

Application of Mind Mapping Combined with PBL Teaching Method in Standardized Training of Ophthalmology Residents

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Abstract: To explore the implementation effect of mind mapping combined with PBL teaching method in standardized training of ophthalmology residents. Eight graduate students and regulatory students who studied in the standardized training base of ophthalmology residents in Inner Mongolia Forestry General Hospital from October 2022 to May 2023 were selected. PBL teaching group: PBL teaching was implemented from October 2022 to January 2023, and mind mapping combined with PBL teaching group: mind mapping combined with PBL teaching was implemented from February 2023 to May 2023. The teaching contents included small lectures, case discussions and teaching. The scores of theory and clinical skills in mind mapping combined with PBL teaching group were better than those in PBL teaching group, and there was no statistical difference in medical record writing. The application of mind map combined with PBL teaching method in the standardized training of ophthalmology residents can significantly improve the theoretical learning efficiency and practical operation ability of residents, which is worth popularizing.

1. Research background

The traditional teaching method of standardized training for residents is that teachers make relevant courseware in advance and teach relevant courseware content in class. The whole process is dominated by teachers' teaching, and students "listen", passively accept knowledge, speak less and discuss less, and the content is monotonous and boring. Students are easy to lack interest in learning and enthusiasm for autonomous learning, easily lose focus in class and easily forget after class. The learning effect is not good. PBL teaching method (problem-driven learning) is a problem-oriented learning method, and its purpose is to cultivate students' ability to solve practical problems. PBL teaching method usually starts from a specific situation or problem, and students actively participate in the process of solving problems through autonomous learning and collaborative inquiry. This teaching method encourages students to exert their subjectivity in learning, which will naturally absorb knowledge and blur the professional boundaries, instead of getting rid of dependence and accepting open thinking ^[1]. The basic principle of PBL teaching

method is to provide appropriate nature, rich resources and effective evaluation tools from experience and practice to help students achieve teaching goals. This teaching method puts the problem first and takes it as the core, so that learners can actively construct knowledge structure and reasoning process. In PBL teaching method, the design of problems often requires students to discuss, analyze and evaluate various solutions, and improve their ability to understand and solve problems through self-reflection and cognition. Therefore, the characteristics of this teaching method are: "critical thinking, autonomous learning, group cooperation and practical application" ^[2]. The application of PBL teaching method has greatly improved students' learning efficiency. Mind mapping teaching method is a teaching method to integrate and display knowledge through visual graphics. It was invented by British psychologist Tony Brighton in 1960s to help people better understand and organize information ^[3]. Mind mapping makes complex or abstract concepts easier to understand by using central themes and branch structures to present information. Mind mapping is an innovative teaching method in medical education, which can help students improve their divergent thinking ability, problem analysis ability and innovation ability ^[4]. Therefore, this study applies mind mapping to PBL case discussion and summary study, in order to improve students' knowledge system construction and teamwork ability, cultivate students' divergent thinking and enhance medical students' clinical thinking ability.

2. Object and method

2.1 Research object

Eight graduate students and students who studied in the standardized training base of ophthalmology residents in Inner Mongolia Forestry General Hospital from October 2022 to May 2023 were selected. PBL teaching group: PBL teaching was implemented from October 2022 to January 2023, and mind mapping combined with PBL teaching group: mind mapping combined with PBL teaching was implemented from February 2023 to May 2023. The teaching contents included small lectures, case discussions, teaching rounds and so on.

2.2 Research methods

Mind mapping combined with PBL teaching group guides residents to construct mind mapping in teaching, while PBL teaching group only conducts regular PBL discussions.

The specific teaching plan of mind mapping combined with PBL teaching group: (1) Problem design: lead the teacher to ask questions in advance to discuss the framework of ophthalmic diseases, and at the same time pass the mind mapping framework to the students, who are responsible for filling in the symptoms, signs, pathogenesis, staging, diagnosis, differential diagnosis, treatment plan and latest research progress before class. (2) Group report, discussion and teacher's comments: In class, a resident is selected as the representative to show the mind map in PPT form, and feedback the learning content before class. Teachers summarize the knowledge points of symptoms, signs, pathogenesis, staging, diagnosis, differential diagnosis, treatment plan, latest research progress and other aspects of the disease, comment on the advantages and disadvantages of PBL discussion in each group, summarize and strengthen the knowledge points, students of different grades speak and discuss, and residents further improve their mind maps after class.

PBL teaching group: (1) Question design: lead teachers to ask questions in advance to discuss the history, inducement, symptoms, signs, pathogenesis, staging, diagnosis, differential diagnosis, treatment plan and latest research progress of ophthalmic diseases. (2) Teachers provide students with clinical cases and designed problems corresponding to the cases before class. For difficult

problems, the instructor will provide students with appropriate prompts during discussion and analysis, and explain some corresponding concepts or provide corresponding reference materials to help students analyze and discuss. (3) Group report: In class, a medical student is selected to report the learning content and discussion results in PPT form. This can help teachers understand the symptoms, signs, pathogenesis, staging, diagnosis, differential diagnosis, treatment options and the latest research progress.

Examination methods: 1. Students are required to pass an exam, with 60 points in theory, 20 points in practical ability, and 20 points in case analysis and writing.

2.3 Statistical methods

SPSS 20.0 software was used to analyze and process the data. The measured data were expressed as (x s), and the difference was statistically significant by t test and $P < 0.05$.

3. Result

3.1 Mind map combined with PBL teaching group and PBL teaching group's theoretical and practical ability scores and case analysis results.

The theoretical score of mind mapping combined with PBL teaching group was 50.00 3.03, while that of PBL teaching group was 45.25 4.54, $P < 0.05$, the difference was statistically significant. The theoretical score of mind mapping combined with PBL teaching group was better than that of PBL teaching group. The score of practical ability of mind mapping combined with PBL teaching group was 17.77 1.24, and that of PBL teaching group was 15.30 2.20, $P < 0.05$, the difference was statistically significant, and the score of practical skills of mind mapping combined with PBL teaching group was better than that of PBL teaching group. The score of medical record writing in mind map combined with PBL teaching group was 17.63 1.06, and that in PBL teaching group was 17.30 2.05, $P > 0.05$, with no statistical significance. See Table 1.

Table 1: The scores of theory and practice ability and case analysis of mind mapping combined with PBL teaching group and PBL teaching group.

group	results of rating	Practical ability score	Case writing
Mind mapping combined with PBL teaching group	50.00±3.03	17.77±1.24	17.63±1.06
PBL teaching group	45.25±4.54	15.30±2.20	17.30±2.05
t	2.96	1.92	0.46
P	0.00	0.03	0.32

4. Discuss

Ophthalmology diseases are diverse and difficult to distinguish, and it is a clinical discipline that pays equal attention to theory and practice. Because of the obscure anatomical features of eyeball such as blood vessels and nerves, the abstract movement features such as cooperation and antagonism of extraocular muscles, and the incomprehensible optical parameters, as well as the differential diagnosis of various diseases, eye complications of systemic diseases need comprehensive analysis, such as diabetic retinopathy, hypertensive retinopathy, drug-induced cataract, blood-related fundus diseases, etc., and a comprehensive and detailed diagnosis is

needed^[5]. In the traditional clinical teaching, it is difficult for the students who have just come into contact with the clinic to master and understand it in a short time by simply explaining the relevant knowledge in class, and it is also difficult to skillfully apply it to the clinic. The process of learning clinical knowledge for medical students is a critical period for cultivating clinical thinking and training clinical practice ability, and it is an important process of combining theory with clinical practice. Therefore, it is very important to adopt which teaching methods and methods in clinical teaching can make students master knowledge faster and better and cultivate clinical thinking better. For this reason, many innovative teaching methods have been introduced to improve this problem, such as three-dimensional questioning teaching method^[6-8], scenario simulation teaching method^[9-10] and reverse classroom teaching method^[11], which have achieved certain results. The teaching and research group of ophthalmology in Inner Mongolia Forestry General Hospital and its own advantages introduced mind mapping combined with PBL case teaching into the classroom and got good feedback.

We can use mind mapping as a mental training tool. Tutors provide a teaching framework of mind mapping, and students can expand their branches infinitely in the process of drawing mind mapping, which is a tool for efficient divergent thinking. With the help of mind map, it is helpful to associate new knowledge with old knowledge, to establish a systematic, networked and organized knowledge system, and to cultivate students' logical thinking ability in this process. It can be improved many times before class, in class and after class to improve students' learning efficiency, autonomous learning ability and memory and understanding ability.

Mind mapping can use graphic skills to connect various topics with each other and establish a memory chain in the form of hierarchical diagram, which realizes the visualization of logical thinking to help understanding and memory. In this study, the mind map is that after students preview the knowledge points related to ophthalmology in advance, they think about the knowledge points of diseases and the relationship between knowledge points by themselves, and display them intuitively in the form of charts and words. It can help students sort out and summarize knowledge points and the relationship between knowledge, and can clearly show students' thinking process. It can help students remember and understand what they have learned and improve their ability of analysis and summary. In class, students can also discuss the mind maps drawn by each group to understand their own thinking processes and learn from each other's strengths.

Mind mapping can effectively improve learning efficiency. In this study, the mind map combined with PBL teaching group and PBL teaching group are significantly better than PBL teaching group in learning efficiency score. The main line of students' discussion in the simple PBL teaching mode is not clear enough, and the logic level is chaotic. However, the tutor organically links the general subject words through the organization chart with the help of the mind map, which can clearly show the correlation between complex clinical problems and basic knowledge points. Students can further supplement the mind map by self-study and with the help of the thinking conductor framework, which greatly improves the learning efficiency.

Mind mapping can improve students' memory and understanding ability. In this study, the mind map combined with PBL teaching group and PBL teaching group were significantly better than PBL teaching group in the scores of memory and understanding ability. Through group discussion, PPT presentation in class further strengthens the impression, and tutors can constantly stimulate learners' thinking and conduct in-depth and broader exploration for specific problem situations. This can better promote the development of students' divergent thinking, better exercise the thinking ability of clinical hypothesis and clinical reasoning for medical students, and strengthen students' understanding ability. Students improve their memory and understanding ability by perfecting their mind maps three times before, during and after class.

To sum up, the application of mind mapping combined with PBL teaching method in

standardized training of ophthalmology residents can significantly improve the theoretical learning efficiency and practical operation ability of residents, which is worth popularizing.

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