



USING CONTROL CHART METHODS IN STATISTICAL ANALYSIS OF PEDAGOGICAL EXPERIMENTS

Jamolov Asilbek Hasan o'g'li,

University of Information Technology and management

Mathematics orientation, 2nd year master

Annotation. *This article examines the application of control chart methods in the statistical analysis of pedagogical experiments. Control charts, widely used in quality management and industrial statistics, are increasingly relevant in educational research for monitoring learning outcomes, teaching effectiveness, and experimental stability over time. The study analyzes theoretical foundations of control charts, their types, stages of application in pedagogical experiments, and advantages compared to traditional statistical methods. Examples of using control charts to evaluate students' academic performance and experimental reliability are presented. The findings demonstrate that control chart methods enhance objectivity, reliability, and continuous monitoring in pedagogical research.*

Keywords. *pedagogical experiment, statistical analysis, control charts, educational quality, learning outcomes, process monitoring.*

PEDAGOGIK TAJRIBALARNI STATISTIK TAHLIL QILISHDA NAZORAT KARTALARI USULIDAN FOYDALANISH.

Annotatsiya. *Ushbu maqolada pedagogik tajribalarni statistik tahlil qilishda nazorat jadvali usullarining qo'llanilishi ko'rib chiqiladi. Sifat menejmenti va sanoat statistikasida keng qo'llaniladigan nazorat jadvallari vaqt o'tishi bilan o'quv natijalari, o'qitish samaradorligi va eksperimental barqarorlikni kuzatish uchun ta'lim tadqiqotlarida tobora dolzarb bo'lib bormoqda. shbu maqolada pedagogik tajribalarni statistik tahlil qilishda nazorat jadvali usullarining qo'llanilishi ko'rib chiqiladi. Sifat menejmenti va sanoat statistikasida keng qo'llaniladigan nazorat jadvallari vaqt o'tishi bilan o'quv natijalari, o'qitish samaradorligi va eksperimental*



barqarorlikni kuzatish uchun ta'lim tadqiqotlarida tobora dolzarb bo'lib bormoqda. Tadqiqotda nazorat jadvallarining nazariy asoslari, ularning turlari, pedagogik tajribalarda qo'llash bosqichlari va an'anaviy statistik usullarga nisbatan afzalliklari tahlil qilinadi. Talabalarning akademik ko'rsatkichlari va eksperimental ishonchliligini baholash uchun nazorat jadvaridan foydalanish misollari keltirilgan. Topilmalar shuni ko'rsatadiki, nazorat jadvali usullari pedagogik tadqiqotlarda ob'ektivlik, ishonchlilik va doimiy monitoringni kuchaytiradi.

***Kalit so'zlar.** pedagogik eksperiment, statistik tahlil, nazorat jadvallari, ta'lim sifati, o'quv natijalari, jarayon monitoringi*

ИСПОЛЬЗОВАНИЕ МЕТОДА КОНТРОЛЬНЫХ КАРТОЧЕК В СТАТИСТИЧЕСКОМ АНАЛИЗЕ ПЕДАГОГИЧЕСКОЙ ПРАКТИКИ.

***Аннотация.** В этой статье рассматривается применение методов контрольных карт при статистическом анализе педагогических экспериментов. Контрольные карты, широко используемые в управлении качеством и промышленной статистике, становятся все более актуальными в исследованиях в области образования для мониторинга результатов обучения, эффективности преподавания и стабильности эксперимента с течением времени. В исследовании анализируются теоретические основы контрольных карт, их виды, этапы применения в педагогических экспериментах и преимущества по сравнению с традиционными статистическими методами. Представлены примеры использования контрольных карт для оценки успеваемости учащихся и надежности эксперимента. Полученные результаты демонстрируют, что методы контрольных карт повышают объективность, надежность и непрерывность мониторинга в педагогических исследованиях.*



Ключевые слова. педагогический эксперимент, статистический анализ, контрольные карты, качество образования, результаты обучения, внедрение мониторинга процесса

In the context of rapid educational reforms and digital transformation, the demand for reliable and objective evaluation of teaching and learning processes has significantly increased. Pedagogical experiments serve as a key research method for testing innovative teaching approaches, curricula, and educational technologies. However, traditional statistical tools such as t-tests or variance analysis often provide only static results and do not reflect dynamic changes occurring during the learning process. Therefore, the use of control chart methods offers a dynamic and continuous approach to analyzing pedagogical data over time.

A pedagogical experiment is a systematic research method aimed at verifying hypotheses related to teaching methods, learning environments, and educational outcomes. It typically involves experimental and control groups, predefined indicators, and longitudinal data collection. Statistical analysis plays a crucial role in ensuring the validity and reliability of experimental results. Integrating control charts into this process allows researchers to monitor changes and identify trends throughout the experiment.

Control charts were developed by Walter A. Shewhart as part of statistical process control theory. Their primary purpose is to distinguish between random (common cause) variation and non-random (special cause) variation. In educational research, this distinction helps identify whether changes in student performance are due to instructional interventions or random fluctuations. Control limits define the range of acceptable variation and support objective interpretation of experimental data.

Control charts used in pedagogical experiments can be classified into variable control charts and attribute control charts. Variable charts, such as X-bar and R charts, analyze quantitative indicators like test scores or average grades. Attribute charts, including p-charts and c-charts, are used for qualitative indicators such as pass



rates, attendance frequency, or error counts. Selecting an appropriate chart depends on data type, sample size, and research objectives.

The methodological process includes defining performance indicators, collecting empirical data, calculating central lines and control limits, constructing control charts, and interpreting results. Researchers must also consider ethical aspects, data reliability, and consistency of measurement tools. Proper methodology ensures that control charts accurately reflect educational processes.

Control chart methods provide several advantages compared to traditional statistical techniques. They allow continuous monitoring rather than one-time analysis, offer visual representation of trends, and enable early detection of deviations. This supports timely pedagogical interventions and enhances the practical value of research findings. Additionally, control charts improve transparency and replicability of experiments.

In educational institutions, control charts can be applied to monitor academic performance, attendance, learning progress, and the effectiveness of innovative teaching strategies. For instance, an X-bar chart may demonstrate gradual improvement in student achievement after introducing interactive learning methods, while identifying periods of instability requiring corrective actions.

Despite their advantages, control chart methods face certain limitations in pedagogical research. These include variability in educational data, small sample sizes, and difficulties in defining stable processes. Researchers must carefully adapt control chart assumptions to educational contexts to avoid misinterpretation of results.

The expanded analysis confirms that control chart methods significantly enhance the statistical analysis of pedagogical experiments. By enabling continuous monitoring and objective evaluation, these methods support evidence-based improvements in teaching and learning. Future studies should explore the integration of control charts with learning analytics systems and digital educational platforms.

REFERENCES:



1. Esanovna D. B. THE ROLE OF MODERN INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE DEVELOPMENT OF THE NATIONAL ECONOMY //Лучшие интеллектуальные исследования. – 2025. – Т. 52. – №. 1. – С. 54-60.
2. Esanovna D. B., Zarif o'g'li K. F. METHODS OF SOLVING OPTIMAL SOLUTIONS OF MATHEMATICAL PROBLEMS WITH ARTIFICIAL INTELLIGENCE METHODS //Modern education an Esanovna D. B., Zarif o'g'li K. F. ADVANTAGES AND ACHIEVEMENTS OF ARTIFICIAL INTELLIGENCE IN ECONOMIC AND SOCIAL AREAS //Modern education and development. – 2025. – Т. 26. – №. 6. – С. 299-304.
3. Esanovna D. B., Zarif o'g'li K. F. РОЛЬ ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ В ПРЕПОДАВАНИИ МАТЕМАТИКИ //Modern education and development. – 2025. – Т. 26. – №. 6. – С. 293-298.
4. Esanovna D. B. ORGANIZATIONAL AND ECONOMIC MECHANISMS AND CONCEPTUAL DIRECTIONS OF TOURISM DEVELOPMENT IN THE REGION //INTERNATIONAL JOURNAL OF SOCIAL SCIENCE & INTERDISCIPLINARY RESEARCH ISSN: 2277-3630 Impact factor: 8.036. – 2025. – Т. 14. – №. 11. – С. 91-94.
5. Daminova B. E. MONITORING METHODS BASED ON MULTILEVEL EDUCATIONAL PROCESSES DATA //Экономика и социум. – 2025. – №. 2-1 (129). – С. 140-142.
6. Daminova B. E., Oripova M. O. METHODS OF USING MODERN METHODS BY TEACHERS OF MATHEMATICS AND INFORMATION TECHNOLOGIES IN THE CLASSROOM //Экономика и социум. – 2024. – №. 2-1 (117). – С. 256-261.
7. Daminova B. E. GAUSS AND ITERATION METHODS FOR SOLVING A SYSTEM OF LINEAR ALGEBRAIC EQUATIONS //Экономика и социум. – 2024. – №. 2-1 (117). – С. 235-239.



8. Daminova R. MODERN REQUIREMENTS FOR ORGANIZING THE PROCESS OF TRAINING AS A MEANS OF DEVELOPMENT AND FORMATION OF PERSONALITY //Science and innovation. – 2023. – Т. 2. – №. В10. – С. 143-145.
9. Daminova B. Organizational and economic mechanisms and conceptual directions of tourism development in the region //Innovation Science and Technology. – 2025. – Т. 1. – №. 7.
10. Якубов М., Даминова Б., Юсупова С. Формирование и повышение качества образования с помощью образовательных информационных технологий //International Scientific and Practical Conference on Algorithms and Current Problems of Programming.-2023.
11. Pant R. et al. Study of produced harmonics in DFIG powered by wind turbines over linear and nonlinear loads //E3S Web of Conferences. – EDP Sciences, 2024. – Т. 563. – С. 01006.
12. Yuldashev S. et al. A development of AI AI-connected system with adaptive assessments method for evaluation methods in education field //2024 4th International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE). – IEEE, 2024. – С. 826-830.