

Study on Influencing Factors of Laboratory Safety Awareness and Attitudes Among Students Majoring in Chemistry-Related Disciplines in Colleges and Universities

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Abstract: With the development of the times, the cultivation of laboratory safety awareness and attitudes among students majoring in chemistry-related disciplines in colleges and universities should attract people's attention and focus, which is also an important foundation and prerequisite for improving the level of laboratory safety. To this end, teachers should conduct research on curriculum construction, cultural atmosphere creation, and teaching management, so as to further enhance the laboratory safety awareness and attitudes of students majoring in chemistry-related disciplines in colleges and universities.

Keywords: Colleges and universities; Chemistry-related disciplines; Laboratory safety awareness; Influence

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1. Significance of cultivating laboratory safety awareness and attitudes among students majoring in chemistry-related disciplines in colleges and universities

1.1. Ensuring the safety of teachers' and students' lives and property

In college teaching, chemistry-related laboratories usually use various hazardous chemicals, including various strongly corrosive acids and alkalis, many flammable and explosive reagents, and even some chemicals with strong toxicity. If these chemicals are misoperated during laboratory use or neglected in daily management, it is easy to lead to serious safety incidents such as explosions, fires, or poisoning ^[1]. Therefore, we should actively carry out the cultivation of laboratory safety awareness and attitudes among students majoring in chemistry-related disciplines in colleges and universities, enable students to have correct attitudes and awareness, and guide them to abide by relevant laboratory regulations and procedures through education and training. This can fundamentally reduce the probability of hazardous situations. In addition, carrying out such cultivation can

prevent teachers and students from physical and mental harm, ensure the safety of various laboratory equipment in schools, and is of great significance for improving the stability and harmony of the campus environment.

1.2. Ensuring the smooth conduct of experimental teaching and scientific research

In laboratory teaching and daily scientific research activities, safety is a crucial issue that cannot be ignored. If students lack corresponding safety awareness and fail to comply with relevant regulations when conducting chemical experiments, it is easy to cause damage to various experimental equipment, lead to distortion of some experimental data, and even adversely affect some normal experimental projects and scientific research content, thereby resulting in a waste of teaching time and resources ^[2]. Conversely, if students can be cultivated to develop a good attitude and awareness, enabling them to strictly follow operating procedures and standards and properly use various experimental supplies when conducting experiments, the efficiency of experiments will be greatly improved, and the smooth implementation of experimental activities will be guaranteed. By enhancing the laboratory safety awareness and attitude of college students majoring in chemistry-related fields, the output efficiency of scientific research results can be significantly improved, and the overall level of practical work can be further advanced.

1.3. Cultivating students' professionalism and sense of responsibility

In their future careers, students majoring in chemistry-related fields often choose to work in industries such as chemical enterprises and pharmaceutical companies. These industries themselves have high safety requirements, and there are many potential hazards in practical work. If students fail to operate in accordance with relevant regulations, various problems may arise ^[3]. For this reason, in the teaching process, teachers should actively cultivate the laboratory safety awareness and attitude of college students majoring in chemistry-related fields, help them develop good professionalism and moral qualities, deepen their understanding of work safety, and enable them to abide by relevant norms in daily study and life, thereby helping students form good behavioral habits. Cultivating the laboratory safety awareness and attitude of college students majoring in chemistry-related fields can lay a solid foundation for their future employment and greatly enhance their industry competitiveness and career development potential.

2. Problems in the laboratory safety awareness and attitude of college students majoring in chemistry-related fields

2.1. Weak safety awareness

An analysis of current teaching work shows that many students do not have good safety awareness in their daily study, which will greatly hinder their subsequent learning activities and the improvement of experimental skills, and is not conducive to their better employment in the future ^[4]. When conducting chemical experiments, many students tend to ignore safety regulations. For example, some students may forget to wear goggles, lab coats, and gloves during experiments, which will greatly increase the risk of injury. In addition, some students may change the experimental process during the experiment, and some may arbitrarily adjust the amount of reagents and change reaction conditions without authorization. All these behaviors will greatly increase the potential risks of the experiment and significantly reduce its safety. Moreover, after the experiment, due to weak safety awareness, many students fail to clean up experimental waste in a timely manner or forget to turn off the power of the instruments. These behaviors seriously violate the relevant regulations of the laboratory, may

cause environmental pollution to a certain extent, and even trigger safety accidents ^[5]. The occurrence of these behaviors reflects that students' experimental safety awareness is insufficient, and they do not realize that their behaviors will put themselves and others in danger.

2.2. Lack of safety knowledge

At this stage, some students have insufficient access to laboratory safety knowledge, which makes it difficult for them to deeply understand the properties of hazardous chemicals. This may lead to non-standard practices in actual operations. When problems arise, some students do not know how to handle them, which also adversely affects experimental safety ^[6]. In addition, during practical experimental operations, students come into contact with many precision instruments. Some students are not familiar enough with the operation of these laboratory instruments, which may also cause misoperations during experiments and thus create potential safety hazards. When encountering sudden safety incidents such as chemical leaks or fires, these students lack the necessary emergency knowledge and skills, making it difficult for them to respond promptly, mitigate the impact of the accident, and ultimately result in unnecessary losses.

2.3. Incorrect attitudes and lucky mentality

In daily educational activities, teachers can observe a phenomenon: some students hold incorrect attitudes towards laboratory safety regulations, and many often have a lucky mentality during experiments, thinking that dangerous accidents will not happen to them ^[7]. When conducting experimental operations, some students adopt the attitude that "occasional non-compliant operations will not cause any problems." They turn a blind eye to safety precautions repeatedly emphasized by teachers and are unwilling to participate in the learning and practice of safety knowledge, resulting in a very incorrect safety attitude that easily exposes them to dangers during experiments. Furthermore, such incorrect attitudes will hurt other students, thereby reducing the overall effectiveness of laboratory safety management work and significantly increasing the risk of laboratory safety incidents.

3. Strategies for cultivating laboratory safety awareness and attitudes among students majoring in chemistry-related disciplines in universities

3.1. Strengthen the construction of safety education courses

To further improve the effectiveness of cultivating laboratory safety awareness and attitudes among university students majoring in chemistry-related disciplines, we should attach importance to the construction and optimization of safety education courses and introduce more high-quality content into the classroom, thereby significantly enhancing the safety level of the laboratory environment. To this end, teachers should incorporate laboratory safety education into the goals of daily education and build a more systematic safety curriculum system. In addition to covering some theoretical knowledge of laboratory safety, this curriculum system should also include the characteristics of various chemicals, as well as relevant laboratory regulations and legal requirements ^[8]. Moreover, teachers can introduce practical operation skills into the curriculum system based on students' actual situations, enabling students better to master the operation methods of various safety equipment and correctly handle hazardous waste. To improve students' ability to respond to laboratory safety issues, teachers should help them acquire more emergency handling knowledge to correctly deal with various accidents when problems arise and master the corresponding emergency methods and procedures ^[9]. In addition, the curriculum

system can be reformed and optimized according to students of different types and grades to ensure the coherence and pertinence of teaching content, thereby greatly improving the effectiveness of cultivating laboratory safety awareness and attitudes among university students majoring in chemistry-related disciplines.

To enhance the level of cultivating laboratory safety awareness and attitudes among these students, we should try to introduce more educational methods, use multimedia tools for auxiliary teaching, and display the harmfulness of laboratory accidents to students through vivid videos and pictures, so that students can have a more intuitive understanding of laboratory accidents ^[10]. Furthermore, teachers can attempt to introduce the blended teaching method into the cultivation of laboratory safety awareness and attitudes among students majoring in chemistry-related disciplines in universities, thereby helping students access more high-quality resources and supporting their self-directed learning activities. In addition, teachers can use virtual simulation technology to simulate some experimental scenarios, so as to improve students' safety awareness and operational capabilities.

3.2. Fostering a safety culture atmosphere

To enhance the effectiveness of cultivating laboratory safety awareness and attitudes among college students majoring in chemistry-related fields, teachers can create a higher-quality safety culture atmosphere, exposing students to more laboratory safety culture content in daily life, and increasing their level of attention to the issue. To this end, universities can regularly organize promotional activities, including various knowledge lectures and laboratory safety-themed exhibitions. These activities can improve students' cognitive level and make them attach greater importance to laboratory safety ^[11]. When holding laboratory safety lectures, we can invite experts and scholars to the university to share their experiences. In laboratory safety-themed exhibitions, we can display various laboratory safety equipment, operating specifications, warning pictures, etc., for students, thereby creating a better safety atmosphere. Furthermore, universities can collect laboratory safety slogans to encourage students to participate more proactively and actively in the construction of laboratory safety.

In cultivating the laboratory safety awareness and attitudes of college students majoring in chemistry-related fields, we should attach importance to the selection of safety models and carry out cultivation work through the power of role models, which is also an important measure to improve students' laboratory safety awareness. Therefore, in practical teaching, we should abide by relevant rules and regulations, reward students who perform well, and make them role models for other students. At the same time, we should also set an example in daily teaching, strictly implement various laboratory regulations, and ensure the rationality and scientificity of laboratory operation procedures, to guide students to form good safety awareness ^[12]. In the long run, a laboratory safety atmosphere of "everyone participates and everyone values" will gradually take shape on campus, improving the level of cultivating laboratory safety awareness and attitudes among college students majoring in chemistry-related fields.

3.3. Strengthening experimental teaching management

To further enhance the effectiveness of cultivating laboratory safety awareness and attitudes among university students majoring in chemistry-related fields, we should attach importance to optimizing laboratory teaching management and formulate a more reasonable and scientific manual of laboratory operation specifications. This manual should include the operating procedures for various experiments, ensuring that students have a clear understanding of all links from experiment preparation to completion, thereby preventing laboratory safety incidents. In addition, the manual should clearly specify laboratory safety precautions to prevent potential hazards

and accidents, and provide usage methods and maintenance guidelines for various laboratory equipment to enable students to use the equipment correctly ^[13]. In daily experimental teaching, teachers play an indispensable role: they need to supervise experiments to ensure that students conduct experimental activities in accordance with the relevant provisions of the manual. For any non-compliant behaviors, teachers must stop them immediately and provide critical education, helping students develop a stronger sense of standardization and improve the standardization of their experimental operations.

Students' safety awareness and attitudes are integral to experimental courses, so they should be incorporated into the experimental course assessment system. To this end, we need to develop a scientific and reasonable assessment standard to ensure that the assessment content is comprehensive and fair. The assessment content should not only cover students' mastery of safety knowledge, but also include their safety behavior during experimental operations and their ability to handle emergencies ^[14]. Through this strict assessment method, we can urge students to attach greater importance to laboratory safety, guide them to consciously abide by safety regulations, and thus develop good safety habits. For students who fail the safety assessment, necessary measures will be taken—for example, they will be prohibited from entering the laboratory to conduct experiments until they can prove that they have mastered the necessary safety knowledge and skills and passed the assessment.

3.4. Enhancing teachers' safety literacy

To ensure the safety of teaching and experimental activities in chemistry-related majors, the school regularly organizes professional teachers and laboratory managers to participate in comprehensive safety training. The training covers various aspects, including the latest safety laws, regulations and policies, hazardous chemical management knowledge, experimental safety operation skills, and emergency rescue technologies. To improve training effectiveness, we specially invite safety experts and industry technicians to give lectures ^[15]. Through a variety of teaching methods such as theoretical explanations, practical operation demonstrations, and case studies, we aim to significantly improve teachers' safety knowledge and management capabilities. In addition, we encourage teachers to actively participate in domestic and international safety academic exchange activities, so as to keep abreast of the latest developments in industry safety and continuously update and improve their own safety knowledge system.

In experimental teaching and scientific research activities, we clearly define teachers' safety management responsibilities and incorporate these safety management tasks into teachers' performance appraisal indicators. Before the experiment begins, teachers must make adequate safety preparations, including conducting a thorough inspection of experimental equipment and reagents, and explaining safety precautions to students in detail. During the experiment, teachers need to supervise students' operations throughout the process and promptly identify and eliminate any potential safety hazards. After the experiment, teachers are also responsible for organizing students to clean up the experimental site and properly dispose of waste generated during the experiment. For safety accidents caused by teachers' dereliction of duty, we will investigate and hold them accountable in accordance with laws and regulations, to urge teachers to earnestly fulfill their safety management responsibilities.

4. Conclusion

In summary, to further enhance the effectiveness of cultivating laboratory safety awareness and attitudes among students majoring in chemistry-related disciplines in colleges and universities, we can analyze aspects such as strengthening the construction of safety education courses, creating a safety culture atmosphere, intensifying the

management of experimental teaching, and improving teachers' safety literacy. Through these efforts, the quality of cultivating laboratory safety awareness and attitudes among students majoring in chemistry-related disciplines in colleges and universities can be elevated to a new level.

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