

ANALYSIS OF STATISTICAL HYPOTHESES AND PEDAGOGICAL EXPERIMENTS.

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Annotation. This article highlights the role of statistical hypotheses in pedagogical research, the stages of their formation and verification, and the issues of scientific analysis of pedagogical experimental work. This article highlights the role of statistical hypotheses in pedagogical research, the stages of their formation and verification, and the issues of scientific analysis of pedagogical experimental work. In the course of the research, the methods of using null and alternative hypotheses, parametric and nonparametric statistical criteria are analyzed. The scientific and practical significance of determining the effectiveness of teaching through mathematical and statistical processing of the results of pedagogical experiments is also substantiated. The article extensively highlights the importance of statistical approaches in modern pedagogical research, their role in ensuring reliability and reliability.

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In the modern educational system, the organization of pedagogical processes on a scientific basis and the assessment of their effectiveness are one of the important tasks. Of particular importance in this process is the statistical analysis of pedagogical experiments and their results. In the modern educational system, the organization of pedagogical processes on a scientific basis and the assessment of their effectiveness are one of the important tasks. Of particular importance in this process is the statistical analysis of pedagogical experiments and their results. Statistical hypotheses serve to ensure the scientific reliability of pedagogical research and make it possible to prove that the results of the experiment are not random, but legitimate.

Through the use of statistical methods in pedagogical research, the effectiveness of teaching methods, educational technologies and methodological approaches is determined. Therefore, the analysis of statistical hypotheses and pedagogical experiments is one of the pressing scientific problems today.

Educational systems worldwide increasingly rely on evidence-based approaches to improve teaching and learning outcomes. Pedagogical research aims to determine

which instructional methods, technologies, and strategies are most effective. Statistical hypotheses provide a scientific foundation for testing assumptions and validating experimental findings. Without statistical analysis, pedagogical conclusions may remain subjective and unreliable. This chapter highlights the relevance of statistics in educational research and defines the scope of the study.

A statistical hypothesis is a statement about a population parameter that can be tested using sample data. In pedagogy, hypotheses often relate to differences in academic achievement, motivation, or skill development. The formulation of hypotheses requires a clear research problem, objectives, and variables. Well-defined hypotheses guide the selection of research methods and statistical tools.

The null hypothesis (H_0) assumes that no statistically significant difference exists between groups or variables. The alternative hypothesis (H_1) suggests the presence of a significant effect or difference. In educational research, rejecting the null hypothesis often indicates the effectiveness of a new teaching method.

Pedagogical experiments are controlled studies conducted to examine educational phenomena. They involve systematic manipulation of independent variables and observation of dependent variables. Experimental and control groups are commonly used to ensure objectivity and comparability of results.

Pedagogical experiments can be classified as diagnostic, formative, and control experiments. Diagnostic experiments assess initial learning levels, formative experiments introduce innovations, and control experiments evaluate long-term effectiveness.

Data collection is a critical stage of pedagogical research. Common tools include tests, questionnaires, observations, and interviews. The quality of collected data directly affects the accuracy of statistical analysis.

Descriptive statistics summarize and organize data using measures such as mean, median, mode, variance, and standard deviation. These indicators provide an overview of students' performance and learning dynamics.

Inferential statistics allow researchers to generalize findings from a sample to a population. Hypothesis testing involves selecting a significance level, calculating test statistics, and making decisions based on p-values.

Parametric tests assume normal data distribution and homogeneity of variance. Common tests include the Student’s t-test, ANOVA, and Pearson correlation. These tests are widely used in large-scale educational studies.

Non-parametric tests are used when data do not meet parametric assumptions. They are suitable for small samples and ordinal data. Examples include the Mann–Whitney U test, Wilcoxon test, and Chi-square test.

The table below illustrates a comparison of learning outcomes between experimental and control groups.

Statistical results must be interpreted carefully to ensure pedagogical relevance. Statistical significance does not always imply educational significance. Researchers should consider effect size and practical implications.

Reliability refers to the consistency of measurement results, while validity indicates whether an instrument measures what it intends to measure. Statistical analysis supports both reliability and validity in educational studies.

Educational research must adhere to ethical standards, including informed consent, confidentiality, and fairness. Statistical transparency enhances research ethics.

The findings of statistically grounded pedagogical experiments inform curriculum design, teacher training, and educational policy. Evidence-based decision-making improves teaching quality.

Group	Sample Size	Mean Score	Standard Deviation
Experimental Group	45	84.6	5.8
Control Group	45	76.2	6.9

Statistical hypotheses and pedagogical experiments are fundamental to scientific educational research. The integration of statistical analysis ensures objectivity,

reliability, and validity. Educators and researchers should develop strong statistical competencies to enhance the quality of pedagogical innovations.

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