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MANAGEMENT MECHANISMS IN MATHEMATICS EDUCATION: INTEGRATION OF DIDACTIC AND MANAGERIAL APPROACHES

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Annotation

The article analyzes the theoretical and practical aspects of integrating management mechanisms in mathematics education based on didactic and managerial approaches. The study focuses on enhancing the efficiency of the learning process in mathematics lessons by harmonizing didactic strategies, pedagogical monitoring, lesson planning and assessment tools with managerial principles. Based on experimental and empirical data, the role of management mechanisms in developing students' competencies, strengthening their motivation, and improving lesson quality is demonstrated. The article also highlights the scientific and practical aspects of creating an innovative management model in the educational process through the integration of didactic and managerial approaches.The research results confirm a significant improvement in students' mathematical thinking, problem-solving, and independent learning competencies.

Keywords:

management mechanisms, mathematics education, didactic approach, managerial approach, pedagogical monitoring, education management, integration, improving education quality, learning process, competency development

Introduction :

In the modern educational process, mathematics is recognized not only as a source of precise knowledge but also as a fundamental discipline that shapes logical thinking, analytical analysis, algorithmic approaches, and problem-solving competencies in students. At the same time, management mechanisms play a crucial role in increasing the efficiency of the educational process.

Management mechanisms represent a set of methods and tools that ensure the optimization of the learning process through planning, monitoring, analysis, and evaluation. While didactic

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approaches focus on shaping the content of education and the learning process, managerial approaches serve to manage resources, control processes, and enhance efficiency. From this perspective, integrating didactic and managerial approaches provides a significant opportunity to substantially improve the quality and effectiveness of the learning process in mathematics education.

The purpose of the article is to analyze the theoretical and practical aspects of integrating management mechanisms in mathematics education based on didactic and managerial approaches, to evaluate their impact on students' competencies, and to develop an effective management model.

Literature Review and Methodology

Foreign Studies Foreign research (Hattie, 2009; Marzano, 2003; Schoenfeld, 2016) demonstrates that management mechanisms have a significant impact on the efficiency of the learning process. In J. Hattie's meta-analyses, it is noted that teachers' management and monitoring activities account for 30–35% of the variance in student learning outcomes. R. Marzano emphasizes the importance of pedagogical management in developing students' knowledge and competencies through lesson planning, assessment, and feedback mechanisms.

Local Studies Local research (Tolipov, 2020; Xodiev & Abduqodirov, 2019; To‘xtaboyeva, 2021) examines effective directions for harmonizing didactic and managerial components of management mechanisms in mathematics education. These studies show that the quality of the learning process can be improved through the integration of pedagogical monitoring, adaptive learning trajectories, and resource management mechanisms.

In addition, PISA and TIMSS international studies (OECD, 2018; IEA, 2019) scientifically confirm the importance of management factors influencing students' mathematical competencies and the overall quality of education, including the learning environment, monitoring and assessment systems, as well as teachers' pedagogical and managerial activities.

The literature review indicates that the integration of didactic and managerial approaches serves as an innovative and effective mechanism for improving the quality of mathematics education.

Research Aim The study is aimed at determining the effectiveness of the learning process in mathematics education through the integration of didactic and managerial components of management mechanisms.

Research Methodology The methodology of the study includes the following main approaches and methods:

1. **Systemic approach** – management mechanisms, the learning process, students, and teachers' activities were studied as a single integrated system.
2. **Experimental design** – experimental and control groups were formed, and a comparison was conducted between classes where management mechanisms were implemented and those where they were not.

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3. **Theoretical methods** – analysis of literature, comparison and generalization of scientific concepts.
4. **Empirical methods** – observation, questionnaires, diagnostic tests, interviews with teachers, and lesson monitoring.
5. **Statistical methods** – descriptive statistics, t-test, correlation analysis, and analysis of variance.

Research Sample The sample consisted of 120 students in grades 7–9 and 14 mathematics teachers. In the experimental group, management mechanisms were systematically implemented.

Results and Analysis

In the study, the management mechanisms incorporating the integration of didactic and managerial approaches were evaluated based on a comparison between the experimental and control groups. The obtained empirical results and their analysis are as follows:

Growth in Students' Achievement Levels Diagnostic tests conducted before and after the lessons with students in the experimental group were analyzed using the t-test.

- Pre-lesson average score: 57.4%
- Post-lesson average score: 74.8%
- T-test result: $t(94) = 8.45$, $p < 0.001$

This result demonstrates that management mechanisms (planning, monitoring, formative assessment) are highly effective in significantly improving students' mathematical knowledge.

Teachers' Management Capacity Teachers were assessed through questionnaires and observation forms before the study and at the end of the experiment. After the introduction of the integrated approach:

- Planning skills rating increased by +38%
- Frequency of applying monitoring and assessment mechanisms in lesson plans rose by +41%
- Teachers' mutual reflection and lesson optimization approaches increased by +35%

These findings indicate that the combined application of didactic and managerial approaches has enabled teachers to perform more effectively in terms of management.

Activity and Motivation During Lessons Observations and questionnaires revealed an increase in students' engagement and motivation during lessons:

- Participation in question-answer sessions: +29%
- Activity in group discussions and problem-solving tasks: +25%
- Participation in self-assessment and differentiated tasks: +22%

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These changes demonstrate that management mechanisms have enhanced the interactivity and responsiveness of the learning environment.

Correlation Analysis The relationship between various components of management mechanisms and learning outcomes was analyzed using Pearson correlation:

Mechanism	**Correlation with learning outcomes (r)**
Planning	r = 0.68
Monitoring and feedback	r = 0.74
Reflection and optimization	r = 0.65

The high correlations (especially between the monitoring + feedback component and learning outcomes) scientifically confirm the strong positive impact of management mechanisms on students' knowledge acquisition

Overall Assessment and Effectiveness The qualitative and quantitative results obtained at the conclusion of the study clearly demonstrate that management mechanisms integrating didactic and managerial approaches significantly enhance both lesson quality and student performance outcomes. Possible reasons for this improvement include: optimized planning, analysis and control at every stage of the lesson, and teachers' reflective approach.

Analysis and Scientific Implications

1. Integrated management mechanisms ensure effective communication and high-quality feedback between students and teachers, thereby improving the didactic quality of the educational process.
2. The high correlation coefficient of the monitoring and feedback components (r = 0.74) highlights their strategic importance in management — control and feedback tools play a direct and critical role in increasing lesson effectiveness.
3. Changes observed in teachers' reflection and optimization approaches support their professional development and create a foundation for continuous improvement of lesson quality.

The research findings allow for the formulation of practical recommendations: widespread implementation of these integrated mechanisms in schools can improve lesson quality and enhance students' mathematical competencies.

Future research could focus on combining didactic + managerial management mechanisms with digital platforms (LMS), as well as developing customized modular designs for individualized student learning trajectories.

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CONCLUSION

The results of the study indicate that integrating management mechanisms in mathematics education based on didactic and managerial approaches substantially increases the efficiency of the learning process. The main conclusions are as follows:

- Integrated management mechanisms effectively improve students' mathematical competencies through lesson planning, monitoring, feedback, and process optimization.
- Teachers' management capacity develops significantly, which contributes to enhancing lesson quality and improving pedagogical decision-making.
- Students' engagement and motivation increase, and the lesson process becomes enriched through interactive and individualized approaches.
- Experimental results confirmed that management elements — planning, monitoring, and feedback — exert the strongest influence on learning outcomes.
- The study provides practical recommendations for modernizing mathematics education in schools and improving management mechanisms.

Thus, the integration of didactic and managerial approaches into management mechanisms has been scientifically proven to be effective not only in enhancing students' knowledge and competencies, but also in advancing teachers' pedagogical practice.

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