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Research on the Measures to Promote the Teaching Reform of Biochemical Laboratory by Using National Experimental Skills

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Abstract

Biochemical examination, as the core course of medical laboratory technology specialty, is highly applied and practical, so it is particularly critical to cultivate students' ability in this specialty. As an important platform to improve the practical ability of medical laboratory students, the national laboratory skills competition has a significant role in promoting the teaching reform of biochemical laboratory. The purpose of this paper is to explore how to promote the reform of biochemistry laboratory teaching through the national laboratory skills competition and put forward specific implementation strategies. Through the deep integration of competition and teaching reform, it aims to cultivate medical laboratory talents with innovative spirit and practical ability, and play the role of "promoting learning, reform and teaching by competition" to meet the rapid development needs of modern medical laboratory technology.

Keywords

national inspection skill competition, Biochemical test teaching, implementation strategy

1. Introduction

With the rapid development of medical science and technology, biochemical examination plays an increasingly prominent role in the fields of clinical diagnosis and treatment, disease prevention and treatment. However, in the past, the teaching mode of biochemical examination focused on theoretical indoctrination, but lacked the cultivation of students' practical ability. At this time, the national laboratory skills competition came into being, which brought new opportunities for the innovation of biochemical laboratory teaching. Participating in this kind of competition can not only effectively temper students' practical skills and enhance their problem-solving ability, but also be a good opportunity for teachers to update their educational concepts and improve their teaching methods. Through the experience of the competition, both teachers and students can achieve qualitative improvement and jointly promote the progress of biochemical laboratory education.

2. Significance of National Laboratory Skills Competition to the Teaching Reform of Biochemical Laboratory

2.1 Improve Students' Practical Ability

With its strict requirements on the accuracy and standardization of practical operation, the National Laboratory Skills Competition has created a valuable platform for students to exercise and improve. Under the tight time limit, students need to successfully complete a series of complex inspection tasks, which not only greatly enhances their practical ability and emergency response speed, but also lays a solid foundation for their smooth entry into the workplace in the future. By participating in the competition in person, students have a deep understanding of every link of the inspection process and mastered various inspection skills, thus ensuring the accuracy and high reliability of the inspection results while improving work efficiency. This competition mechanism undoubtedly paved a broad and bright road for students' professional skills growth and career prospects, and helped them fly high in the field of medical laboratory.

2.2 Promote the Renewal of Teachers' Educational Ideas

Skill competition is not only a stage for students' skill level, but also a comprehensive survey of teachers' teaching quality. It is like a mirror, reflecting the shortcomings in daily teaching, prompting teachers to accurately integrate these feedbacks into daily teaching, constantly improving educational concepts and enhancing personal professionalism. In the careful observation of the competition evaluation, it is not difficult to find that some players make operational mistakes due to nervousness, such as hand shaking affecting the stability of the calibration pipette, inaccurate liquid filling, bubbles, reading deviation, etc., which ultimately affect the competition results. Some players even choose to give up when facing unexpected small situations. These phenomena clearly show that besides solid theoretical foundation and skilled operation skills, good psychological quality is also an important factor to win the competition. At the same time, some players' behaviors in the competition, such as improper classification of medical waste, the tip of straw touching the waste tank and so on, also revealed some limitations of the traditional teaching concept. In the past, many teachers may focus too much on the teaching of basic theories and skills, and to some extent ignore the cultivation of students' awareness of biological safety, psychological quality and adaptability.

In view of this, it is particularly urgent to update the educational concept. While strengthening the teaching of basic theories and skills, teachers should pay more attention to the cultivation of students' psychological quality and biosafety awareness, so as to lay a solid foundation for students' future performance in various competitions, job markets and practical work. This is not only an inevitable requirement to improve students' comprehensive quality, but also an internal driving force to promote the continuous development of medical laboratory education.

2.3 Promote the Reform of Teaching Methods

The fundamental goal of vocational education is to shape workers who have both professional skills and cultural literacy and knowledge base, and its core lies in strengthening individual practical

operation ability and workplace adaptability. However, the traditional experimental teaching often falls into a fixed framework: teachers set the experimental process in advance, prepare experimental materials, and elaborate the scientific principles, operating steps, results analysis and clinical significance behind the experiment in class, while students just follow the established steps to complete the experimental tasks and submit reports. Students in this mode often lack opportunities for active thinking and independent exploration, and the experimental process is more like a repetitive exercise than a real skill internalization.

Crucially, traditional experimental teaching pays too much attention to confirmatory experiments, ignoring the value of design, innovation and exploratory experiments, which leads to a far cry from the actual clinical needs. In order to reverse this situation, we draw inspiration from the skill competition and try to integrate the elements of case teaching and independent inquiry learning into our daily teaching. Taking the experiment of blood glucose measurement as an example, we did not stop at completing the experiment, but encouraged students to independently design the experimental scheme of urine glucose or cerebrospinal fluid glucose measurement in team form (Su, Liu et al., 2019). In this process, students need to explore the following questions: What are the connections and differences between urine glucose, cerebrospinal fluid glucose and blood glucose measurement in clinical application? When the content of the target component in the sample to be tested is abnormal, how to deal with it effectively? This design not only tests students' experimental operation skills, but also stimulates their active thinking and innovative consciousness, and cultivates their abilities of autonomous learning, inquiry learning and teamwork. After the experiment, each team needs to send a member to show its design results, and accept peer evaluation, and learn from each other to achieve common progress. In this process, teachers play the role of instructors, make a diagnostic evaluation of students' design schemes, point out the highlights and shortcomings, and further stimulate students' innovative thinking and teamwork ability. This teaching mode fully embodies the student-centered teaching concept, making experimental teaching a key link to cultivate students' comprehensive quality. In this process, students not only mastered the necessary skills of biochemical examination, but also achieved a qualitative leap in thinking mode, laying a solid foundation for future career development.

3. The Implementation Strategy of Promoting the Teaching Reform of Biochemical Laboratory with the National Laboratory Skills Competition

3.1 Integrate the Content of Competition into the Course Teaching

The syllabus and plan of biochemistry laboratory course have been comprehensively optimized according to the topics and requirements of the national laboratory skills competition, aiming to deeply integrate the core content of the competition into daily teaching. By explaining in detail the advanced inspection techniques and methods involved in the competition, such as high performance liquid chromatography, mass spectrometry, molecular biology detection, etc., the course not only enables students to keep up with the forefront of the industry, but also greatly stimulates their interest in

learning and effectively improves their practical ability. In order to make students better understand the practical application of inspection technology, a number of cases closely related to the competition are integrated into the teaching. For example, by analyzing the cases of tumor markers detection in the competition, the clinical significance, detection principles and methods of these markers are elaborated in detail, and students are guided to carry out experimental operations, from sample processing to data analysis, and participate in the whole process (Huang, Bian, Li et al., 2018). This teaching method not only deepens students' understanding of biochemical testing technology, but also lays a solid foundation for their future study and career, so that they can better adapt to the needs of the industry and enhance their competitiveness.

3.2 Strengthen Practical Teaching Links

In order to significantly improve the teaching effect of biochemical laboratory course, practical teaching plays a vital role. By building an on-campus laboratory or establishing an off-campus training base with industry enterprises, students can exercise and grow in a rich practical environment. In practical activities, we focus on cultivating students' experimental planning, data analysis ability, and flexible coping and solving skills in the face of problems. For example, through the implementation of the experimental project of "biuret method determination of serum total protein", students can not only master the experimental operation process, but also deeply understand the experimental design logic, master the data analysis method, and learn to solve the possible challenges in the experiment. This practice-oriented teaching mode not only helps students meet the high standard requirements of various skill competitions, but also paves a solid road for their career development, so that they can handle complicated and changeable actual situations with ease in the future workplace.

3.3 Carry out Simulated Competition Activities

It is an effective way for students to experience the tense atmosphere of the national test skills competition in advance to hold mock competitions on campus regularly. These activities not only copy the real scenes and processes of the competition, but also provide a platform for students to test their practical ability and adaptability. In a simulation competition, students are divided into several groups, and each group needs to complete a series of complex inspection tasks, including sample collection, processing, instrument operation and data analysis. Among them, a group showed excellent teamwork ability when faced with a task about blood biochemical index detection. They have a clear division of labor, some are responsible for sample processing, others focus on instrument operation, and others are responsible for data recording and analysis (Wu, 2018). In a tense and orderly atmosphere, they not only completed the task accurately, but also found a potential fault of the instrument in advance and adjusted it in time, thus avoiding possible errors. This simulation competition not only tested the students' professional skills, but more importantly, it exposed the students' ability to cope with emergencies. For example, when a group encountered the problem of insufficient reagents in the experiment, they quickly adjusted the experimental scheme, made use of existing resources to carry out alternative experiments, and successfully completed the task. This kind of flexibility is indispensable in

future work.

In addition, the simulation competition has greatly stimulated students' interest in learning and their sense of competition. In the preparation process, students spontaneously strengthened their study of professional knowledge, actively consulted teachers and discussed with classmates, forming a strong learning atmosphere. After the competition, many students said that although they encountered many difficulties in the process, it was these challenges that made them more deeply aware of their own shortcomings and inspired them to further improve themselves and pursue Excellence.

3.4 Strengthen the Construction of Teaching Staff

The strict scoring system of biochemical test items in the National Test Skills Competition clearly takes the experimental results and data reports (50 points) and other aspects of experimental operation (50 points) as the judging criteria, which profoundly reveals that teachers must pay attention to the standardization of operation and the accuracy of results when guiding students (Chen, Lv, Yang et al., 2019). This competition, like a mirror, reflects the blind spot that may exist in traditional experimental teaching, that is, paying too much attention to students' completing the experimental process and obtaining the results, but not strictly evaluating the accuracy of the results. In the field of medical laboratory education, teachers shoulder the heavy responsibility of cultivating students with profound professional theoretical literacy and accurate, standardized and skilled laboratory skills. However, in the actual teaching, teachers may pay too much attention to the teaching of the basic use of instruments and ignore some key operational details. These seemingly insignificant details in routine teaching have become important criteria in skill competition, and also reflect the indispensable operating norms in actual inspection work. In view of this, the construction of teachers has become the key to improve teaching quality.

Since 2014, the National Laboratory Skills Competition has been successfully held for four times, in which the biochemical laboratory project has always focused on "blood sugar determination", and the implementation plan, scoring standards and detailed rules of the competition have been improved and updated year by year. First of all, this competition not only provides a platform for students to show themselves and challenge themselves, but also creates a valuable opportunity for teachers to learn and communicate with famous teachers and peers. The pre-competition briefing will invite experienced experts to deeply interpret the competition documents, and the post-competition summary meeting will become a grand meeting to share the competition experience and exchange ideas. These activities greatly broaden teachers' horizons, update their teaching concepts, promote the improvement of teaching methods, and thus enhance teachers' professional quality. Secondly, in order to speed up the construction of "double-qualified" teachers, colleges and universities can take various measures, such as full-time and half-full-time, to encourage professional teachers to go deep into the clinical front line for further study and experience the real scene of clinical laboratory, so as to continuously enhance their practical skills and optimize the structural requirements of "double-qualified" teachers. This measure not only improves teachers' practical ability, but also enables them to better combine clinical

practice with theoretical teaching and provide students with more practical teaching content.

3.5 Establish an Incentive Mechanism

In order to effectively stimulate students' enthusiasm and enthusiasm for participation, colleges and universities need to establish a perfect incentive mechanism to encourage students to actively participate in national inspection skill competitions and simulated competitions in schools. The core of this mechanism is to commend students who have performed well in the competition by setting up rich awards and honorary certificates, as an affirmation of their efforts and talents. Specifically, colleges and universities can set up multi-level awards, such as the first prize, the second prize, the third prize and the excellent prize, and issue exquisite honorary certificates and medals to the award-winning students as a symbol of their honor (Yu, Liu, Huang et al., 2020). At the same time, in order to further enhance students' participation motivation, colleges and universities can incorporate competition results into the evaluation system of students' learning achievements as an important reference to measure students' mastery of professional skills and practical ability. On this basis, colleges and universities can link the competition results with scholarships and appraisals. For students who have achieved excellent results in the competition, they can give appropriate extra points or give priority to scholarship evaluation and outstanding student selection, so as to encourage students to participate in the competition activities more actively. Through such an incentive mechanism, we can not only stimulate students' competitive consciousness, but also cultivate their teamwork spirit and innovation ability, and lay a solid foundation for their future development.

4. Concluding

As a key stage to strengthen the practical skills of medical laboratory students, the national laboratory skills competition has played a significant catalytic role in the innovation of biochemical laboratory teaching. By deeply integrating competition elements into daily teaching, strengthening practical training, organizing simulated competition experience, strengthening the construction of teaching staff, and building an effective incentive mechanism, these measures can greatly improve students' practical operation ability, promote the updating and iteration of teaching content, drive the transformation and upgrading of teaching methods, and improve the professional quality of teachers as a whole. These reform strategies are aimed at cultivating medical laboratory professionals with innovative thinking and practical skills to meet the ever-changing challenges of modern medical laboratory technology. Therefore, the National Laboratory Skills Competition has become a valuable opportunity, which should be fully utilized to accelerate the reform of biochemical laboratory teaching and promote its development to a higher level.

References

Chen, J. G., Lv, R. G., Yang, X. Y. et al. (2019). Summary of the experience of participating in the national vocational college inspection skill competition. *Health Vocational Education*, *37*(17), 24-26.

Huang, S. Y., Bian, Y. H., Li, Q. S. et al. (2018). Evaluation of medical laboratory technology specialty participating in the national vocational college laboratory skills competition. *New West*, (33), 154+156.

Liu, Y. X. (2020). Promote the teaching reform of biochemical testing with national testing skills competition. *Health Vocational Education*, *38*(22), 44-45.

Su, X. L., Liu, X. Y., Bertha et al. (2019). Exploration on improving the preparation level of medical laboratory skills competition in higher vocational colleges. *Primary Medical Forum*, *23*(31), 4562+4588.

Wu, X. L. (2018). Leading the teaching reform of biochemical laboratory with the national laboratory skills competition. *Health Vocational Education*, *36*(04), 70-71.

Yu, W., Liu, H. W., Huang, Y. S. et al. (2020). Enlightenment of vocational skills competition on drug testing teaching. *Guangdong Chemical Industry*, *47*(10), 224+226.