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The effect of modified observation-teaching-discussion pedagogy combined with microteaching on the critical thinking ability of nursing interns in China: a quasi-experimental study

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Aim: The aim of this study is to investigate the effect of modified observation-teaching-discussion pedagogy combined with microteaching on improving the critical thinking ability of nursing interns in China.

Methods: Two hundred baccalaureate nursing students practicing in the department of neurosurgery were divided into two groups chronologically, with 100 students per group. The control group received traditional clinical mentoring while their counterparts in the intervention group received mentoring by modified observation teaching discussion pedagogy combined with microteaching. Then, we compared the two groups with respect to theoretical knowledge and nursing operation skills. The Critical Thinking Ability Scale was used to evaluate the critical thinking ability of the two groups of nursing students. Data were analyzed with SPSS 22.0 software.

Results: Following the internship, the scores of nurses in the intervention group were significantly higher than those in the control group for theoretical knowledge, technical skills and critical thinking ability ($p < 0.05$ for all).

Conclusion: The application of modified observation-teaching-discussion pedagogy in combination with microteaching promoted the knowledge, technical skills and critical thinking ability of nursing students in clinical practice.

KEYWORDS

modified observation-teaching-discussion pedagogy, microteaching, nursing students, internship, critical thinking ability

1. Introduction

The experience of nursing practice is crucial to the development of nursing students, and critical thinking is one of the clinical abilities that nursing students need to possess (Siles-González and Solano-Ruiz, 2016; Jiménez-Gómez et al., 2019). Critical thinking is one of the contributing factors in academic achievement as well as an essential component in clinical

decision making, nursing practice, and education (Fero et al., 2010). There are many reasons for nursing interns to learn critical thinking skills. The first reason is that thinking is the key component in problem solving, and nursing students without these proficiencies become part of the problem. In addition, nursing interns should be capable of making major decisions independently and quickly in critical situations. Critical thinking skills enable them to identify essential data and distinguish between problems that require urgent intervention and those that are not life-threatening. Thus, nursing students should be able to reflect on their actions and consider the possible consequences of each action to make precise and proper decisions (Akbar and Maarefi, 2010). However, Several authors have coincided on the need to develop nursing students' critical thinking and found that nursing students lack critical thinking ability during the clinical practice (Bittner and Gravlin, 2009; Montagna et al., 2010; Christianson, 2020). Therefore, nursing educators should pay more attention to cultivating the critical thinking abilities of nursing students.

Various investigations have suggested that it is necessary to design educational strategies that are based on student learning style to improve students' critical thinking (Westerdahl et al., 2020). At present, nursing practice teaching methods mainly include mind mapping, micro-classes, Problem-Based Learning (PBL) and scenario simulations in China (Zhang et al., 2016; Dong et al., 2019; Zheng et al., 2020). The cultivation and application of critical thinking abilities in nursing students has not been fully valued and demonstrated previously; moreover, few studies have reported self-experience and multiple evaluation (An et al., 2017).

Observation-teaching-discussion (OTD) pedagogy is a progressive teaching method centered on clinical observation, theoretical learning and case discussion. The modified OTD teaching method involves nursing students first being put in contact with patients to understand specialist diseases. Then, they enter the classroom learning and tackle problems. They also use a self-study guidance link to expand their learning vision; they also learn to summarize and integrate theoretical knowledge, systematically master theoretical knowledge, and learn to solve clinical practical problems with theoretical knowledge via the discussion of clinical cases (Wang, 2018).

The biggest difference between the modified OTD and the standard OTD teaching method is the addition of a key part of the roots, that is, why do this in clinical practice? The purpose is to allow students to enter the discussion of clinical cases with thinking, rather than mere communication, in order to maximize the effect of nursing students' learning. In this improvement process, nursing teachers guide students to actively contact patients and expand their own learning horizons, so as to improve students' critical thinking ability.

The microteaching method is a teaching method that divides a very complex operation into several single teaching skills that can be observed and controlled in a very easy manner. This technique uses video recording and audio/video recording technology to provide feedback on various teaching skills (Yuan et al., 2013; Dayanindhi and Hegde, 2018). Although several studies have shown that microteaching which is a teacher training technique currently practiced worldwide, provides teachers an opportunity to perk up their teaching skills by improving the various simple tasks called teaching skills (Remesh, 2013; Deshpande and Shastri, 2020). The "micro" in the microteaching method is to disassemble the learning content, gradually form a

number of sub-items, and classify, sort and sort the sub-items. The theoretical knowledge is divided into practical knowledge, which is fed back to students through modern technology such as video. After repeated video playback, students can find their own shortcomings in operation, so as to stimulate students to reflect on and improve their professional knowledge, and improve their critical thinking ability in the process. At present, there are few studies on the application of modified OTD combined with microteaching in nursing education, and it is still unclear how effective the modified OTD combined with microteaching is in nursing teaching. Moreover, the common purposes of the two teaching methods can improve students' critical thinking ability, so as to give full play to the maximum teaching effect. Therefore, the present study was performed to examine the effect of neurosurgery teaching education using the modified OTD combined with the microteaching methods on critical thinking of the nursing students. The results of the study will also provide evidence regarding undergraduate nursing education in clinical practice and could contribute to the improvement of nursing students' critical thinking. In addition, they may provide guidance for nurse educators and further studies on the issue.

2. Data and methods

2.1. Study design and participants

This was a quasi-experimental study (Figure 1). From July 2018 to December 2019, 200 nursing undergraduates who practiced in the Department of Neurosurgery of our hospital were selected as subjects. The study was approved by the Medical Ethical Committee of our institution.

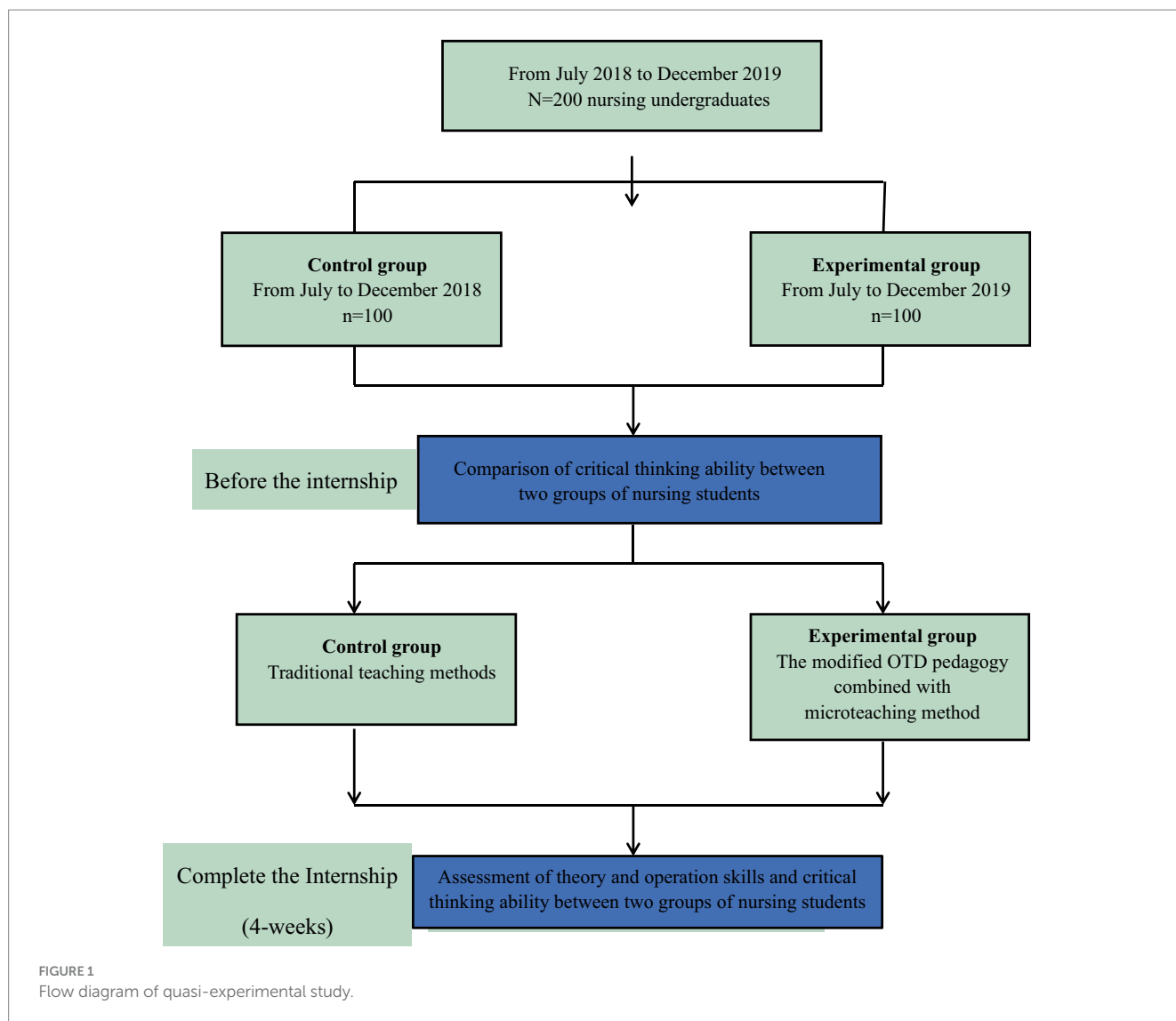
Potential study participants met the following criteria before being enrolled into this study: (1) All students were full-time 4-year nursing undergraduates. (2) In our department, each student completes a 4-week internship. (3) All students voluntarily signed informed consent. Exclusion criteria: (1) Termination of internship; (2) Other reasons did not complete.

After obtaining written informed consent, every participant, each batch of 15–18 students was divided into three groups with each group containing 5–6 students. For the control group, we selected 100 nursing undergraduates who practiced in the Department of Neurosurgery of our hospital from July to December 2018; the other 100 students were allocated to the study experimental group from July to December 2019. There were no pre-existing differences in knowledge levels and operational skills between the experimental and control groups. The principles of medical ethics were strictly respected during this study and all undergraduate students participating in this quasi-study provided informed consent.

2.2. Procedure

2.2.1. Teaching faculty and content

First, we needed to use specific criteria to select clinical teachers and build a team of clinical teachers. Then, we needed to build a teaching resource platform to share information. The basic criteria for the selection of clinical teachers were as follows: age of care ≥ 5 years; intermediate or above title; skilled nursing skills; strong professional



ability; strong teaching management, organization and coordination ability, and ≥ 2 years of clinical nursing experience. Head nurses in the department selected clinical teachers through quantitative assessments such as organizing speeches, teaching rounds and nursing skills competitions and organizing training for teaching methods. The head nurses selected 20 teachers and constructed clinical teaching teams.

Four diseases were the main focus of theoretical teaching: pituitary adenoma, brain injury, stroke and subarachnoid hemorrhage. For each disease, the students needed to learn the definition, pathology, classification, clinical manifestations, treatment, and nursing aspects, with a significant focus on nursing. Four nursing skills were taught: oral nursing, vital sign measurement, sputum suction and nasal feeding. For each skill, the student needs to learn the purpose of the operation, the steps involved and the precautions to take.

2.2.2. Teaching methods

The teaching content and teachers were the same for both groups. The control group adopted the traditional teaching method. After entering the department, the general teacher introduced the system

and the environment, conducts one theory and one operation study per week, and conducts collective theory teaching and standard operation demonstration and operation practice on Monday; the other parts of the internship involves one-on-one teaching. The traditional teaching method is still a combination of theoretical knowledge teaching and standardized operational demonstration. The key difference between the traditional teaching method and the modified OTD combined microteaching method lies in whether students are guided to think independently about clinical problems. The traditional teaching method lacks the training of students' critical thinking ability. The study group adopted the modified OTD combined with the microteaching method, as described hereafter.

2.2.2.1. Preparation before teaching

The teacher team prepared teaching materials, such as collecting classic cases for nursing ward round discussion, making and shooting reverse operation video and standard operation video for nursing skill teaching, formulating quality evaluation criteria for Power-Point reports for the nursing students, and building a teaching resource platform to share information.

2.2.2.2. Theoretical learning

The modified OTD teaching method involved the following strategy.

(1) Clinical observation: on day 1, case data were collected and nursing students used their knowledge to complete the nursing assessment of patients with neurosurgical diseases, such as the observation of clinical manifestations in patients with craniocerebral injury (traumatic brain injury, loss of consciousness, unequal pupils, headache, nausea, vomiting, urinary incontinence and other common symptoms). (2) Nursing room: On the 2nd day, an integrated nursing room (60 min) was organized for teachers and students to guide nursing students to actively think about and raise nursing problems that might arise in patients through clinical real-life scenarios (for example, nursing problems in comatose patients such as ineffective airway clearance, nutritional disorders and the risk of skin integrity damage). (3) On the 3rd day, nursing students conducted a comprehensive, systematic and in-depth study and thematic inquiry on a nursing problem in the nursing room and searched for measures to solve the nursing problem by reviewing relevant literature; finally, they prepared a PowerPoint presentation of the study content, including basic knowledge of the disease (definition and typology of the disease, pathophysiology, clinical manifestations, treatment principles and methods, nursing diagnosis and nursing measures), reflections and literature search (analysis and summary, questions and suggestions, including references). (4) Case discussion: on the 5th day, nursing students provide a PowerPoint presentation and receive comments from the faculty team who will correct, ask questions, evaluate, and provide scores for the theoretical assessment. The nursing students were instructed to further study and discuss the problems that arose in the discussion session.

2.2.2.3. Operational skills learning

Operation skills learning involved the microteaching method.

- (1) Self-learning operation: on the first day, nursing students taught themselves the basics of nursing, conducted nursing operation drills, recorded operation videos with mobile phones, and uploaded them to the WeChat group formed by nursing students.
- (2) Observing negative videos: On the second day, nursing students watched negative video teaching materials and self-recorded videos to identify problems in the videos.
- (3) Calibration: On the third day, the established nursing students watched standard operation videos and guided the nursing students to conduct self-correction, analysis, and improvement.
- (4) Training and assessment: Nursing students strengthened their operation training with regards to operative problems and underwent a nursing operation assessment at the end of each week.

2.3. Data collection

We set up a questionnaire to score the theoretical operation assessment. After completing the 4-week internship, students were required to participate in the theoretical and operational skills assessment. In addition, students were asked to respond to a critical

thinking skills questionnaire before entering and after leaving our neurosurgery department.

2.4. Data collection tools

2.4.1. Assessment results of theory and operation skills

Each week, teachers assessed theoretical knowledge of each nurse and the mean score of the four assessments was divided into theoretical results. Nursing operation assessment was based on the “basic nursing” standards for operation examination (four operations, each with a total mark of 100 points).

2.4.2. Assessment of critical thinking ability

For evaluation, we used the critical thinking ability scale revised by Chinese scholar (Pang et al., 2004). This scale includes seven dimensions and 70 items, including open mind, truth seeking, systematic ability, analytical ability, thirst for knowledge, confidence in critical thinking, and cognitive maturity. The Likert 6-point scale was used for scoring, with a total score of 70–420. A total score ≤ 210 was negative; 211–279 was neutral; ≥ 280 was considered positive and ≥ 350 indicates strong critical thinking ability. The scale had good reliability and validity, with a validity of 0.89 and Cronbach coefficient of 0.90 before the internship. And after the internship, the scale has a validity of 0.85 and Cronbach coefficient of 0.88. When nursing students entered and left the course, the researcher connected to the WeChat group of nursing students through the questionnaire star to send electronic questionnaires and indicated the matters needing attention when filling the questionnaire.

2.5. Statistical analysis

Student theory and skills scores and critical thinking skills measured before and after the internship were analyzed using descriptive statistics using SPSS 22.0 software (IBM, Armonk, NY, United States) We used a T test and Chi-squared test to compare group differences in critical thinking ability between the control and experimental groups. To compare mean score differences between the two groups at the pre- and post-internship, an independent t-test was used to compare mean scores within a group. $P < 0.05$ was statistically significant.

3. Results

In the study, a total of 200 students were enrolled in this Department of Neurosurgery of our hospital between July 2018 and December 2019. There were 100 students in the control group and 100 students in the experimental group. There were 22 males and 78 females in the control group; age 21–24 years (mean: 21.10 ± 0.98 years). The experimental group contained 26 males and 74 females; age 20–24 years (mean: 20.97 ± 0.52 years). There was no significant difference between the two groups with regards to gender or age (see Table 1).

The comparison of theoretical knowledge level and operational skills between the two groups of nursing students is shown in

TABLE 1 Baseline characteristics of nursing students.

Item	Experimental group <i>n</i> = 100	Control group <i>n</i> = 100
Age (Mean ± SD)	20–24 (20.97 ± 0.52)	21–24 (21.10 ± 0.98)
Sex		
Female, <i>n</i> (%)	74 (74%)	78 (78%)
Male, <i>n</i> (%)	26 (26%)	22 (22%)

TABLE 2 Comparison of theoretical level and operational skills between two groups of nursing students (score, $\bar{x} \pm s$).

Group		Theoretical knowledge	Oral nursing	Measurement of vital signs	Sputum suction nursing	Nasogastric nursing
Control group	100	75.06 ± 6.23	81.27 ± 5.57	82.00 ± 5.16	80.15 ± 5.33	82.22 ± 5.84
Experimental group	100	86.92 ± 4.82	88.43 ± 4.26	90.08 ± 3.22	90.24 ± 3.88	89.35 ± 3.99
<i>t</i> value		15.061	10.629	13.290	15.312	10.083
<i>p</i> value		0.000	0.000	0.000	0.000	0.000

Table 2. The results showed that students' theoretical knowledge level and operational skills in the two groups after completing the 4-week internship. In terms of theoretical knowledge scores, the statistical results of experimental group (86.92 ± 4.82) and control group (75.06 ± 6.23) were statistically significant ($p < 0.01$), suggesting that the theoretical knowledge scores of the experimental group were significantly higher than that of the control group after receiving the modified OTD combined with microteaching method. Besides, operational skills were included four skill operations, such as oral nursing, measurement of vital signs, sputum suction nursing and nasogastric nursing. We found that the scores of various skills operation of nursing students in the experimental group were higher than those in the control group, which indicated that the modified OTD combined with microteaching had a significant improvement effect on the improvement of the operation skills of nursing students.

The comparison of critical thinking ability between the two groups of nursing students before practice is shown in [Table 3](#). The results showed that the total score of critical thinking ability of nursing students in the experimental group (254.68 ± 29.07) was slightly lower than that in the control group (255.17 ± 25.60), and there was no statistical difference ($p > 0.05$), indicating that there was no significant difference in critical thinking ability of nursing students in the two groups before they started to practice, which was comparable. Besides, the critical thinking ability of nursing students was neutral before and after the practice before and after the practice of the control group. This indicates that the critical thinking ability of nursing students needs to be improved urgently.

The comparison of critical thinking ability between the two groups of nursing students after practice is shown in [Table 4](#). The results showed that the total score of critical thinking ability and all dimensions of nursing students in the experimental group were higher than those in the control group, and the difference was statistically significant, which indicated that the intervention effect of the modified OTD combined with microteaching was obvious. Therefore, we found that in the experimental group that participated in the 4-week practice of the modified OTD combined with microteaching, the critical thinking ability of nursing students was greatly improved, which had

a significant teaching effect compared with the control group that did not conduct any intervention.

4. Discussion

4.1. Summary of major findings

Our study findings showed that the modified OTD combined with the microgrid teaching method were effective teaching strategies to improve nursing students' theoretical knowledge and practical operation skills. The results in [Table 2](#) of this study showed that the theoretical knowledge and nursing operational skills scores of nursing students in the study group were significantly higher than those of the control group (all $p < 0.01$). Traditional teaching methods for nurses mostly use mechanical memory learning methods such as indoctrination and duck-filling and tend to ignore the cultivation of independent learning and active thinking ability ([Alamrani et al., 2018](#); [Ward et al., 2018](#)). The modified OTD teaching method guides nursing students to assess the condition of patients with neurosurgical diseases; this represents the application and consolidation of their own mastered theoretical knowledge. At the same time, this method can stimulate the desire of nursing students to learn and explore deficiencies in their existing knowledge, gain new knowledge, and find the answers to outstanding questions by reviewing textbooks. The teachers provide options to query information, summarize and integrate fragmented knowledge points in the process of preparing PowerPoint presentations so as to achieve the purpose of sorting out and constructing theoretical knowledge. The purpose is to organize and construct a theoretical knowledge framework system. When the nursing students report their PowerPoint presentation, the theoretical knowledge is consolidated again, such that they can grasp the theoretical knowledge systematically and firmly and improve their theoretical knowledge effectively. The micro-grid teaching method aims to decompose the more complex nursing operation into several simple and single operations. Nursing students can take advantage of the repeated viewing of videos, watch opposite operation videos and their own operation videos; this practice can identify problems and

TABLE 3 Comparison of critical thinking ability between two groups of nursing students before practice (score, $\bar{x} \pm s$).

Group	Searching for the truth	Open mind	Analytical ability	Systematization ability	Critical thinking confidence	Thirst for knowledge	Cognitive maturity	Total points
Control group	40.87 ± 8.24	39.47 ± 5.59	33.60 ± 4.00	36.45 ± 5.81	30.53 ± 5.55	30.38 ± 6.08	43.87 ± 5.84	255.17 ± 25.60
Experimental group	41.23 ± 5.59	40.03 ± 6.01	33.55 ± 4.31	36.30 ± 6.50	30.22 ± 5.83	29.72 ± 5.93	43.63 ± 6.07	254.68 ± 29.07
t value	3.05	6.82	0.932	0.864	0.701	0.435	0.776	0.899
p value	0.764	0.676	0.636	0.291	0.396	0.822	0.849	0.271

TABLE 4 Comparison of critical thinking ability between two groups of nursing students after practice (score, $\bar{x} \pm s$).

Group	Searching for the truth	Open mind	Analytical ability	Systematization ability	Critical thinking confidence	Thirst for knowledge	Cognitive maturity	Total points
Control group	42.82 ± 8.20	41.44 ± 5.78	35.98 ± 4.21	38.47 ± 5.80	33.11 ± 5.85	32.81 ± 5.80	46.02 ± 5.94	270.65 ± 27.35
Experimental group	48.96 ± 7.95	46.79 ± 6.08	40.41 ± 4.49	42.67 ± 6.15	37.06 ± 6.52	38.42 ± 7.03	50.07 ± 6.36	305.01 ± 28.98
t value	5.377	6.379	7.198	4.972	4.508	6.255	5.377	8.622
p value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

avoid students from making such mistakes again. Students can adopt self-practice and self-correction against the standard video operation; this makes the nursing operation more standardized and skillful and effectively improves the nursing operation skills.

Furthermore, our study showed that the modified OTD combined with microteaching method can cultivate and improve critical thinking ability of nursing students. The results in Table 3 of this study showed that the critical thinking ability of nursing students was neutral before and after the practice of the control group. This indicates that the critical thinking ability of nursing students needs to be improved urgently. Table 4 showed that the critical thinking ability of nursing students in the study group was positive after the internship. These results suggest that modified OTD combined with microteaching method can effectively improve the critical thinking ability of nursing students. One of the cores of educational literacy is to cultivate critical thinking ability in students (Lee et al., 2017; Westerdahl et al., 2020). Critical thinking is the foundation that can guide nursing staff to identify, judge and solve problems in a scientific manner (Chan, 2013). Cultivating critical thinking ability of nursing students plays a decisive role in the future development prospects of nursing. In this study, critical thinking runs through every link of the modified OTD combined microteaching method. Compared with traditional teaching methods, there are some key advantages of the modified OTD teaching method. Firstly, clinical observation; Under the guidance of theoretical knowledge, nursing students comprehensively analyze and evaluate the basic condition of patients based on the information provided by the patients themselves, such as expression, chief complaint, past situation, current situation, mental state and lifestyle. The clinical observation of nursing students allows the completion of evaluations for diseases and patients in the teaching link; this improves the observation and knowledge of nursing students along with their assessment ability and their ability to analyze problems. Second, teaching ward rounds; teachers encourage nursing students to share the problems found in practice and gradually guide them to reflect on theory at a deeper level to better integrate the theory and apply it into clinical practice. During the process of reflective practice, nursing students are inspired to carry out in-depth

self-analysis to gain a deeper understanding of clinical problems. By establishing common sharing learning modes, broadening the knowledge level and the way of thinking, it is possible to improve the critical thinking ability of nursing students more efficiently. Third, self-study guidance; in the context of the current era of information overload, the key is to cultivate critical reading and thinking ability of our nursing students in order to avoid blind following in the process of data collection (Lee and Oh, 2020). When looking up data, Nursing students can distinguish authenticity, analyze and judge, reasonably choose and think independently, so as to screen out the most reliable information from the mass of knowledge. Fourth, case discussion; providing a report in the form of a PowerPoint presentation provides the initiative of learning to the nursing students, who analyze, judge, summarize, and identify the logical relationships between the data obtained. By organizing teachers, students and nursing students to cooperate, discuss case studies and explore teaching activities, the nursing students can learn to think about problems from different angles and multiple dimensions; this is not only conducive to the dissemination of thinking, but also a more comprehensive and thorough understanding of the topic content. The teacher's heuristic questioning provides each nursing student with the opportunity to reflect on learning results and express his or her own views. In view of the viewpoints raised by others during the questioning process, the teacher encourages the nursing student to further think and explore the new problems caused by the collision of thoughts (Kyriakoulis et al., 2016). The learning mode of self-study and teacher guidance not only increases the confidence of nursing students with regards to critical thinking, but also makes them trust their actual judgment, deepens their critical consciousness, and inspires their spirit to bravely explore the truth.

4.2. Advantages of the modified microteaching method

Nursing students and teachers watch and evaluate self-recorded and negative operation videos together to encourage the

nursing students to question, make active judgments, learn, and reflect on nursing practice, and modify or reconstruct concepts. By combining self-learning, the thoughts of others and teacher evaluation, it is possible for nursing students to open their minds, and focus more on their own presence, cognitive bias or error. Thus, the nursing students gain from this evidence-based method that allows them to confirm their own ideas with others and appreciate the authenticity of intellectual curiosity, significantly improved the search for truth, stimulate innovative thinking and improve the critical thinking ability of nursing students through continuous and conscious strengthening exercises (Horntvedt et al., 2018).

4.3. Study limitations

There are some limitations to this study that need to be considered. First, this study was limited to neurosurgical nursing interns, and further research needs to involve other disciplines. Second, another limitation of the study is that the sample size was low and we suggest that future studies should consider a large sample.

5. Conclusion

The modified OTD combined microteaching method can efficiently connect theory with practice and focus on the advantages of the two methods while positively promoting each other. Critical thinking is skillfully integrated into each link of the modified OTD combined microteaching method. This method encourages students to repeatedly undergoing critical readings, logical thinking, objective and cautious evaluation training, discuss topics and perform independent thinking. The method also allows multivariate evaluation with regards to promoting the critical thinking habits of nurses, improving found-analysis-problem solving skills, and provides a solid foundation for innovative thinking. These skills are vital if nursing students are to meet the social, medical and health demands of nursing personnel.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

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Ethics statement

The studies involving humans were approved by The Medical Ethical Committee of YiChang Central People's Hospital. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

S-MW: Formal analysis, Funding acquisition, Writing – original draft, Writing – review & editing. Y-YL: Writing – original draft, Writing – review & editing. QM: Data curation, Investigation, Writing – original draft. J-QW: Conceptualization, Data curation, Investigation, Writing – original draft. Y-FT: Project administration, Supervision, Validation, Visualization, Writing – original draft. Z-YX: Supervision, Validation, Visualization, Writing – original draft.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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