKING SKILLS IN TEACHING PROBABILITY THEORY

Abstract

Logical thinking is an ability to use abstract concepts, it is thinking by reasonings and denials. The level of logical thinking affects progress in a subject therefore it is necessary to develop logic at students. The solution of logical tasks develops ability to allocate essential, to approach generalizations independently. Logical games help to cultivate cognitive interest, ability to creative search, desire and ability to study, and it helps to develop logical thinking in students. The main cogitative operations, such as analysis, synthesis, comparison, generalization, classification and ability to apply gained knowledge are formed as a result. So, students are able to define regularities and perform a task on this regularity, to classify and group objects, to compare, find general and private properties, to generalize and abstract, analyze and assess an activity; to solve logical, non-standard problems by reasonings, to be able to be guided in the schematic image of graphic tasks.

Skills of logical thinking when training probability theory are considered in the article. The experiment was made and the results of efficiency of this problem solution were shown.

Keywords: *logical thinking, logical tasks, experiment, probability theory.*

In modern society, each student has to have necessary logical thinking. Teaching probability theory needs to be constructed so that students could solve logical problems which put them on new higher level. Formation of logical thinking is a task of our research.

Logical thinking is an ability to operate with abstract concepts, this is thinking by reasonings and denials. Level of logical thinking affects progress in a subject therefore it is necessary to develop logic at students.

In this regard, there is a question of logical thinking use in teaching probability theory. *The relevance of the problem* of our research is connected with the fact that in modern society the developed logical thinking of students is one of important skills necessary for future expert. Application of methods in pedagogics for development of logical thinking is necessary for teaching competitive experts. The problem of logical thinking was studied in pedagogics and psychology in the general theory of thinking (O.K. Tikhomirov, R.S. Nemov, L.S. Vygotsky, S.L. Rubenstein).

Logical thinking is one of types of thinking, characterized by use of concepts, logical designs functioning on the basis of language and language means [1].

Logical thinking is developed strictly consecutive thinking during which the person repeatedly addresses use of logical operations and conclusions, and the course of this thinking can be tracked from the beginning to the end and to check its correctness, correlating to the known requirements of logic. R.S. Nemov also noted the importance of scientific thinking: «Scientific thinking is always logical thinking. The lack of strict logic does such thinking unsubstantiated and does not guarantee absence of mistakes. In any case, it is much more difficult to find a mistake in thinking which is intuitive or based on common sense, than in logically sustained and consecutive one» [2, C. 316].

Nevertheless, emphasizing importance of logic in the course of thinking, R.S. Nemov states that logic itself is not an object of research of psychologists. For its studying there is a special science – logic. The difference between logic and psychology consists that logic studies formal rules of thinking, abstracting from the fact that thinking acts as a kind of mental activity of a real student. Thinking for logic is an abstract process of reflection including logical operations and conclusions

which in itself can be considered as correct and wrong irrespective of who these operations, conclusions and conclusions makes. For a psychologist, thinking is one of many informative processes of a person, and thinking interests a psychologist not in terms of its rules, correctness or falsehood, but as special informative process [2].

Logical thinking is difficult, structured process, as well as any other type of thinking. S.L. Rubenstein in the works determined that to the fullest knowledge of subject and permission of the specified task logical thinking goes by means of various operations making various bounds of process of thinking interconnected and overstepping each other. They are analysis and synthesis, comparison, judgment, generalization. These operations are various parties of the main operation of thinking - "mediation", i.e. disclosure of the most significant objective communications, relations [3].

Proceeding from the problem relevance, we defined the subject of our research: «Development of skills of logical thinking in teaching probability theory» for specialties 5B050800 – «Account and audit», 5B050900 – «Finance». The base of the research is Zhangir Khan West Kazakhstan Agrarian and Technical University. Students of BF-12, BUA-12 groups participated in the experiment.

Research objective: development of logical thinking at students by means of additional tasks system, with the use of new teaching technologies.

Research hypothesis: Skills of logical thinking in teaching probability theory will be developed if the complex of tasks in the course of which solution students seize system logical thinking is the basis for technology of development of learning process.

Research problems were defined for achievement of the goal and check of the hypothesis in work:

- The analysis of literature and practice on the research subject
- Identification of the level of logical thinking development at students
- Development and approbation of a series of tasks on the development of logical thinking skills in students
- Check and control of process and activization of logical thinking at students
- To define efficiency of introduction of a complex of logical tasks in studying «Probability theory» discipline

The results of researches on justification of pedagogical conditions necessary for increase in efficiency of the organization of development of logical thinking skills with the use of individual tasks, texts of examinations, tests, taking into account individual tasks by the principle of gradual accumulation of their difficulties; readiness of teachers of higher education institutions for interaction with students and providing assistance to them in performing individual tasks; development of various tasks; realization and accounting of individual opportunities of students to the performance of individual tasks; orientation of individual tasks for the development of personal qualities of students.

Research includes stating and forming experiment stages.

The purpose of the stating experiment: to reveal the initial level of quantitative representations at 1 year students.

Problems of this experiment:

1. To carry out diagnostics of the level of development of quantitative representations at 1 year students.

2. To analyse received results.

Thus, the results of the stating experiment allowed us to develop a series of lessons at the stage of the forming experiment.

Proceeding from the results of the stating experiment, the definite purpose of the forming experiment stage was defined by us.

Purpose: to develop and approve a series of logical tasks in probability theory by means of application of new teaching technologies.

For the realization of the purpose and problems of the forming experiment we developed the program of the forming experiment based on the developed logical tasks which includes a series of lessons in the development of quantitative representations by means of information technologies. All tasks are intended for several lessons, the level of complexity of tasks gradually become complicated.

Thus, if to use these methodical recommendations in practical activities, then the efficiency of lessons and, as a result, level of logical thinking of students will increase.

The stating and forming stage of the experiment was passed under natural conditions of lessons according to time-table. During the experiment we checked efficiency of logical thinking at 1 year students. The experiment took place within the program developed by us, taking into account pedagogical conditions allocated in a hypothesis. We defined efficiency of pilot study according to the dynamics of development of mathematical representations at 1 year students by means of information technologies.

Having realized experimental method of the development of logical thinking skills in teaching probability theory with application of tasks for the development of cogitative operations, we started the last stage of experiment – control. The purpose of this stage was: to reveal dynamics of logical thinking development of students with the use of special tasks and without it.

At the control stage of experiment we used the same techniques, as in the stating experiment stage. Necessity of repeated performance was in revealing how the level of logical thinking development increased or decreased, and how good (without changes) the ability of students to analyze, synthesize, compare, generalize is. After data processing, we carried out the comparative analysis of the results of work of students in two groups at the control stage.

The dynamics of results of the second semester in comparison with the first one of experimental groups is presented in the histogram (see figure 1).

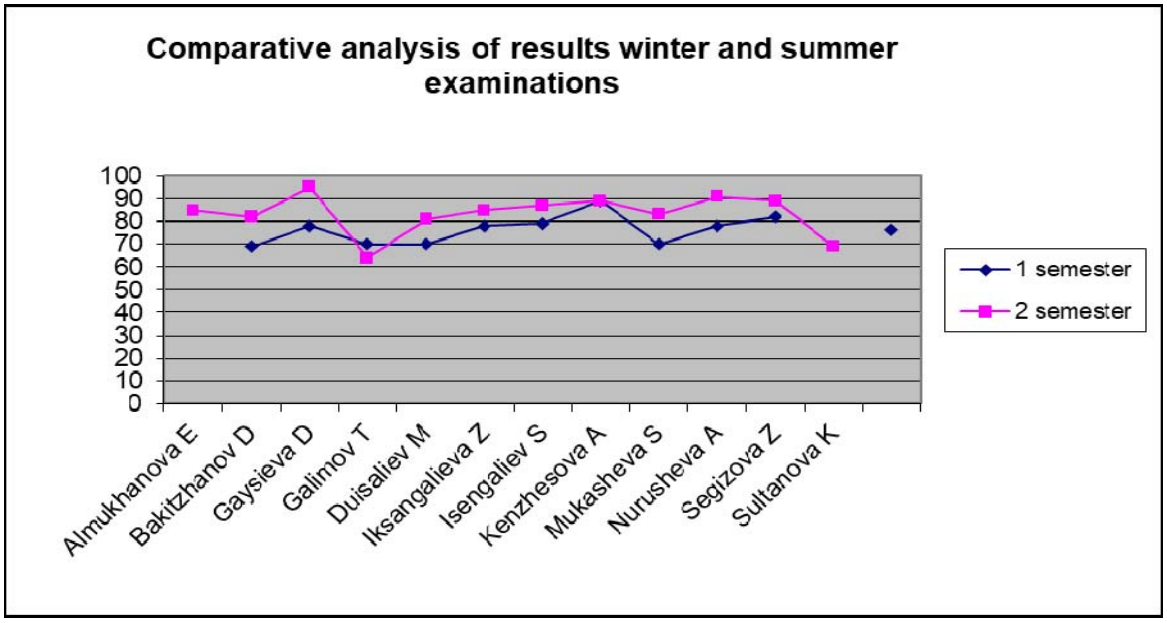

Figure 1 - Comparative analysis of winter and summer examinations results in experimental group

The results of data analysis show that more than a half of students seized cogitative operations successfully. High degree of independence in performing tasks should be noted. Students worked with interest and actively. They understood that their knowledge of the studied subject is checked, tried not to ask questions to show knowledge and independence. But among them there is a student whose result went down. The bad progress is a consequence of weak attendance of lessons and also negative attitude to study. Apparently from the given results, it is possible to draw a conclusion on considerable improvement of logical processes at students including processes of analysis, synthesis, classification and generalization.

Students of experimental group formed positive attitude to logical tasks. The number of students capable to find answers to questions without effort increased considerably. Most of students began to conclude rules independently, to make decisions on the basis of independent observations, and at the emergence of questions they addressed abilities of judgments and conclusions.

Dynamics of intermediate control results in experimental and control groups is presented in the histogram (see figure 2).

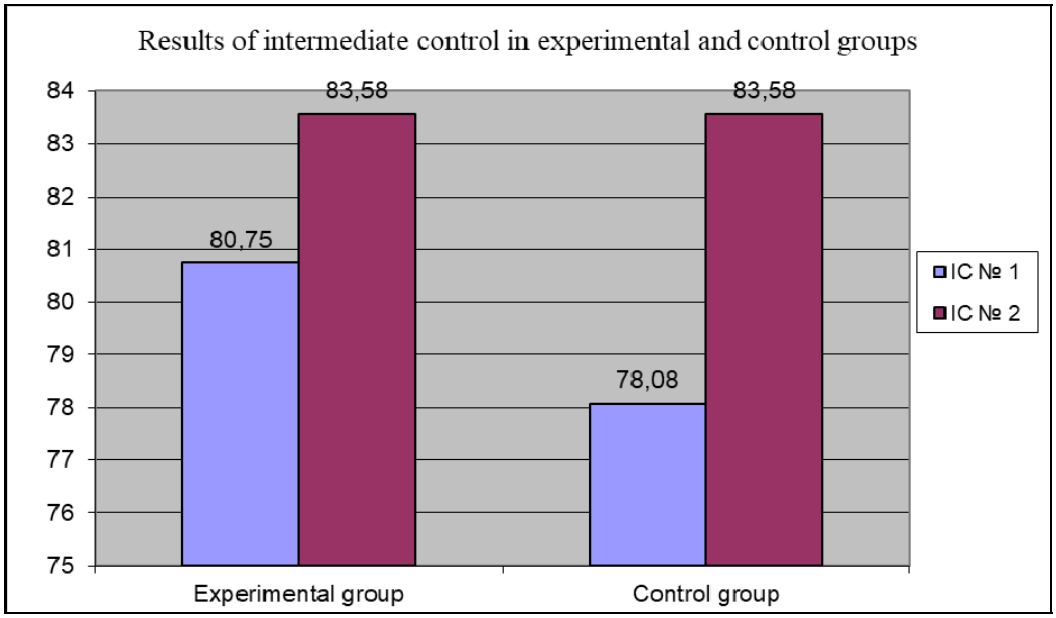

Figure 2 - Results of intermediate control in experimental and control groups

The control group was also exposed to diagnostics, as well as experimental one. Let's give results of examination in experimental and control groups (see figure 3).

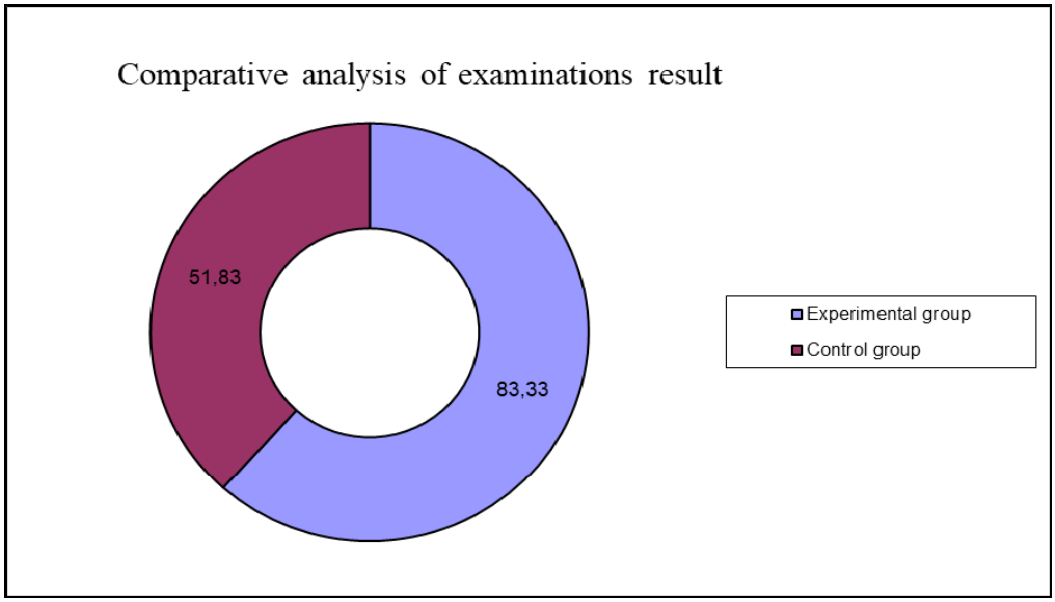

Figure 3 - Comparative analysis of session results in experimental and control groups

By the results given in the histogram, it is possible to say, that by the end of the experiment there were changes in indicators of formation of logical thinking at students of experimental group which affected the general result of development of logical thinking. At the same time indicators of control group were rather low.

Having made comparative analysis of the results of two stages of our skilled and experimental work, we determined that due to the system of tasks developed by us, students of experimental group learned to solve new types of logical tasks which were unfamiliar to them earlier, acquired the main methods and ways of these tasks solution. In the course of solution of non-standard tasks, students performed certain cogitative operations, namely: analyzed statements of the problem, selected numbers and compared them according to the requirements of solvable task, learned to argue,

generalize correctly and critically comprehend the received results. The system of logical tasks developed and approved by us allowed to increase quality of all above-mentioned abilities.

Thus, the analysis of results of logical thinking development of students demonstrates that application of specially picked up and developed tasks in a system can influence favorably development of logical thinking of students, therefore, our hypothesis stated in maintaining was confirmed. Due to the integrated approach it is possible not only to form logical operations, but also logical thinking that results in raising achievement and efficiency of group as it will be easier for a student to draw conclusions and to apply the gained knowledge and abilities.

As a result of the made experiment we solved and made the following:

1. Results of the stating experiment demonstrate that 1 year students have average level of mathematical representations development. It means that it is necessary additionally to develop 1 year students in parallel with traditional lessons and by means of information technologies.

2. Results of the forming stage of the experiment showed that development of mathematical representations proceeded at the realization of the following pedagogical conditions:

- accounting of students' interests;
- accounting of intellectual development;
- to use various forms and methods of work.

3. As indicators of knowledge of mathematics at 1 year students, we allocated a series of lessons.

4. The most effective methods of teaching, in our opinion, are the method of complex organization of lessons, explanation and display, game methods and others.

Summing up the results, it is possible to draw the following conclusions: information technologies and traditional lessons in mathematics are optimum development tool of logical thinking at first-year students. It is also necessary to consider that now children coming to a university are already enriched with a large amount of knowledge and skills, adequately imagining such phenomena of life which children did not know about fifteen years ago. Modern children seize rules of logical games and, applying them, systematically beat adults.

In the course of solution of tasks set for the research, the following results were received:

- the level of development of logical thinking skills at 1 year students was revealed;
- a series of lessons in the development of logical thinking skills in students was developed and approved.

Development of logical thinking skills in teaching probability theory for 1 year students is solved insufficiently fully. The efficiency of the solution of this problem in our opinion depends on the development of literature and methods of use of new information technologies in higher education institutions and also computer programs. The practical value of work is that methodical recommendations and pedagogical conditions developed in a research can be used in practical activities of teachers for increase in efficiency of development of mathematical representations.

REFERENCES

1. Tikhomirov O.K. Thinking psychology. - M.: Akademiya, 2002. – 288 p.

2. Nemov R.S. Psychology. – M.: VLADOS center, 2003. – 688 p.

3. Rubenstein S.L. Fundamentals of general psychology. - St. Petersburg, 2002. – 720 p.

4. Bayarstanova A.S., Sadykova G.A., Berniyazova F.A. Probability Theory and Mathematical Statistics. – Uralsk: Zhangir Khan WKATU. – 2010. – 125 p.

5. Gmurman V.E. Probability theory and mathematical statistics.– M.: YuRAYT, 2013. - 479 p.

6. Gmurman V.E. Guide to the solution of tasks on probability theory and mathematical statistics. - M.: Vysshaya shkola, 2004. - 479 p.

7. Ryabushko, A.P. Individual tasks on higher mathematics. – Minsk: Vysh.shkola, 2007. – 304 p.

ТҮЙІН

Логическое мышление – это умение пользоваться абстрактными понятиями, это мышление путем рассуждений и опровержений. Уровень логического мышления влияет на успеваемость по предмету, поэтому необходимо развивать логику у обучающихся. Решение

логических задач развивает способность выделять существенное, самостоятельно подходить к обобщениям. Логические игры помогают воспитывать познавательный интерес, способность к творческому поиску, желание и умение учиться, а это помогает развитию логического мышления у обучающихся. В результате формируются основные мыслительные операции, такие как анализ, синтез, сопоставление, обобщение, классификация и умение применять полученные знания. А значит, студенты умеют определять закономерности и выполнять задание по данной закономерности, классифицировать и группировать предметы, сравнивать, находить общее и частное свойства, обобщать и абстрагировать, анализировать и оценивать свою деятельность; путем рассуждений решать логические, нестандартные задачи, уметь ориентироваться в схематическом изображении графических заданий.

В статье рассматриваются навыки логического мышления при обучении теории вероятности. Проведен эксперимент и показаны результаты эффективности решения данной проблемы.

РЕЗЮМЕ

Логикалық ойлау - дерексіз ұғымдарды қолдана алу мүмкіндігі, ол ақылмен және талқылау арқылы ойлау. Логикалық ойлау деңгейі пән бойынша үлгерімге әсер етеді, сондықтан білім алушылардың логикасын дамыту керек. Логикалық есептерді шешу жалпыға бірдей көзқарастарды анықтауға мүмкіндік береді. Логикалық ойындар когнитивтік қызығушылықты, шығармашылық ізденуді, оқуға қабілеттілікті жоғарылатады, бұл білім алушылар арасында логикалық ойлауды дамытуға көмектеседі. Нәтижесінде талдау, синтез, салыстыру, қорыту, жіктеу және осы білімді қолдану мүмкіндігі сияқты негізгі операциялар жасалады. Бұл дегеніміз, студенттер негізгі тұрақтылықты анықтай алады және сәйкес үлгіде тапсырмаларды орындау, объектілерді жіктеу және топтастыру, салыстыру, жалпы және нақты қасиеттерді табу, олардың қызметін талдау және бағалау жұмыстарын атқара алады; логикалық, стандартты емес тапсырмаларды негіздеу арқылы шешіп, графикалық тапсырмалардың схемалық көрінісінде жұмыс жасай алады.

Мақалада ықтималдық теориясын оқытудағы логикалық ойлау дағдылары қарастырылады. Тәжірибе жүргізіліп және осы мәселені шешу тиімділігінің нәтижелері көрсетілді.

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ИССЛЕДОВАНИЕ СИСТЕМ УПРАВЛЕНИЯ ЛИНЕЙНОГО И СИММЕТРИЧНОГО КЛА ПРИ ВОЗМУЩЕНИИ

Аннотация

В настоящей работе предлагается новый подход к построению вектор-функций Ляпунова. Для исследования симметричных КЛА линейных и нелинейных систем управления с успехом может реально применяться метод функций А.М.Ляпунова. Использование этого метода сдерживается отсутствием универсального подхода к построению функции Ляпунова. Следует напомнить, что ошибка в выборе или неудача в построении необходимой функции Ляпунова не означает неустойчивости системы: она указывает лишь на неудачу при построении функции Ляпунова.

Предлагается динамически компенсатор для оценки вектора состояния космического летательного аппарата и возмущений. Исследование робастной устойчивости систем управления космического летательного аппарата с учетом возмущений производится градиентно-скоростным методом вектор функций Ляпунова. Область робастной устойчивости