

METHODOLOGICAL APPROACHES TO TEACHING THE PROPER USE OF GLASSWARE IN LABORATORY SESSIONS

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Abstract. The article is devoted to methodological approaches for teaching the proper use of glassware in laboratory sessions. It analyzes the types of glassware, their functions, the development of students' practical skills, and the importance of adhering to safety rules. The article provides recommendations for the effective organization of laboratory sessions within chemistry education and pedagogical practice.

Keywords: glassware, laboratory session, methodological approach, practical skill, safety rules, chemistry education, experiment, student, theoretical knowledge, teaching, effectiveness.

МЕТОДИЧЕСКИЕ ПОДХОДЫ К ОБУЧЕНИЮ ПОРЯДКУ ИСПОЛЬЗОВАНИЯ СТЕКЛЯННОЙ ПОСУДЫ НА ЛАБОРАТОРНЫХ ЗАНЯТИЯХ

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Аннотация. Статья посвящена методическим подходам к обучению порядку использования стеклянной посуды на лабораторных занятиях. В ней анализируются виды стеклянной посуды, их назначение, формирование практических навыков у учащихся, а также важность соблюдения правил техники безопасности. Статья предлагает рекомендации по эффективной организации лабораторных занятий в рамках преподавания химии и педагогической практики.

Ключевые слова: стеклянная посуда, лабораторное занятие, методический подход, практическое умение, правила безопасности, химическое образование, эксперимент, ученик, теоретические знания, преподавание, эффективность.

Introduction

Laboratory sessions are an integral part of chemistry education, playing a crucial role in integrating theoretical knowledge with practical skills. Students conduct various chemical experiments in a laboratory setting, which not only reinforces their theoretical understanding but also develops their competence in experimental methodology, adherence to safety rules, and proper use of laboratory equipment [1]. One of the most essential tools in this context is glassware.

Glassware constitutes the primary equipment in a chemistry laboratory and is manufactured in various shapes and sizes, including test tubes, flasks, burettes, pipettes, cylinders, desiccators, and others. Each type of glassware has a specific function and application. Proper selection, usage, and storage of glassware ensure the accuracy, reliability, and safety of laboratory work. Therefore, teaching the correct procedures for using glassware in laboratory sessions represents an important methodological task [2].

A common issue observed in practice is that students often lack sufficient knowledge of the functions of glassware and the rules for their proper use, which can lead to mistakes in experiments or sometimes compromise laboratory safety [3]. For example, using glassware not intended for

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heating, placing hot glassware on a cold surface, or inaccurate use of measuring equipment can disrupt experimental results or create hazards.

From this perspective, selecting appropriate methodological approaches for teaching the use of glassware is essential. Students should be provided with both theoretical explanations and practical skill development. Key aspects include:

Introducing the types and functions of glassware;

Teaching usage rules step by step;

Developing skills related to laboratory safety;

Integrating theoretical knowledge with practical exercises during instruction.

This article is devoted to analyzing methodological approaches to teaching the proper use of glassware in laboratory sessions and developing effective instructional strategies.

Main Section

The process of using glassware in laboratory sessions occupies a significant place in teaching methodology, as it not only helps students acquire theoretical knowledge but also develops practical skills. Glassware has specific handling procedures, and teaching them correctly is crucial for laboratory safety, accuracy of experimental results, and overall educational effectiveness [4].

At the beginning of the instructional process, students should be provided with a theoretical understanding of the types, shapes, and functions of glassware. For example, test tubes are used for conducting experiments with small quantities, while flasks are intended for preparing or mixing solutions. Graduated cylinders are used for precise volume measurements, and pipettes are designed to transfer specific amounts of liquids. When each piece of glassware and its function is clearly explained, students learn to select the appropriate equipment correctly during laboratory work.

The next stage involves teaching the rules for proper use of glassware. In this phase, the instructor demonstrates, through practical exercises, the conditions under which specific glassware can be used and the safety precautions to follow. For instance, students learn that glassware not intended for heating should never be placed over a flame, hot glassware should not be set on cold surfaces immediately, and measuring equipment should only be used for precise measurements. These rules help develop solid, practical skills in students.

It is essential that methodological approaches emphasize the integration of theory and practice. The teacher first provides general information about the glassware and then demonstrates their use directly in the laboratory through experiments. This approach not only imparts knowledge but also fosters independent working skills. Collaborative work, joint experimentation, observation, and drawing conclusions are additional methods that yield effective learning outcomes.

Laboratory safety is an integral component of these methodological approaches. Students are taught to strictly follow safety measures when handling glassware. They learn to prevent breakage, keep equipment clean, wash and dry items after use, and remove chemical residues. This practice helps cultivate responsibility, technical discipline, and a culture of careful work.

The use of visual aids and interactive methods is also important when teaching the proper use of glassware. Instructors can enhance the learning process by showing real examples of glassware alongside diagrams, tables, and video demonstrations. During practical exercises, students directly handle the glassware, conducting experiments that reinforce their theoretical knowledge through hands-on practice.

In conclusion, methodological approaches to teaching the proper use of glassware contribute not only to students' competence in performing laboratory tasks but also to the development of

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scientific thinking, analytical skills, and responsible behavior. This process is crucial for improving the effectiveness of chemistry education and for fostering students' professional competencies.

Conclusion

Teaching the proper use of glassware in laboratory sessions is one of the key processes determining the effectiveness of chemistry education. Glassware is essential for nearly all experiments conducted in the laboratory, and its correct selection, use, and storage ensure not only the accuracy of experimental results but also the safety of students. Without solid skills in using glassware, students may make mistakes in laboratory work or face the risk of injury. Therefore, it is crucial to organize methodological approaches appropriately during the educational process.

Analysis of the teaching process shows that instructing students on the proper use of glassware yields several positive outcomes. First, students gain comprehensive knowledge of the types of glassware and their functions. Second, they acquire the skills to select and use the glassware correctly during practical sessions. Third, students develop a strict adherence to safety rules when handling glassware. This not only enhances laboratory culture but also fosters responsibility and carefulness among students.

The teacher plays a vital role in methodological approaches to teaching glassware usage. The instructor first conveys theoretical knowledge and then demonstrates practical application in the laboratory. Ensuring students' active participation and guiding them towards independent work are also of significant importance. Practical experiences show that lessons incorporating interactive methods allow students to grasp the material faster and enhance their ability to work independently.

Moreover, the use of modern pedagogical technologies is effective in teaching glassware usage. Tools such as multimedia presentations, video lessons, and 3D models of laboratory equipment increase students' engagement and expand their knowledge of glassware structure, applications, and storage rules.

During the learning process, special attention must be paid to laboratory safety. Students cannot effectively use glassware until safe working habits are firmly established. Regular supervision, demonstrative examples, and preventive discussions are appropriate in this regard.

Based on these considerations, the following recommendations can be made:

The procedures for using glassware should be taught step by step, starting with theoretical foundations and followed by practical exercises;

Students should receive comprehensive explanations of glassware types, functions, and conditions of use;

Laboratory safety should always be prioritized, with real examples and practical demonstrations included when teaching precautionary measures;

The use of interactive methods, group work, video lessons, and visual materials during lessons leads to more effective outcomes;

Assigning small independent experiments helps develop responsibility, technical discipline, and the ability to work independently.

In conclusion, methodological approaches to teaching the proper use of glassware in laboratory sessions play a crucial role in enhancing the quality of chemistry education, developing practical skills, fostering a culture of safety, and preparing students for independent scientific research activities.

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