Statistical analysis of the development levels of students' endurance quality based on student's mathematical-statistical criteria

Abduhamid Nurullaev[1*], *Alisher* Ibragimov[1], *Feruza* Elkulieva[1], and *Abdurashid* Nurullayev[2]

[1]Bukhara State Pedagogical Institute, Bukhara City, Piridastgir, Street 2, 200100, Uzbekistan
[2]Bukhara State University, Bukhara, Uzbekistan

Abstract. In the article, the main ideas of the student's mathematical-statistical student method in the design of the educational process based on the development of students' resilience in physical education classes. Initial (N_0) hypothesis. About equality of mean values $H_0: X_T = X_H$ Based on the criteria of the hypothesis, a statistical analysis of the development levels of the quality of endurance in students was determined. According to the statistical calculation, it was observed that the average absorption value of the experimental and control groups differs from each other, the efficiency indicator is 1.14-1.15 times higher, and the confidence intervals obtained on the basis of the average value do not overlap with each other. Key word**s:** student, resilience, Student method, criterion, research

1 Introduction

Data selection and decision-making process do not affect the analysis performed [3]. It is important to analyze the results of scientific and pedagogical research and evaluate their effectiveness. It should not be forgotten that the tests used in the study are affected by objects related to the results of the study. The main problem is not pedagogical theory, but the variability of research results [3]. In addition to statistical tests and hypotheses, data analysis is also important in evaluating the effectiveness of the educational process, and in some cases, statistical methods are not required in the process of data analysis and processing. The article describes the definitions in this field and their application in the educational process.

Experimental research plays an important role in all fields of science. Mathematical statistics are used in the analysis of many theoretically obtained results based on available empirical materials. Pedagogical research uses certain hypotheses and the results of theoretical research [2]. Because the absence of universally recognized axiomatics does not allow correct reasoning.

* Corresponding author: nurullayev@gmail.com

2 The main part

Designing an educational process based on the development of students' resilience in physical education classes and organizing experimental studies studying its results is an important component of the research, and creating its methodological support is a guarantee of achieving the expected results. Based on this axiom, in order to widely implement the theoretical ideas advanced in the research, experimental work was carried out on the basis of an acceptable methodology. This methodology included the following pedagogical aspects:

- study and analysis of scientific-pedagogical, philosophical, methodical sources related to the problem;
- to study and analyze the current state of the educational process aimed at developing resilience in students;
- to determine the principles, forms, methods, tools and ways of organizing physical education classes based on the development of endurance in students;
- planning research work;
- analysis of experimental results;
- summarizing the research results, mathematical-statistical analysis on the improvement of the technology of designing the educational process based on the development of students' endurance in physical education classes;
- formation of a research work in the form of a dissertation.

The special methodology recommended for the experiment was formulated as follows: the 2nd general secondary school of Navoi city, Navoi region, the 12th general secondary school of Kyziltepa district, the 29th general school of Bukhara city, Bukhara region, designated as respondents. secondary school, 46th general secondary school in Karakol district, 3rd general secondary school, Khojayli district of the Republic of Karakalpakstan, physical education teachers, sports coaches pedagogical survey for; a survey of general secondary school teachers, sports coaches with the opportunity to assess the level of theoretical and practical professional activity skills related to the design of the educational process aimed at developing the physical quality of endurance in students; organizing physical education classes aimed at developing the quality of endurance in students in general secondary schools, giving a professional assessment of the pedagogical conditions created for the design, and conversations aimed at exchanging ideas on identifying existing difficulties and eliminating them was conducted [2].

In order to increase the interest of schoolchildren in physical education and sports, to determine the system of physical exercises to develop the quality of endurance in them, and to organize the educational process, to learn the process of designing the appropriate use of physical exercises in the design of physical education classes. We conducted a questionnaire among science teachers and sports coaches [1].

In the implementation of educational experiments to determine the level of development of the physical quality of endurance in students, first of all, it is necessary to properly design the educational process aimed at the development of endurance, interest in mastering physical exercises that serve to develop endurance, sports criteria of interest in participating in sports competitions, interest in maintaining and strengthening health, interest in physical attractiveness, and interest in physical development were defined. When designing the educational process, we studied the criteria of the level of development of the physical quality of endurance in students, dividing them into the following groups:

- students run 60 meters in physical education class (seconds);
- standing long jump (cm) exercises;

- pulling on a high horizontal bar (times);
- 1000 meter run (minutes, seconds);
- 1500 meter run (minutes, seconds);
- 2000 meter run (minutes, seconds);
- running and long jump (cm);
- being able to perform physical exercises such as throwing a small ball a distance (meters) according to established standards.
- criteria of cognitive (knowledge) interest: interest in learning more about one's capabilities, interest in acquiring new knowledge about endurance-building exercises;
- criteria of interest in competition: interest in comparing abilities with peers, interest in engaging in new sports, interest in challenging opponents, enjoyment in participating in sports competitions, self-assessment and comparison with peers;
- criteria of interest in maintaining and strengthening health: avoiding health problems, improving well-being, having a strong healthy body, following doctor's recommendations, seeking to solve health problems, improving health trying to keep, interest in preventing hereditary diseases, feeling very healthy, trying to prevent disease;
- criteria of interest in physical attractiveness: losing weight, looking young and attractive, reducing body weight, having a beautiful Picture, being able to control one's own weight, losing excess calories;
- criteria of interest in physical development: development of own strength, interest in agile movement, improvement of endurance, development of body flexibility, interest in being physically strong, interest in flexibility, development of sports skills, development of muscle activity, movement and developing intensity of influence.

The goals and objectives of each stage were determined based on the general purpose of the research [1].

At the first stage, that is, at the stage of theoretical research (2019-2020), the current scientific and practical situation on the subject under study was analyzed. Also, the purpose and objectives of the research were determined, and the research hypothesis was developed. At the same time, a diagnosis of the specific characteristics of the ability to communicate among schoolchildren was carried out, as well as the level of their physical fitness was determined. Correlations between physical qualities and indicators of the ability to engage in communication among schoolchildren at the stage of primary training were determined.

The purpose of the determining stage was to determine the level of development of students' interest in national sports based on the existing creative approach.

In the determining stage (2019-2020 academic year), the following works were carried out in experimental and test works:

- diagnosis of the initial level of the design of the educational process aimed at developing the physical quality of endurance in students selected on the basis of the principle of voluntariness according to the developed criterion program and diagnostic tools;
- analysis of the activities of pedagogues on the development of students' interest in sports;
- Worker on DTC, basic educational programs, certain subjects ("Physical education", "Physical education and sports", "Physical education theory and methodology", "Conducting and refereeing competitions in sports" Dactures, UUMs were studied and analyzed.

Indicators were developed to determine the level of physical quality and endurance development in students. Their structure, content and assessment methods are presented in Table 4.1.

The results of the determining experiment and test, that the development of endurance physical quality in students is not at a high level and it does not meet modern requirements,

are reflected in the legal and regulatory documents directly related to this process. This was explained by the following reasons: observation of a feeling of inclination towards computer technologies and mobile communication tools among most students compared to sports activities, students not being aware of enough theoretical information about physical qualities and types of sports; the fact that practical training is not aimed at developing students' physical qualities of endurance; that independent tasks are reproductive (non-creative, non-problematic), lack of sports equipment in some schools.

In the third stage of the research (2021-2022), work was carried out to clarify the theoretical and methodological aspects of the work with schoolchildren, analytically generalize the experimental results based on the methods of mathematical methods, and put the research results into practice. In the final part of this stage, the results of the experiment were summarized in the dissertation and the mathematical methods were compared based on the methods.

Based on the results of the experimental research, we analyzed the average learning of the students in the experimental and control groups (tables 1-3) using the Student's mathematical-statistical method [3].

Table 1. Indicators determining the level of development of students' physical qualities of endurance

II.	**Indicators determining the level of development of students' physical qualities of endurance**		
1.	The fact that he has information about physical qualities	Qualities formed in physical education classes and sports clubs	Integrative-creative sports games
2.	A new ideological and conceptual approach formed	It is integrated, formed on the basis of personal experience and mastery of subjects adjective system	
3.	Systematic analysis and creative decision-making skills formed	Practical training, based on practical skills	Situational tasks, stimulating games
4.	Flexibility and mobility	Personal and practical qualities, practical skills oriented to the field formed on the basis of practical training	

Table 2. Coverage of pilot educational institutions in regions

Provinces	Experimental group		Control group	
	At first	At the end of	At first	At the end of
Bukhara region	50	50	51	51
Navoi region	46	46	47	47
Republic of Karakalpakstan	42	42	42	42
Total	138	138	140	140

Table 3. At the beginning of the experiment, indicators for determining the effectiveness of the development of endurance in physical education classes

Criteria	pilot testing schools		number of pupil	Grade levels (in numbers and percentages)					
				High		Medium		Low	
motivational-emotional	Bukhara region	Experimental group	50	6	12,0%	15	30,0%	29	58,0%
		Control group	51	7	13,7%	13	25,5%	31	60,8%
	Navoi region	Experimental group	46	6	13,0%	12	26,1%	28	60,9%
		Control group	47	7	14,9%	11	23,4%	29	61,7%
	Republic of Karakalpakstan	Experimental group	42	6	14,3%	11	26,2%	25	59,5%
		Control group	42	5	11,9%	13	31,0%	24	57,1%
	Total	Experimental group	138	18	13,0%	38	27,5%	82	59,4%
		Control group	140	19	13,6%	37	26,4%	84	60,0%
cognitive-volitional	Bukhara region	Experimental group	50	6	12,0%	14	28,0%	30	60,0%
		Control group	51	7	13,7%	13	25,5%	31	60,8%
	Navoi region	Experimental group	46	6	13,0%	14	30,4%	26	56,5%
		Control group	47	7	14,9%	13	27,7%	27	57,4%
	Republic of Karakalpakstan	Experimental group	42	5	11,9%	11	26,2%	26	61,9%
		Control group	42	4	9,5%	13	31,0%	25	59,5%
	Total	Experimental group	138	17	12,3%	39	28,3%	82	59,4%
		Control group	140	18	12,9%	39	27,9%	83	59,3%
active-practical	Bukhara region	Experimental group	50	7	14,0%	14	28,0%	29	58,0%
		Control group	51	6	11,8%	16	31,4%	29	56,9%
	Navoi region	Experimental group	46	6	13,0%	14	30,4%	26	56,5%
		Control group	47	5	10,6%	16	34,0%	26	55,3%
	Republic of Karakalpakstan	Experimental group	42	5	11,9%	12	28,6%	25	59,5%
		Control group	42	5	11,9%	12	28,6%	25	59,5%
	Total	Experimental group	138	18	13,0%	40	29,0%	80	58,0%
		Control group	140	16	11,4%	44	31,4%	80	57,1%

An average of 278 pupils participated in the experiment, of which 138 students participated in the experimental group and 140 students in the control group.

The brief essence of the problem is as follows: Let two prime sets be given. One is the average scores of the experimental group respondent-pupils at the end of the experiment, and the second is the average scores of the control group respondent-pupils. The scores are

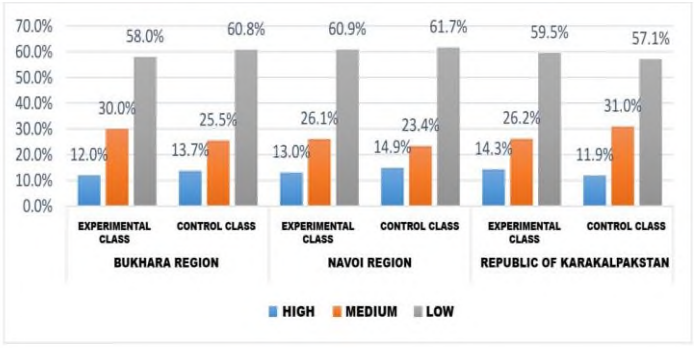
assumed to have a normal distribution. Such an assumption is reasonable, because the conditions of approximation to the normal distribution are simple and they are fulfilled.

The indicators of the table mean that the indicators obtained in the experimental groups during the final experiment-testing period have a positive meaning compared to the results of the students of the control groups.

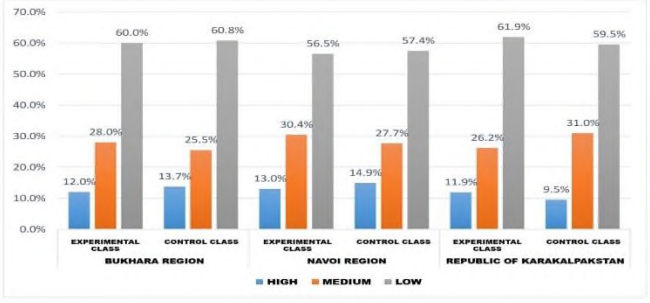
It was confirmed that the accuracy of the average mastery rate in the experimental group is higher than the control group, with the same parameters as above for the mastery rate and the number of students in the experimental group.

Based on the table, we select the H1 hypothesis, which shows the efficiency of the experimental and control group acquisitions, and the H0 hypothesis, which is contrary to it, and reflect it in the table below [3].

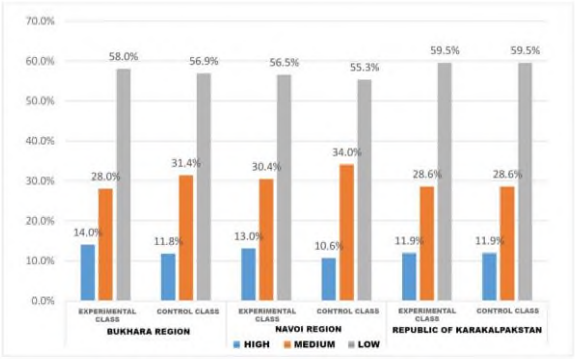
According to the results of the conducted research, it was observed that the mastering indicators at the beginning of the experiment were almost close to each other in the experimental and control groups (Pictures 8-9).



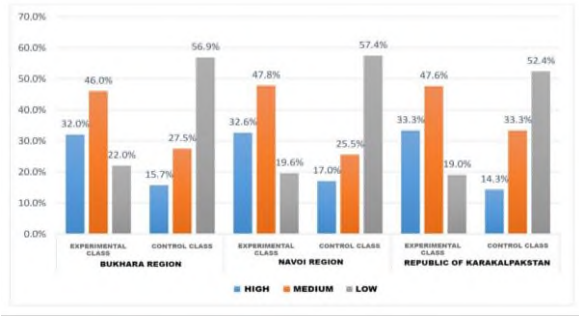
Picture 8. mastery indicators according to the motivational-emotional criterion (at the beginning of the experiment)



9-picture. mastery indicators according to the cognitive-volitional criterion (at the beginning of the experiment)



10-picture. mastery indicators according to the functional-practical criterion (at the beginning of the experiment)



In order to verify the reliability and accuracy of the obtained results, the verification by mathematical statistical methods was explained in the next paragraph.

3. Prospects for the design of the educational process based on the development of endurance in students in physical education classes

To check the reliability of the results, the mathematical symbols used in the statistical analysis were clarified. In this

Table 4. In the table, the mathematical symbols used in the statistical analysis to check the reliability of the results were clarified

Practical actions	Mathematical symbols	
	Experimental group	Control group
To keep track of group-specific metrics	X_T	X_H

Based on the essence of Student's method, two different hypotheses are put forward that contradict each other.

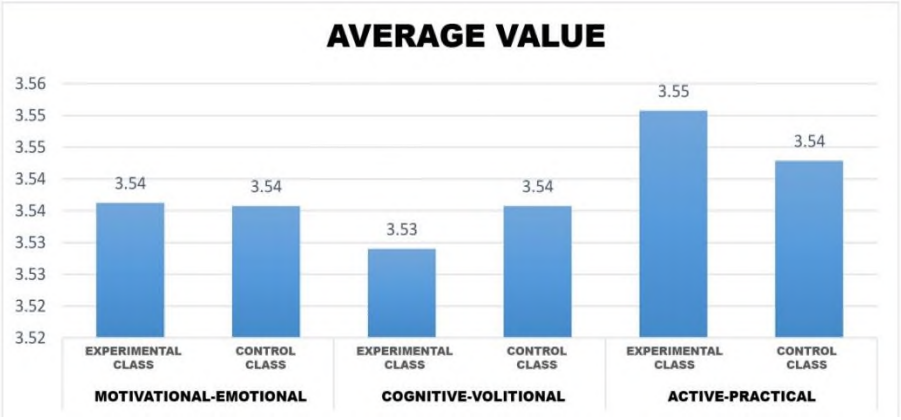
The main ideas of the student method. Initial (N0) assumption. About equality of mean values $H_0 : X_T = X_H$ hypothesis. As a hypothesis H0, the results obtained by the students in the experimental group are effective compared to the results obtained by the students in the control group. The results obtained for the experimental and control groups

overlap with each other in the main set of available indicators. That is, the indicators recorded by the respondents of the experimental and control groups are equal to each other. Even after the application of the special methodology, it means that the creative ability of the respondent-students is almost undeveloped or at a satisfactory level compared to the grounding experience.

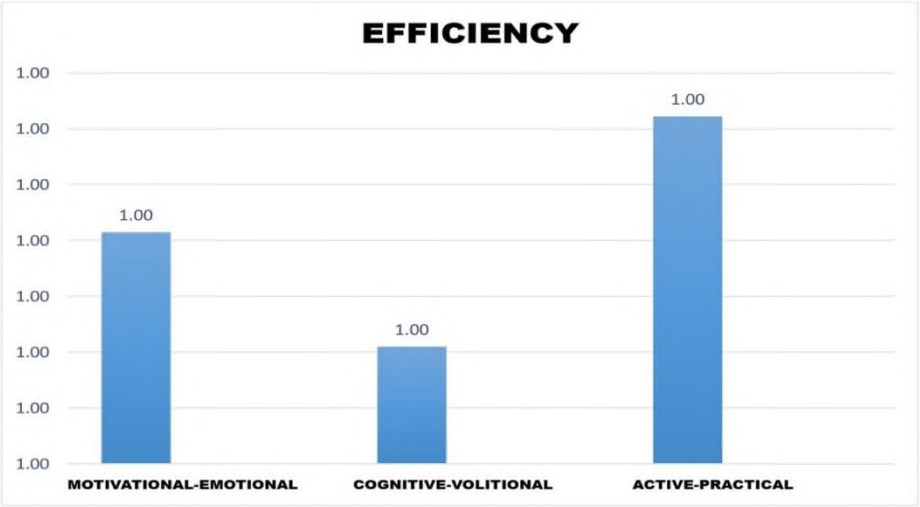
Alternative (N1) assumption. $H_1 : X_T \neq X_H$ hypothesis is obtained.H1- and as a hypothesis, the results obtained by the students in the experimental group are effective compared to the results obtained by the students in the control group. Alternative (N1) assumption N0 in the guesswork serves to deny the expressed idea. Based on the application of a special methodology, the results recorded by the respondents of the experimental and control groups do not coincide with mathematical expectations in the main set of indicators [3]. The indicators recorded by the respondents-students of the experimental and control groups are not equal to each other

Also, according to the results of the obtained statistical functions, the empirical value of the Student method, the degree of freedom of statistics, the critical value, the confidence deviation, the indicator of the evaluation of the teaching effectiveness and the evaluation of the students' knowledge level were calculated based on the indicator formulas and their values were tabulated :

When comparing the statistical values obtained from the experiment, the value of the Student criterion is less than the critical value, the teaching quality evaluation index is less than one, and the student evaluation index is less than zero. and proves to be reliable [3]. A graphic representation of these indicators was described:



Picture 11. At the beginning of the experiment, the average mastery indicators of the development of endurance in physical education classes



Picture 11.1. Effectiveness indicators of the development of endurance in students in physical education classes at the beginning of the experiment

So, it is a statistical calculation based on the initial results N0 leading to the acceptance of the hypothesis.

3 Conclusion

Pedagogical experience was conducted in order to create methodological bases for designing the educational process based on the development of endurance in physical education classes. The results related to the proof of the research results were collected and processed on the basis of mathematical and statistical methods.

All forms of experimental work were put into practice.

The results of the experimental tests were qualitatively analyzed.

The results of the pedagogical experiment on the design of the educational process based on the development of endurance in physical education classes have been proven to be effective.

References

1. Abdiyev A.N., Abdullayev A.X. Oliy pedagogik ta'limda jismoniy tarbiya mashg'ulotlari samaradorligini oshirish muammolari. Fan-sportga. //Ilmiy-nazariy jurnal .T.: 2008. №1. – B.15-17.
2. Nurullayev A. СПЕЦИФИЧЕСКИЙ АСПЕКТ РАЗВИТИЯ ФИЗИЧЕСКИХ КАЧЕСТВ ВЫНОСЛИВОСТЬ У УЧАЩИХСЯ //ЦЕНТР НАУЧНЫХ ПУБЛИКАЦИЙ (buxdu. uz). – 2021. – Т. 8. – №. 8.
3. A.R.Nurullayev. Jismoniy tarbiya darslarida o'quvchilarda chidamlilikni rivojlantirishga asoslangan o'quv jarayonini loyihalashtirish (pedagogika fanlari bo'yicha falcafa doktori (PhD) diss.). Toshkent; 2023. №. 3.
4. Nurullayev A. METHODOLOGICAL METHODS OF TEACHING CHILDREN FOR MOVEMENT ACTIVITIES IN THE PROCESS OF PHYSICAL EDUCATION CLASSES //ЦЕНТР НАУЧНЫХ ПУБЛИКАЦИЙ (buxdu. uz). – 2021. – Т. 3. – №. 3.

5. Нуруллаев А. Р., Гафурова М. Ю., Мансуров Ш. Ш. Деление спортивных занятий на периоды //Педагогическое образование и наука. – 2019. – №. 6. – С. 153-155.
6. Nurullaev A. R. Methods of developing endurance in students through the use of folk games in physical education classes //ACADEMICIA: An International Multidisciplinary Research Journal. – 2020. – Т. 10. – №. 11. – С. 520-
7. Kuldoshev R. et al. Mathematical statistical analysis of attainment levels of primary left handed students based on pearson's conformity criteria //E3S Web of Conferences. – 2023. – Т. 371. – С. 05069.
8. Hamroyev A., Jumayeva H. Effectiveness criteria and experimental results of designing students' creative activities in primary class mother tongue education //E3S Web of Conferences. – EDP Sciences, 2023. – Т. 420. – С. 10007.
9. Qo‘ldoshev A. R. Psychological aspects of left-handedness: concept, causes, and peculiarities //Psychology and Education Journal. – 2021. – Т. 58. – №. 1. – С. 4981-4988.
10. Akramova G. Medicinal properties of “Péganum hármala" plant //BIO Web of Conferences. – EDP Sciences, 2024. – Т. 93. – С. 02018.
11. Mamurov B. The nationwide project" Green Space" is a means of stabilizing the ecological situation //BIO Web of Conferences. – EDP Sciences, 2024. – Т. 93. – С. 05004.
12. Nurullaev A. R. Methods of developing endurance in students through the use of folk games in physical education classes An International Multidisciplinary Research Journal. Year: 2020, Volume: 10, Issue: 11 //Online ISSN. – С. 2249-7137.
13. Ruzimbaevich N. A., Ruzimbaev M. A. Healthy Directions of Physical Exercises and Measures for Their Implementation //International Journal on Economics, Finance and Sustainable Development. – 2021. – Т. 3. – №. 3. – С. 227-231.
14. Ruzimbaevich N. A., Ruzimbaev M. A. Classification and Methodology of National Movement Games Training Physical Qualitie //International Journal on Economics, Finance and Sustainable Development. – Т. 3. – №. 3. – С. 232-237.