Universe Scientific Publishing

ORIGINAL ARTICLE

Application Research and Practice of TBL Innovative Teaching Method in the Course of Clinical Biochemical Testing Technology

Hongxia Gao, Yan Liu, Guoqing Wang*

Beihua University, Jilin 132013, Jilin, China. E-mail: wgq@beihua.edu.cn

Abstract: The purpose of this study is to explore the practical application effect of TBL innovative teaching method in the course of clinical biochemistry test technology. The research object is all undergraduate students in the laboratory major of 2018 medical school of our university. The research method is comparative experiment method, the teaching method of LBL teaching is set as control group, while the experimental group adopts TBL teaching method. By the final teaching evaluation and the data collected in the process, the influence of TBL teaching methods on the teaching effect of the course is compared and analyzed. The evaluation methods are combined with subjective and objective evaluation. The evaluation methods include questionnaire, student mutual evaluation, final test and other multiple ways. And the results of this study showed that the average score of the experimental group using TBL teaching method was significantly higher than that of the control group using traditional teaching method. In addition, through the process evaluation, it was found that the students in the experimental group were superior to the students in the control group in terms of learning interest, communication ability and learning methods. As a result, the application of TBL teaching method in the teaching of clinical biochemistry test obviously promotes the teaching quality and effect of this course.

Keywords: TBL Teaching Method; Clinical Biochemical Testing Technology; Application and Practice

Clinical biochemistry test technology is an important course in modern medicine, and it is also a professional course of medical laboratory specialty[1]. Its curriculum content is characterized by a wide range of knowledge points, more abstract knowledge and not easy to understand[2]. The teaching methods often used in medical teaching are: LBL、CBL、PBL、TBL、RBL, and TBL teaching combines many advanced ideas and methods in the PBL、 CBL, and pays more attention to team learning and students' creativity than other methods[3]. Since the beginning of this century, TBL teaching method has been widely used in medical courses in Europe and America. Extensive teaching examples have also confirmed the advantages of this teaching method. Many colleges and universities in China are carrying out research and experiments on TBL teaching methods, such as integrating case teaching, situational teaching, flipping classroom and so on with TBL teaching according to different teaching contents, which is not only helpful for the students to study the theory deeply, to understand the future professional work deeply, but also to cultivate the students' comprehensive qualities such as practical vocational skills and innovation, which is very important for the future work of modern medical students.

doi: 10.18686/aem.v9i1.160

1. An overview of the application of TBL innovative teaching method to clinical biochemical testing technology

Clinical biochemistry test technology is a highly cross-disciplinary subject that integrates knowledge of chemistry, clinical medicine, biology and chemical detection[4]. The course is based on basic medicine, biology and chemistry, on which to study biochemical markers related to prevention, diagnosis, treatment of diseases and prognosis care, and to study the techniques and methods of detecting these markers, which provide scientific basis for diagnosis, treatment of diseases and other processes, so it is also highly applicable and operational. In 2013, the Ministry of Education made a major adjustment in the training objectives, methods and academic system of the medical laboratory specialty. The school system was changed to four years, and the teaching training target was the laboratory technician. Because of the change of training goal, the teaching content and emphasis of this course also change and shift. Nowadays, the teaching of this course in many colleges and universities pays more attention to the teaching of testing items and testing techniques. In the premise of satisfying the comprehensive goal and development of the subject, more attention is paid to the cultivation of students' knowledge application ability and practical ability. And the traditional teaching method is not suitable for the current teaching of the course, some colleges and universities began to actively try PBL, TBL and other teaching methods.

PBL teaching method was first developed by an American medical professor in 1969, which emphasizes problem-based teaching to guide students to master knowledge and solve problems actively. Teachers play more auxiliary roles in teaching and promote students to explore problems better by creating situations. PBL is very popular and common in the current teaching; and the CBL teaching method is also common in the medical curriculum, which is based on case-based knowledge to teach clinical cases and encourage students to apply clinical knowledge to practice[5,6].

The TBL teaching mode explored in this paper emphasizes learning new lessons and exploring problems with the team as the unit, which can be said to put forward a new learning model based on the integration of PBL and CBL core ideas. Created by American Larry Michaelsen professors, the method encourages students to team-oriented learning, memory and practice, and emphasizes cooperation and communication within and between groups. This way of learning together helps modern medical students to participate more actively in case-solving, practical inquiry and other learning links. TBL teaching is divided into three stages: preparation, application and evaluation. Students complete their study preparation before class, mainly including reading and autonomous learning to the death of textbooks. Teachers test students' preparation through discussion at the beginning of class. The application stage is that teachers bring cases, throw questions, students in groups, groups in the class for autonomous and free discussion to solve problems and integrate new knowledge with old knowledge. TBL teaching method does not need more teaching resources than the traditional mode, but it is of great help to the improvement of students' learning, practical ability and comprehensive quality of thinking and innovation, and the effect of application in the teaching of some contents is due to PBL and other teaching methods[7,8].

2. Research object, research method and teaching content selection

2.1 Research object

The students of many classes of clinical laboratory major of grade 2018 in our medical school were selected as the object of comparative teaching research. There was no difference in the overall scores of each class before the experiment, the average score of the class in the control group was 75.3 points in the last semester, and the comprehensive score of the experimental group was 74.8 points in the last semester. There was no significant difference in the total number and gender distribution between the two groups, and the teaching materials, class hours and teaching resources allocated were basically the same.

2.2 Research method

2.2.1 Teaching experiment methods

The experimental study period is one semester, while the control group still is traditional teaching, while the experimental group is TBL. The teaching methods of the control group are not repeated, and the teaching process of the experimental group is as follows: (1) Reasonable division of teams. The class size is about 50 people, a group of about 8 people, a total of 6 groups, the grouping standard is the comprehensive evaluation of the school period, the division takes into account the students' character, learning ability, thinking mode and so on, so that each group of students characteristics, comprehensive ability equal, the different levels of students equally divided into each group, and consider the possible chemical role between students. Then the team leader is selected by self-recommendation and mutual evaluation in the group, which is responsible for task assignment, discussion organization, recording, extracurricular activities planning and other tasks. (2) Design teaching cases and questions. According to the specific learning content, teachers prepare the appropriate number and strong guidance, more complex cases and related problems, and design each link of teaching, such as situation simulation, problem guidance, so that students in a reasonable range of practice to explore the focus of learning and the stage of preparation of doubts. (3) Testing links. At the beginning of the teaching stage, the students' preparation is tested by individuals and teams, the content is the basic concept of the new class, the key knowledge, the test method is oral quiz, written quiz, and the control time is 5-10 minutes. (4) Explain basic concepts. According to the results of the test, we can explain the missing or puzzled problems in the students' independent preparation flexibly and quickly. (5) Throw out cases and questions to guide students to group discussions. The group leader introduces the problems discussed by the group, then organizes the members to discuss scientifically, then concludes the discussion between groups, and then the members of the class discussion stage explain the results of the discussion. (6) Teachers lead students to conduct specific analysis and evaluation of the discussion process and the results of the problem.

2.2.2 Evaluation method of research effect

The teaching effect of the two groups was evaluated by theoretical examination, summary writing and questionnaire survey, and combined with the subjective process evaluation of teachers. The theory examination is to let the student carry on the closed paper examination, the examination content contains the new lesson content and the related old knowledge, mainly by the choice question and the case analysis question. Summary writing is to allow students to collect information and write a summary of knowledge after class. The questionnaire survey is after the chapter course, and let the student evaluate the teaching in the form of questionnaire, which is helpful to understand each student's cognition degree, satisfaction degree and opinion on the new teaching method.

2.2.3 Statistical analysis technique

It is necessary to study the concrete influence of different teaching methods on the teaching effect, and use statistical knowledge to carry out data statistics and teaching analysis on the two groups of teaching. The statistical content is theoretical examination results, survey data obtained by questionnaire survey and so on, covering the overall achievement, learning interest, teaching method satisfaction, team writing ability and so on.

2.3 Teaching content selection

Different teaching contents have adapted teaching methods, TBL are not adapted to the teaching of all contents of the course, or need other teaching methods to assist. The course mainly includes detection methods, specific detection items, selection and evaluation and so on, among which detection techniques include metabolic substance testing, organ disease testing and so on. Teaching content is different, the design of teaching time, objectives, assessment is different. This study is the first half of the second school year, students have learned the basic knowledge of medicine, and have a certain understanding and contact with teaching methods such as case analysis, so team learning is not abrupt. In order to guide students to team study by good cases, the study should combine with the teaching arrangement of the course, the current teaching progress and the existing teaching resources, and teaching is mainly carried out with the content of specific test items, such as serum albumin determination, lactate dehydrogenase activity determination and so on. Because the medical examination involves many factors, needs the actual

operation ability, therefore when the research, the teacher comprehensively completes the quality control, then lets the student first take the team as the unit to carry on the experiment inquiry.

3. Key points of the implementation stage of teaching research

3.1 Preparation of teachers and students

The application of TBL teaching in clinical biochemical testing course requires teachers to have sufficient and comprehensive knowledge, subject vision and excellent and comprehensive clinical experience, not only can excellent teaching, because of the flexibility and uncontrollable nature of TBL teaching, but also needs teachers to organize and discuss flexibly and control the teaching process. Therefore, teachers need to make comprehensive and specific preparations. In this study, teachers of this class and related teachers form a thematic group, select typical cases according to the selected teaching contents, involve problems, and strictly control other factors according to the problems, and adjust the cases and problems involved reasonably. In response to the complexity of medical issues, the cluster has made every effort to be fully proactive in its preparation. Write teaching plan as specific as possible, and clear context, reasonable arrangement of time, taking into account the consolidation and application of old knowledge.

Students' preparation mainly refers to the autonomous learning of the new class before class, and collect relevant case materials for independent inquiry. Before class, the teacher arranges the preview task through the class group, and passes the selected case data and the question to the student, the student carries on the targeted inquiry in the offline group according to the existing group, through the literature review, the question analysis and so on, summarizes, records the individual and the team overall result. In the preparation stage, students are allowed to seek help from the teacher within the specified time, and the teacher uses reasonable ways to guide and provide reference materials to help students to better master learning methods, better data collection and more independent inquiry problems.

3.2 Class discussions and inductive reviews

Class discussion takes many ways because of the different content, and different places in the learning stage, such as after the test experiment, the group explores their own discussion results in PPT form, or reproduces the process and results of the inquiry in the form of flipping the classroom. During the discussion, other students can ask questions or supplement the results, and the results show that the team thinks again to answer the questions. In this process, teachers should make relevant records and maintain the order of discussion, and create an overt, respectful and open atmosphere of discussion.

After each group presents the result, the teacher records the result in time and arranges the clear thread, if the team has the question, gives the point, or guides the student to analyze the case clearly, helps the student to find the answer gradually, analyzes the question in own inquiry; moreover, the teacher should carry on the summary, the key point and the confusion question in the discussion.

4. Findings and discussions

4.1 Results of the study

At the end of the experiment, summarize, collate and analyze the information of the evaluation results, and study the results of this comparative experiment. The results of the theoretical results showed that before the implementation of the experiment, the average score of the theoretical examination in the experimental group was 65, and the average score of the theoretical score in the control group was 64. After the application TBL teaching, the theoretical score of the experimental group was obvious and higher than that of the control group, the average score of the control group was 65, while the average score of the experimental group was 78. The scores of students' literature writing were: the average score of experimental group was 80, and the average score of control group was 65, the difference was significant. The objective evaluation results of questionnaire survey showed that the students' interest in learning, team consciousness and teaching satisfaction were higher.

4.2 Discussion on research process and results

Some medical courses in colleges and universities have been trying to TBL teaching, not only clinical biochemical testing courses, through this study also proved that TBL teaching can improve the teaching quality of the course, and can be well combined with LBL、PBL and other teaching methods. Experimental results show that the students improve their theoretical achievement and comprehensive ability by applying TBL to teaching. The reasons are summarized as follows: (1) TBL teaching enables students to communicate in the form of teams, which is beneficial to students to sort out their knowledge structure, form a comprehensive knowledge structure, and learn different inquiry methods quickly; (2) TBL teaching invisibly improves students' autonomous initiative, thus improving their learning efficiency; (3) Because of the reasonable grouping and strict control in teaching, most students can dare to explore and dare to speak, and the completion of the task is better, which also shows that the students are very satisfied with the TBL teaching method.

At the same time, the teaching also found that in the later stage of the implementation of the method, some students' participation decreased, mainly manifested in poor pre-class preparation effect, not active discussion, after communication with students, found that some students think that pre-class preparation, after-class writing and other links occupied their excessive extracurricular time, resulting in a sudden increase in their learning burden, learning interest decline. Secondly, the scores of the two groups of multiple choice questions are not different, which indicates that the teaching link of the theory course is not deep enough or there are some problems such as missing content in the discussion and summary link, or there are cases of design, problems are not comprehensive and so on.

5. Conclusion

Above all, TBL teaching is really helpful to improve the teaching quality of clinical testing courses, but its requirements for students and teachers are very high, so there are many problems in this study. However, complex and diverse factors may be considered in practical application, and each link should be improved continuously in the future, so that TBL teaching method can be better applied in clinical biochemistry teaching.

Acknowledgement

This article was supported by 2017 teaching and research project of Education Department of Jilin Province; Science Leading Group Office of Jilin Province (Project Number: GH19058).

References

1. Xu M, Li P, Zhao Y. Study on teaching strategies of biochemistry and biochemistry testing technology (in Chinese). Laboratory Medicine and Clinic 2016; 13(21): 3122-3124. doi: 10.3969/j.issn.1672-9455.2016.21.058.
2. Wang L, Su H, Shao H. Research and practice of research, frame and case-based teaching model—Taking the course of clinical biochemistry and biochemistry in higher vocational education as an example (in Chinese). Continuing Medical Education 2016. doi: 10.3969/j.issn.1004-6763.2016.07.029.
3. Cao C. Current situation and reform analysis of the teaching of biochemistry test (in Chinese). Chinese and Foreign Communication 2017; (21): 89.
4. Xu Z, Chu M. Design and implementation of comprehensive training in biochemical testing (in Chinese). Chinese Journal of Health Laboratory Technology 2018; 28(2): 252-253+256.
5. Zhang X, Yao H, Hao C, *et al*. Application of PBL and CBL teaching method in teaching clinical biochemistry test (in Chinese). The Chemistry of Life 2020; 1-4.
6. Zhang Y, Wang D, Guo S, *et al*. A probe into the teaching reform of clinical biochemical testing technology course in four-year laboratory (in Chinese). The Journal of Medical Theory and Practice 2019; 32(15): 2491-2493.
7. Wang Y, Yang Y, Yi W, *et al*. Exploration on the reform of experimental teaching of "clinical biochemistry testing technology" for comprehensive practice ability (in Chinese). Journal of Chengdu University of Traditional Chinese Medicine (Educational Science Edition) 2019; 21(1): 39-41.
8. Chen C, Ma K, Bei Z, *et al*. Research and discussion on the teaching mode of "school and college in one" course of biochemical examination in medical laboratory technology specialty (in Chinese). Course Education Research 2018; (40): 247.