ETHIOPIAN INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 05, May-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

# SCIENTIFIC APPROACHES TO TEACHING CHEMISTRY FOR MEDICAL STUDENTS BASED ON THE MODULAR SYSTEM

***Karimov Javohir Sobirzoda***
*Lecturer at Bukhara State Medical Institute named after Abu Ali ibn Sino*
*karimov.javohir@bsmi.uz*
*+998 93 144 23 45*
*0009-0005-6935-0150*

**Abstract:** This study focuses on analyzing the theoretical-pedagogical foundations, methodological approaches, and practical experiences of teaching chemistry using a modular system in higher medical education institutions. Conducted at Bukhara, Tashkent, and Samarkand Medical Institutes from 2022 to 2024, the research aimed to assess the impact of the modular system on educational quality. Through questionnaires, statistical analysis (SPSS, ANOVA, t-test), and empirical data, it was determined that students taught under the modular system achieved, on average, 17% higher knowledge levels compared to those taught with traditional methods ($p < 0.05$). The modular system effectively fosters independent thinking, scientific inquiry, and practical skills in students. The article analyzes implementation strategies and provides practical recommendations for teaching chemistry in medical education based on modern pedagogical technologies.

**Keywords:** Modular system, chemistry, medical education, pedagogical innovations, independent thinking, practical skills.

Introduction: In contemporary medical higher education, significantly enhancing the quality of education and effectively integrating modern pedagogical technologies are among the most pressing priorities. For students in medical fields, chemistry serves not only as a foundation for mastering theoretical knowledge but also as a critical platform for preparing for clinical practice. Consequently, there is a growing need to shift from traditional teaching methods to a modular system, which makes the educational process systematic, efficient, and interactive. Modular learning promotes the development of independent thinking, encourages scientific exploration, and enhances students' ability to apply acquired knowledge in practical settings. Furthermore, the modular system enables clear structuring of topics and time allocation, facilitating more effective organization of the learning process. Pedagogical theories and practical experiences indicate that modular education supports better knowledge acquisition, longer retention, and sustained academic achievement. This article examines the theoretical-pedagogical approaches to teaching chemistry on a modular basis in medical higher education institutions, analyzes practical experiences, and discusses methods to support the educational process. It also addresses challenges in implementing the modular system and strategies to overcome them. The article proposes effective methods for teaching chemistry to students based on modern pedagogical technologies.

Methods: The study was based on a combination of methodological, analytical, and empirical approaches. Its primary objective was to investigate the organization and management of teaching chemistry on a modular basis in higher medical education institutions. The research involved faculty and students from the chemistry departments of Bukhara, Tashkent, and Samarkand Medical Institutes.

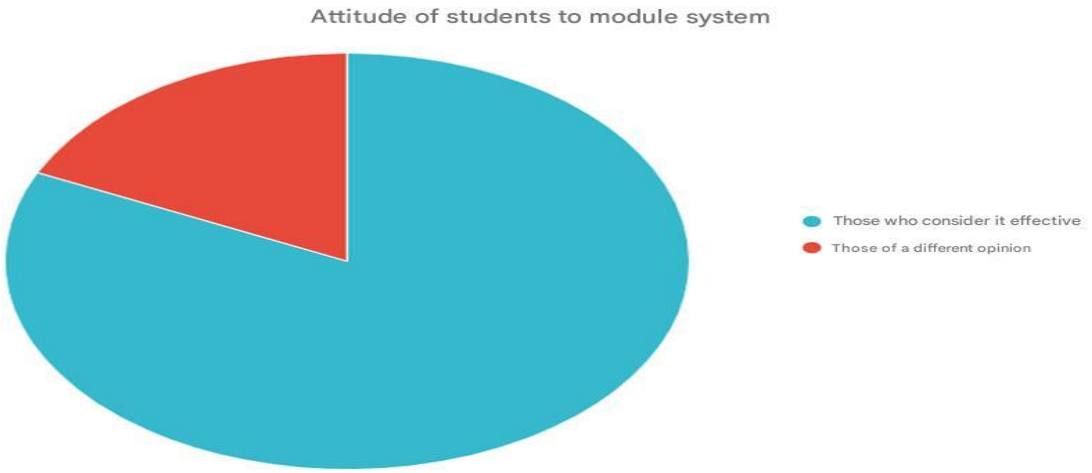
eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 05, May-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

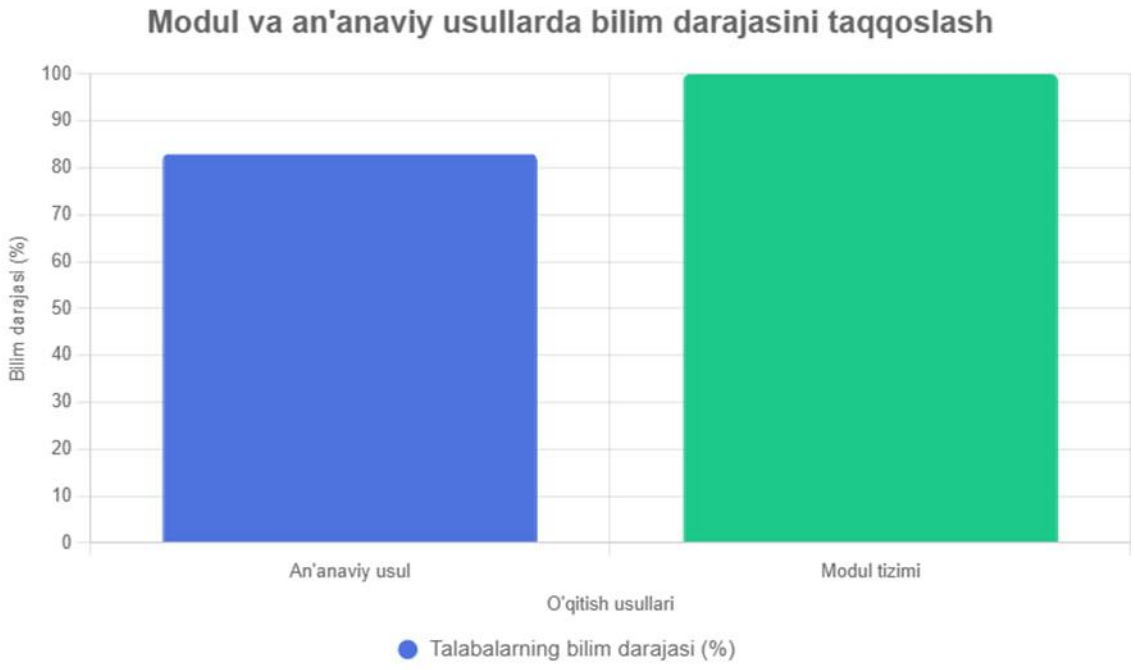
As part of the empirical component, specialized questionnaires were developed and distributed among faculty and students. These questionnaires evaluated the impact of the modular system on the educational process, students' comprehension of the material, their independent work skills, the interactivity of classes, and the effectiveness of the teaching methodologies employed.

From 2022 to 2024, changes in the educational process were studied in medical institutions where the modular system was implemented. Data collection involved analyzing curricula, textbooks, and methodological guides. Statistical analysis was performed using SPSS (Statistical Package for the Social Sciences) software.

This software facilitated the analysis of questionnaires, tests, educational performance indicators, and other quantitative data. The statistical significance of the findings was established using ANOVA, t-




tests, and correlation analysis, which enabled the identification of key changes in the educational process and the outcomes of the modular system.



eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 05, May-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

Results: The analysis of the collected data confirmed the high effectiveness of modular learning. Statistical analysis revealed that students taught under the modular system demonstrated, on average, a 17% higher knowledge level compared to those taught using traditional methods ($p < 0.05$). Additionally, the modular system significantly improved the quality of laboratory work performance. Questionnaire results indicated that the majority of students view the modular system as effective and report that active participation in the learning process enhances their independence. This motivated students to engage in deeper exploration of the material and pursue scientific inquiries. Interactive methods were a key factor in improving the quality of education. Moreover, the modular system fostered the development of collaborative skills among students. The data analysis also showed that faculty recognized the improvement in educational quality. They noted that the modular system provides a structured presentation of material and allows for step-by-step monitoring of students' progress.

Conclusions: The study affirmed the critical role of modular learning in enhancing the quality of chemistry education. The modular system supports the development of independent thinking, scientific approaches, the practical application of theoretical knowledge, and the evaluation of research methods. This approach aligns fully with the demands of modern medical education. Nevertheless, certain organizational and methodological challenges were identified during the implementation of the modular system. For instance, faculty require specialized training courses to adapt to new pedagogical methods. Successful adoption of the modular system necessitates ongoing updates to didactic materials and the development of electronic educational resources. Moving forward, advancing modular learning will require the widespread adoption of interactive and innovative pedagogical methods, as well as the use of diagnostic and formative approaches. Teaching chemistry on a modular basis plays a pivotal role in improving educational quality in higher institutions, fostering scientific thinking, and developing professional competencies among students. The modular system has demonstrated its superiority over traditional methods, making it entirely compatible with the standards of modern medical education.

**References:**

1. Jalolov J.J. "Foundations of Pedagogical Technologies", Tashkent: TSPU, 2020.
2. Ganiev I.A. "The Role of the Modular System in Medical Education", Uzbekistan Medical Journal, 2022, No. 2.
3. Mahmudov S.M. et al. "Methods of Teaching Chemistry", Tashkent: Fan, 2021.
4. Azizova Z.O. "Modular Learning Technologies", Journal of Innovative Education, 2023, No. 4.
5. World Health Organization. "Transforming and scaling up health professionals' education and training", WHO Guidelines, 2013.
6. Harden R.M., Crosby J. "AMEE Guide No 20: The good teacher is more than a lecturer—the twelve roles of the teacher", Medical Teacher, 2000.
7. Brown, S., Race, P. "Lecturing: A Practical Guide", Routledge, 2002.
8. Ministry of Higher and Secondary Specialized Education, Collection of Modular Curricula, 2021.
9. Foundations of Medical Pedagogy. Textbook. Tashkent: Ipak Yoli Publishing, 2022.
10. Internal Reports of Bukhara Medical Institute (2022–2023).