METHODS OF ANALYZING THE IMPACT OF INTERACTIVE TECHNOLOGIES ON STUDENT ACTIVITY

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Abstract

To scientifically substantiate the effectiveness of the idea of increasing student activity through the use of interactive technologies and to further improve it, a complex, systematic, and multifaceted analysis of this impact is essential. This is because activity, as a pedagogical phenomenon, is characterized not only by final results but also by the dynamic, processual, and qualitative changes that occur within the educational process itself. Therefore, evaluating activity should not be limited to test results or grades but requires a methodological approach that reveals the internal mechanisms of the educational process.

Keywords: interactive technologies, student activity, analysis methods, mixed methodology, quantitative analysis, qualitative analysis, pedagogical experiment, learning analytics.

Introduction

In pedagogical research, it is emphasized that the process of analyzing activity must encompass the student's cognitive, affective, and behavioral activities [Creswell, 2024]. Cognitively, this is manifested in the ability to understand, analyze, and apply knowledge; affectively, it is expressed in the student's interest, attitude, and motivation toward the lesson. Behavioral activity is observed in the student's real participation during the lesson, engagement in communication, and activity in completing assignments. Interactive technologies influence the harmonious development of these three components.

It is scientifically recognized that there is no single, universal method for assessing activity in modern pedagogical research [Zimnyaya, 2010]. Because academic activity is a complex and multidimensional phenomenon, it cannot be fully described through a single method. Consequently, the mixed methods approach is widely used in current scientific and practical research. This approach involves the integrated use of qualitative and quantitative research methods.

Furthermore, it is important to consider the time factor when analyzing the impact of interactive technologies. Alongside short-term results, long-term changes—such as the formation of the student's readiness for independent learning, self-management abilities, and academic responsibility—should also be evaluated [Harmer, 2015]. This requires conducting research based on step-by-step and continuous monitoring.

Literature Review

Quantitative analysis methods hold significant importance in objectively evaluating the effectiveness of the educational process in pedagogical research. Among these methods, pedagogical experiments, tests, and surveys occupy a leading position. Particularly in determining the impact of interactive technologies on students' academic activity, quantitative methods allow for obtaining clear, comparable, and statistically reliable results.

A pedagogical experiment is one of the most widely used and effective quantitative research methods, based on introducing specific changes into the educational process and observing the results. In a controlled pedagogical experiment, two groups are typically formed: the experimental group (taught based on interactive technologies) and the control group (taught based on traditional methods). By comparing the activity indicators of students in these groups, the real pedagogical effectiveness of interactive technologies is determined.

Observation protocols are widely used to measure the external and observable manifestations of activity. During the observation process, objective parameters such as the number of constructive answers given by students during the lesson, the

frequency of asking questions, the level of participation in discussions, contribution to group work, and activity in performing practical tasks are determined in advance. These indicators are recorded based on special assessment scales and subsequently prepared for statistical analysis.

In the statistical processing of the obtained quantitative data, mathematical-statistical methods are used, specifically the mean, variance, standard deviation, and Student's t-test [Hafizov, 2024]. These methods allow for determining that the differences between the experimental and control groups are not coincidental and for establishing the reliability level of the results. The results of the statistical analysis serve to scientifically conclude whether interactive technologies have had a significant impact on students' academic activity.

Additionally, questionnaires and motivational surveys are used as important tools within quantitative analysis. Through these surveys, students' subjective attitudes toward the learning process, their level of interest in the lesson, self-confidence, learning motivation, and attitudes toward interactive methods are determined. Using questions designed on the Likert scale, students' opinions can be expressed in the form of numerical indicators, enabling their statistical analysis.

However, alongside the possibilities of quantitative methods, there are also limitations. These methods often fail to fully reflect the deep, internal, and complex psychological processes of activity, including the level of deep perception of the topic, the ability for logical analysis, reflective thinking, or the formation of metacognitive strategies [Hafizov, 2024]. While numerical results express the student's activity as a general indicator, they cannot reveal under what conditions and for what reasons this activity arose.

Therefore, in modern pedagogical research, quantitative methods are often used in harmony with qualitative methods to provide a more complete and deep analysis of the impact of interactive technologies on student activity. While quantitative analysis serves as an important basis for determining the results of interactive

education, qualitative analysis allows for revealing the meaningful and psychological essence of these results.

Methodology

Quantitative methods, such as tests, questionnaires, and statistical analyses, measure students' knowledge levels, activity frequency, and educational outcomes. However, the impact of interactive technologies is not limited to results expressed only by numbers [1]. These technologies also shape changes in students' thinking styles, self-confidence, communication culture, and attitudes toward the educational process. These specific aspects are analyzed more deeply through qualitative research methods.

Qualitative methods—through observation, interviews, reflective journals, and analyses based on open-ended questions—allow for an understanding of students' subjective experiences, emotions, and activities within the educational process [2]. In lessons where interactive technologies are applied, instances such as students expressing their opinions freely, their readiness to work in groups, and showing initiative are identified precisely through qualitative analysis. Therefore, mixed methodology is regarded as the most optimal approach for determining the true pedagogical effectiveness of interactive education.

To fill this gap, qualitative analysis methods are employed. These include in-depth interviews, focus group discussions, and the analysis of students' work (e.g., project results, essays, portfolios). For example, using the "stimulated recall" method, students are shown a video recording of an interactive session and asked about the reasons for their decisions and actions during the process. This method provides valuable data for studying students' cognitive activity, strategic thinking, and level of self-regulation. Furthermore, through discourse analysis of content created by students (blog posts, forum comments, multimedia projects), valuable insights can be gained regarding their level of thinking, cultural awareness, and choices in language use.

Results and Discussion

In recent years, technological approaches in educational analysis have also gained significant importance. Learning Management Systems (LMS), such as Moodle, or interactive platforms (Padlet, Mentimeter), highlight the digital footprints of activity. Data such as the frequency of system access, time spent on assignments, the number and content of messages in discussion forums, and contributions to collaborative work can be collected automatically and processed using learning analytics tools for large datasets. This methodology allows the teacher to obtain individual, precise, and timely information about each student's activity dynamics, as well as to understand how a specific interactive technology is perceived by all participants.

Conclusion

In conclusion, analyzing the impact of interactive technologies on activity requires a multifaceted and flexible methodological approach. Effective analysis is achieved by identifying statistical changes in indicators through quantitative methods, revealing the internal causes and content of these changes through qualitative methods, and implementing precise and continuous monitoring of activity using technological tools. Only the synergy of these approaches allows for a full understanding of how interactive technologies change student activity not only quantitatively but also qualitatively, providing a scientific basis for their didactic effectiveness.

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