



WAYS TO INTEGRATE THEORETICAL KNOWLEDGE WITH PRACTICAL ACTIVITIES IN CHEMISTRY

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Abstract.

This article explores the didactic and methodological foundations of integrating theoretical knowledge with practical activities in teaching chemistry. By its nature and content, chemistry is closely linked to practice, and students consolidate theoretical concepts by reinforcing them through experiments and laboratory work. The article provides a detailed analysis of the types of practical activities, the stages of their organization, the use of modern technologies, the teacher's role, existing challenges, and suggestions for their resolution. This approach plays a crucial role in developing students' independent research skills, analytical thinking, logical reasoning, and safety culture.

Keywords: Chemistry, theoretical knowledge, practical activities, laboratory work, methodology, interactive methods, virtual laboratory, pedagogical approach.

Аннотация.

В данной статье рассматриваются дидактические и методические основы интеграции теоретических знаний с практическими занятиями при преподавании химии. По своей природе и содержанию химия тесно связана с практикой, и учащиеся закрепляют теоретические понятия посредством проведения опытов и лабораторных работ. В статье подробно анализируются виды практических занятий, этапы их организации, использование современных технологий, роль учителя, существующие проблемы и предложения по их решению. Такой подход играет важную роль в формировании у учащихся навыков самостоятельного исследования, аналитического мышления, логического рассуждения и культуры безопасности.

Ключевые слова: химия, теоретические знания, практические занятия, лабораторная работа, методика, интерактивные методы, виртуальная лаборатория, педагогический подход.

Introduction

In modern education, integrating theoretical knowledge with practical skills holds significant importance in the teaching of all subjects. In particular, for natural sciences such as chemistry, deep and thorough understanding of theoretical knowledge must be reinforced by practical skills developed through hands-on experience. Chemistry is not merely a set of formulas and equations but a subject that is better understood through real substances, their interactions, and the processes of experimentation and testing.

In today's era of globalization, chemistry serves as a foundation for various fields such as industry, medicine, ecology, and technology due to its practical orientation. Therefore, integrating theoretical knowledge with practical activities enhances students' interest in the subject, fosters creative thinking, and provides opportunities to test themselves in professional directions.

Main Part

Chemistry, as a scientific discipline, teaches the laws of nature through substances and their interactions, and learning theoretical concepts from books alone is not sufficient. A student can better grasp the properties of substances, reaction processes, and energy changes by observing them directly and conducting experiments. Therefore, practical activities are considered an integral part of the learning process.

Through practical work, students not only apply theoretical concepts but also develop analytical thinking, observation skills, patience, technical skills, and a culture of safety. For instance, working with acids, observing gas evolution, and preparing solutions all require practical skills.

Integrating different types of practical activities: In chemistry, practical work is commonly conducted in the following forms:

Demonstration experiments: Conducted by the teacher and observed and analyzed by all students. These may range from simple experiments to complex laboratory demonstrations.

Practical laboratory work: Students conduct experiments independently or in small groups using laboratory equipment.

Independent research and mini-projects: Senior students and talented learners conduct in-depth research on chemical phenomena of interest, carry out experiments, and present their results.

When these types are fully integrated within a topic, theoretical knowledge is easily transferred to practice and better assimilated. For the effective organization of practical activities, the teacher must strictly follow these stages:

1. **Planning:** Selecting the topic for practical work, defining goals and objectives.
2. **Preparation:** Checking laboratory equipment, explaining safety rules, and preparing necessary reagents.
3. **Implementation:** Students perform experiments step-by-step under the teacher's supervision and guidance.
4. **Analysis:** Summarizing results, drawing conclusions, and linking them to theoretical concepts.
5. **Reflection:** Students share their opinions, discuss mistakes made during the experiment.

In today's digital age, virtual laboratories and online simulations have made practical work more accessible. Students can test complex and hazardous reactions in a virtual environment. This approach is especially effective in schools that lack adequate laboratory facilities. Additionally, interactive presentations, 3D models, and animations help students visualize theoretical concepts more clearly and understand complex processes.

When a teacher is methodologically well-prepared, they not only explain the topic but also constantly stimulate students' interest during practical work. It is important to consider each student's individual capacity: simple experiments for those with lower academic levels and more complex tasks for advanced students. In this way, a differentiated approach is implemented.

Conclusion



In conclusion, the approach of integrating theoretical knowledge with practical activities in chemistry is closely related to national education policy, the system of training pedagogical personnel, and the modernization of school laboratories. Every teacher should master innovative methods and design each lesson based on the harmony of theory and practice, explaining the essence of the subject with practical examples. Only in this way can students learn to apply knowledge in real life, and chemistry becomes a useful tool in their everyday activities.

Chemistry is one of the most important natural sciences that develops through the integration of theoretical and practical knowledge. A student who is limited to theoretical knowledge alone will struggle to adapt to practical situations in the future. Therefore, it is essential to enrich each topic in chemistry lessons with experiments, laboratory work, mini-projects, and virtual simulations to enable deeper understanding. Through practical activities, students gain not only knowledge but also the skills to conduct independent research, think logically, and make evidence-based decisions. This is one of the key factors in preparing competitive specialists for modern society.

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