World Journal of Engineering Research
Print ISSN: 2959-9865
Online ISSN: 2959-9873
DOI: https://doi.org/10.61784/wjer3100

EFFECT EVALUATION OF THE BOPPPS TEACHING MODEL BASED ON THE OBE CONCEPT AND SPOC PLATFORM ON HUMANISTIC CARE ABILITY AND NURSING COMMUNICATION COMPETENCE OF HIGHER VOCATIONAL NURSING STUDENTS

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Abstract: Objective: Higher vocational nursing education aims to develop students' clinical competence, yet traditional teaching methods often fail to adequately cultivate humanistic care and nursing communication abilities. The BOPPPS model, combined with the OBE concept and SPOC platform, offers a student-centred, outcome-driven, blended learning approach. However, evidence of its effectiveness in Internal Medicine Nursing courses for vocational nursing students remains limited. Methods: A quasi-experimental study was conducted. The 2022 and 2023 higher vocational nursing students (hereinafter referred to as nursing students) from two parallel classes at a vocational college were enrolled. A total of 452 students participated: the class of 2022 (n=216) served as the control group (traditional teaching), and the class of 2023 (n=236) as the experimental group (BOPPPS–OBE–SPOC intervention). Humanistic care ability and nursing communication competence were measured using validated scales before and after the intervention. Results: Following the intervention, the experimental group taught with the BOPPPS model (based on the OBE concept and SPOC platform) exhibited significantly superior performance in humanistic care and nursing communication abilities relative to the control group ($P < 0.05$). Conclusion: The BOPPPS teaching model based on the OBE concept and SPOC platform significantly improves humanistic care and nursing communication abilities in higher vocational nursing students enrolled in the Internal Medicine Nursing course. This blended, student-centred approach can be considered an effective pedagogical strategy for nursing education.
Keywords: BOPPPS; OBE; SPOC; Humanistic care; Clinical competence; Nursing communication abilities; Higher vocational nursing education

1 INTRODUCTION

Higher vocational education is an integral part of China's educational system. It shoulders the mission of cultivating highly skilled, application-oriented talents who can meet the frontline needs of production, construction, service, and management. On 21 December 2022, China issued the Opinions on Deepening the Reform of the Modern Vocational Education System [1], which calls for the extensive implementation of project-based teaching, scenario-based teaching, and modular instruction, and for the deep integration of modern information technology with education and teaching. With higher vocational colleges as the main body, the goal is to cultivate high-quality technical and skilled talents that meet the needs of economic and social development in the new era. Furthermore, the China Educational Modernization 2035 plan explicitly states that the need to innovate talent cultivation methods, promote "heuristic, inquiry-based, participatory, and cooperative teaching approaches", and develop students' innovative spirit and practical abilities. At the same time, the plan emphasizes "improving teachers' ability to apply information technology, updating teaching philosophies, refining teaching methods, encouraging students to use information tools, and fostering active and autonomous learning, so as to enhance students' ability to analyses and solve problems using information technology" [2]. These policies show that the goal of higher vocational education is to be student-oriented, employment-driven, and to produce highly skilled personnel with strong practical abilities.

Internal Medicine Nursing is a core course in higher vocational nursing programmers. Whether measured by class hours or by the number of questions in the national nurse licensure examination, it accounts for 30%–40% of the entire professional curriculum [3]. The course involves extensive content and presents considerable academic difficulty [4]. At present, in our institution, higher vocational Internal Medicine Nursing teaching still relies on traditional multimedia lectures and large-class instruction. This traditional model has several shortcomings:

① Teachers cannot dynamically monitor or provide feedback on students learning progress, leading to delays in adjusting instruction and a lack of personalized guidance.

② Nursing students have weak active-thinking skills and a low sense of professional identity.

③ Students lack initiative and motivation for autonomous learning.

④ Students' abilities in humanistic care, hands-on operation, communication, and clinical thinking are weak – their capacity to integrate knowledge and translate theory into practice is deficient; when dealing with clinical cases, there is

a disconnect between the skills they have learned and their practical application.

Against the backdrop of "educational interconnectivity", the traditional, single-model teaching approach for higher vocational Internal Medicine Nursing can no longer meet the demands of talent cultivation. Therefore, there is an urgent need to explore a teaching model that aligns with the characteristics of the Internal Medicine Nursing course and fulfils the national talent cultivation objectives.

Outcome-Based Education (OBE), also known as competency-based, goal-based, or demand-based education, was proposed by the American scholar William G. Spady in 1981. OBE is an educational philosophy oriented towards students' learning outcomes – that is, curriculum design and implementation are aimed at the learning results that students ultimately achieve through the educational process [5]. In recent years, the OBE concept has been applied effectively in engineering education, curriculum development, online teaching, general education courses, and other areas [6–12]. Compared with traditional teaching, OBE-based instruction is student-centered and outcome-oriented; students experience a stronger sense of participation, achieve deeper knowledge internalization, and gain a greater feeling of accomplishment. This indicates that OBE theory has good feasibility in guiding curriculum instructional design, providing a reference and support for this study.

Small Private Online Courses (SPOC) essentially use Massive Open Online Course (MOOC) resources for teaching schemes targeting small, specific populations. SPOC is a new instructional model that teachers can implement on campus by leveraging the vast resources of MOOCs. The core of this teaching model remains the classroom session, with learning activities designed and organized by the teacher using instructional resources on the MOOC platform. Learners watch course videos before class and identify difficult points. During class, teachers organize discussions to address questions that arise during preview and discussion. Depending on the course progress and learners' needs, teachers can use MOOC resources for small-class teaching, which effectively stimulates learning motivation and improves learning efficiency [13–15]. To date, SPOC has shown strong vitality in various disciplines both domestically and internationally.

The BOPPPS teaching model was developed by the Instructional Skills Workshop (ISW). It emphasizes a student-centered teaching philosophy and consists of six main components: Bridge-in, Objective, Pre-assessment, Participatory learning, Post-assessment, and Summary. Relevant research in China and abroad has focused on the concept introduction, teaching link design, objective setting, and multi-faceted evaluation of the BOPPPS model [16–19]. The educational outcomes reported show that: through effective design of the bridge-in section, student classroom participation is higher and the classroom atmosphere is more active; the six-step instructional design makes the teaching plan more complete and the links more optimized. Through pre-assessment, teachers become familiar with students' knowledge reserves and can creatively introduce group-cooperation strategies to increase engagement and enhance teaching effectiveness. Teachers better understand the learning situation and can impart knowledge to students more accurately. The notable effectiveness of BOPPPS provides a solid foundation for the implementation of this study.

The BOPPPS combined with SPOC teaching method is essentially a form of "blended learning". Blended learning is characterized by rich learning resources, support for personalized learning, and high teaching efficiency [20], and is regarded as the latest paradigm of competency-based education [21]. At present, research on this method is mainly concentrated in courses such as electrical engineering, physical chemistry, pathogenic biology, and Python programming [22–25]; studies on the application of BOPPPS combined with SPOC in Internal Medicine Nursing are rare. This study aims to explore the application and effect of the BOPPPS combined with SPOC teaching method in the Internal Medicine Nursing course for higher vocational nursing students, with the goal of contributing to the development of nursing education.

2 METHOD

2.1 Study Population

After obtaining informed consent, cluster sampling was performed from September 2024 to January 2025 at a tertiary vocational medical college in central China. This produced two cohorts: the 2022-intake students formed the Control group (n = 216) and the 2023-intake the Intervention group (n = 236). Inclusion criteria were: (1) enrolment in a three-year vocational nursing programme; (2) completion of prerequisite courses (Human Anatomy, Pathophysiology, Biochemistry, Nursing Psychology, Health Assessment); and (3) first-time enrolment in the second-year Internal Medicine Nursing course. Exclusion criteria were: (1) medical leave >4 consecutive weeks, or (2) absenteeism >20% of scheduled sessions. No significant between-group differences were found in age ($P = 0.984$) or gender ($P = 0.097$).

2.2 Textbooks and Teaching Content

Both groups took the Internal Medicine Nursing course in the first semester of their second year, using the same textbook (Wang & Wang, 1st ed., People's Medical Publishing House), teaching faculty, syllabus, and full-time instructors for theory and practice. The unit "Nursing Care for Cerebrovascular Diseases" (3 credit hours) was selected as the teaching exemplar for this study.

2.3 Teaching Methods

The control group received traditional classroom instruction according to the conventional teaching method. The specific process was as follows: teachers and students first reviewed the key points of the previous lesson together, then the teacher introduced the new lesson through cases and taught according to the syllabus requirements, and finally summarized the key points of the lesson and assigned homework.

In contrast, the intervention group adopted the BOPPPS hybrid teaching model based on the OBE concept under the SPOC platform. The detailed steps were as follows. (1) Pre-class: According to the curriculum standards, teaching objectives were set, and online learning and communication platforms (QQ groups, WeChat groups, etc.) were established. One week before class, teachers published learning task sheets, micro-classes, PPTs, animations, teaching cases, and pre-class test questions on the MOOC platform and arranged pre-class tasks through the online communication platforms. Students completed pre-class learning as required (reading tasks, self-learning of pre-class knowledge, completing pre-class exercises, and noting learning difficulties). Questions, confusions, and difficult knowledge points were sent to the lecturer via QQ or WeChat. The teacher then prepared teaching content based on students' pre-class feedback and common problems. (2) In-class: Phase 1 (Course introduction) – after pre-study, students were introduced to the course in the MOOC discussion area, where the instructor posted cases, knowledge links, social foci, questions, and animations to stimulate curiosity. Phase 2 (Goals) – teaching objectives were determined according to course standards and job task requirements and uploaded to MOOC one week before class. Phase 3 (Pre-test) – the teacher posted pre-class test questions on Rain Classroom two days before class, analyzed the results one day before class to identify weaknesses, and adjusted classroom teaching content and objectives accordingly. Phase 4 (Participatory learning) – based on teaching objectives, job requirements, and pre-test results, the teacher determined key points and difficulties, and used different methods (group discussion, scenario simulation, role-playing, etc.) according to different knowledge points, timely integrating internal medicine nursing skills. Phase 5 (Post-test) – teachers set post-test questions based on teaching objectives, job competency requirements (including clinical practice ability training), teaching difficulties, and students' pre-class and in-class problems, using a high-fidelity electronic manikin system for assessment. Phase 6 (Summary) – the teaching effect of the knowledge module was summarized; students' problems and deficiencies in basic knowledge learning and application, skills mastery, and professional ability development were analyzed, and solutions and suggestions were proposed. Finally, test questions were issued for common problems to check for omissions and consolidate knowledge. (3) Post-class: The course leader organized all teaching staff to conduct discussion and summary, including process discussion (students' online participation, pre-class preparation results, classroom participation, group discussion involvement, etc.) and outcome discussion (regular and final theoretical and practical examination scores, student questionnaires and interview results, test papers, etc.). Based on the course characteristics, improvement suggestions were proposed to guide subsequent teaching. The design of the specific teaching process is illustrated using the nursing care of patients with cerebrovascular diseases as an example, as shown in Table 1.

Table 1 Nursing Care for Patients with Cerebrovascular Diseases: BOPPPS Hybrid Teaching Design Based on OBE Concept SPOC Platform

Time	Contents
Pre-class	Rain classroom pushes "pre-class learning task list" to help students complete pre-class independent learning. 1) Students go to the MOOC "Internal Medicine Nursing" knowledge map to learn cerebrovascular disease knowledge online according to the task list, and teachers supervise and feedback online. 2) Assigned individual pre-class subjective homework. After completing the homework, students take photos and upload them. Pre-class homework only counts completion points, not right or wrong points. 3) Assigned group pre-class tasks (report and present the discussion results in the form of PPT). To encourage group students to actively discuss and cooperate, every group member must participate, and each member must be assigned a task. The task topics include the following aspects: ① What are the three major diseases that currently cause human death? ② What are patients most worried about? ③ What is our main task as medical workers? ④ What are the upper limb spasticity patterns of hemiplegic patients? ⑤ Why is the side-lying position beneficial to patient recovery? ⑥ My opinion on the case of "White Strongman"? Episode 4: A taxi driver usually has a mild personality, but recently his temperament has changed drastically, and he is very irritable and irritable, causing a major traffic accident. After being admitted to the hospital for examination, it was found that it was caused by a brain tumor. Where is the brain tumor located? Why did it cause personality changes? Episode 10: A female patient was admitted to the hospital due to cerebral arteriovenous malformation. After arguing with others, she suddenly had a severe headache and vomited. What might be the reason? Episode 18: A worker was crushed by a heavy machine, resulting in severe cerebral hemorrhage. The doctor directly opened the skull without any medical equipment on site. Why did he take the risk to do so? 4) The task list emphasizes that the understanding and mastery of cerebrovascular diseases is the prerequisite for further exploration of the course.
In-class	The course is carried out in the order of "pre-class introduction - knowledge point sorting - raising questions - group competition (discussion + mutual evaluation) - learning feedback". 1) Pre-class test. The questions are 9 basic multiple-choice questions, multiple-choice questions and judgment questions to test students' pre-class learning effect. 2) Introduction of cerebrovascular diseases. The course content is introduced through the introduction of photos of

	celebrities such as Stalin, Roosevelt, and Churchill, and three pre-class debate questions (① What are the three major diseases that currently cause human death? ② What are patients most worried about? ③ What is our most important task as medical workers?). When answering the three questions, each group went to the podium to report and display in the form of PPT. There were 4 groups in each class, and each group had a time limit of 3 minutes to report. Other groups scored. 3) Knowledge point sorting. Focus on explaining the problems that occurred in the pre-class online test, personal homework, and pre-class test. 4) Constantly throwing questions. In order to cultivate students' high-level thinking abilities such as problem solving and in-depth thinking, questions are thrown in class: ① If someone around you suddenly speaks unclearly and has a crooked mouth, how would you judge whether he has a stroke? Use observation questions in life to introduce the knowledge of cerebrovascular diseases in this class. ② Is cerebrovascular disease a stroke? Is stroke equivalent to cerebrovascular disease? Why do some people recover almost completely after a stroke, while others are left with serious functional impairments? What are the reasons behind this? What is the difference between ischemic and hemorrhagic strokes? Which is more dangerous? Introduce the definition and classification of cerebrovascular diseases so that students can better understand the definition and classification of cerebrovascular diseases. The method of asking questions and on-site interaction is fascinating, so that students know the truth and the reason. ③ Why do high blood pressure and diabetes greatly increase the risk of stroke? Why does arteriosclerosis cause ischemic stroke? How do blood clots form and block cerebral blood vessels? Why does intracranial pressure increase after a hemorrhagic stroke? What are the hazards of increased intracranial pressure to brain function? Which organ is most likely to be damaged when hypoxia occurs? Introduce knowledge points such as cerebrovascular anatomy and risk factors. ④ When preparing to talk about the FAST principle, please demonstrate how the "FAST" principle can be used to determine stroke? And give several different patient symptoms, so that students can quickly determine whether it is an ischemic stroke or a hemorrhagic stroke? ⑤Suppose you are an emergency nurse and receive a patient suspected of stroke. How should you assist the doctor in making a preliminary diagnosis and treatment? Do you know what the "golden 4.5 hours" is? Why does the treatment of stroke emphasize time so much? Introduce knowledge points such as first aid measures. ⑥Why is the earlier the better for rehabilitation training after stroke? Is late rehabilitation still useful? Provoke students to think. 5) Group discussion, competition performance, and mutual evaluation. In order to encourage students to think and discuss, the "White Strongman" case and questions are pushed through Yu Classroom in the group competition performance. After independent thinking and peer discussion, the group students go on stage to make PPT reports. The group students discuss and summarize and share ideas, and the teacher makes supplementary summaries. The group evaluates and scores each other, and the teacher confirms the fairness of the scoring after class. 6) Feedback on learning this week. To encourage students to actively summarize, reflect and make suggestions, feedback in the form of subjective questions is set at the end of the class. Students respond to their self-study situation, satisfaction, learning confusion or suggestions in real time.
Post-class	1) Provide additional answers (text) based on students' classroom learning feedback. 2) Assign personal after-class homework within a limited time and score according to the correctness rate. 3) Assign personal optional after-class extension homework, including but not limited to drawing a mind map of cerebrovascular disease knowledge map, using simulated electronic people to conduct stroke treatment simulation drills, etc. 4) The cumulative public announcement of the group experience value of this class (before class + during class). Before class, the group performance accumulates experience value according to cooperative discussion and PPT completion, and the class accumulates experience value according to the group competition ranking. 5) Knowledge point hyperlink expansion, introduction to stroke treatment guidelines.

2.4 Evaluation Indicators

2.4.1 Humanistic caring ability inventory

The CAI, originally developed by Nkongho, was administered in its Chinese version translated and validated by Xu Juan [26]. The inventory comprises three dimensions – cognitive (14 items), courageous (13 items), and patient (10 items) – for a total of 37 items. Items are rated on a 7-point Likert scale, with 13 items reverse-scored. Total scores range from 37 to 259, with higher scores indicating greater humanistic caring ability. Based on the normative distribution, caring ability is classified as high (>220.30), moderate (203.10–220.30), or low (<203.10). In this study, the Cronbach's α coefficient of the scale was 0.842.

2.4.2 Nursing student clinical communication competence scale

This scale was developed by Yang Fangyu et al. [27]. It comprises six dimensions (establishing rapport, attentive listening, identifying patient problems, mutual participation, delivering effective information, and validating feelings) and includes 28 items, each representing a specific communication behaviour. Items are rated on a 4-point Likert scale (4 = always used, 3 = frequently used, 2 = occasionally used, 1 = never used). Seven items are reverse-scored. Total scores range from 28 to 112, with higher scores indicating stronger clinical communication competence.

2.5 Statistical Methods

All data analysis will be conducted using the SPSS26.0. The count data of the two groups were expressed as [n (%)],

and the chi-square test was used for comparison between the two groups. The measurement data of the two groups were described by mean ± standard deviation (x ± s), and the values between the two groups were compared using independent sample t-test, with $P < 0.05$ indicating statistically significant differences.

3 RESULT

3.1 Comparison of Humanistic Caring Ability Scores between Intervention and Control Groups

As shown in Table 2, the intervention group had significantly higher scores in cognitive, patient, courageous dimensions and total humanistic caring ability than the control group (all $P < 0.001$). The total score rose from 186.25 ± 3.59 (control) to 193.93 ± 2.09 (intervention), suggesting that the BOPPPS model based on OBE and SPOC platform effectively enhances humanistic caring ability in higher vocational nursing students.

Table 2 Comparison of Humanistic Caring Ability Scores of Two Groups of Higher Vocational Nursing Students (Mean±SD, Points)

Group	N	Cognitive	Patient	Courageous	Total score
Control group	216	72.34 ± 3.25	61.50±1.56	52.41±1.72	186.25±3.59
Intervention group	236	75.32±1.14	63.65±1.22	54.96±1.41	193.93±2.09
T value		-13.240	-16.370	-17.170	-28.047
P		<0.001*	<0.001*	<0.001*	<0.001*

** P<0.001*

3.2 Comparison of Clinical Communication Competence Scores between Intervention and Control Groups

As shown in Table 3, the intervention group had significantly higher scores in all six dimensions and total clinical communication competence than the control group (all $P < 0.001$). The total score rose from 72.76 ± 2.09 (control) to 84.92 ± 3.74 (intervention), suggesting that the BOPPPS model based on OBE and SPOC platform effectively enhances clinical communication competence in higher vocational nursing students.

Table 3 Comparison of Clinical Communication Competence Scores of Two Groups of Higher Vocational Nursing Students (Mean±SD, Points)

	Control group (N=216)	Intervention group (N=236)	T value	P
Establishing rapport	16.24±0.44	18.32±0.65	-39.555	<0.001*
Attentive listening	13.99±0.33	16.15±0.65	-43.573	<0.001*
Identifying patient problems	13.65±0.37	15.79±0.64	-42.705	<0.001*
Mutual participation	9.43±0.31	11.13±0.53	-41.280	<0.001*
Delivering effective information	7.12±0.30	9.01±0.58	-42.692	<0.001*
Validating feelings	12.32±0.35	14.51±0.67	-42.557	<0.001*
Total score	72.76±2.09	84.92±3.74	-42.147	<0.001*

** P<0.001*

4 DISCUSSION

4.1 Effect of the BOPPPS Teaching Model Based on the OBE Concept and SPOC Platform on Improving Humanistic Caring Ability in Higher Vocational Nursing Students

The results of this study showed that the intervention group scored significantly higher than the control group in all three dimensions of humanistic caring ability (cognitive, patient, courageous) and the total score (all $P < 0.001$), indicating that this teaching model can effectively enhance the humanistic caring ability of higher vocational nursing students. Several factors may explain this improvement.

First, the OBE concept emphasizes student-centered, outcome-oriented education, integrating humanistic caring ability as a clear course objective. In the Internal Medicine Nursing course, teaching activities were designed backwards from the expected outcome that "students can demonstrate respect, empathy, and patience in clinical encounters". This made students aware of the importance of humanistic care in every class and case discussion, thereby increasing their learning initiative and focus. In contrast, traditional teaching often treats humanistic care as an implicit or supplementary element without measurable goals or assessment criteria. A systematic review by Tan et al. (2018) demonstrated that OBE approaches improve nursing student competencies in knowledge acquisition, clinical skills, and behavioral performance, supporting the effectiveness of outcome-based curricula in nursing education [28]. By incorporating caring ability into core learning outcomes, the OBE approach encourages students to internalize caring attitudes while acquiring professional knowledge and skills.

Second, the SPOC platform provided rich digital resources for case-based and scenario-based learning. Real or semi-real clinical nursing cases were uploaded, including typical caring scenarios such as nurse-patient communication, emotional reassurance, privacy protection, and informed consent. Students watched these videos and completed online discussions before class, developing an initial understanding of caring behaviors. A systematic review confirmed that

SPOC-based blended teaching in nursing education significantly improves students' theoretical knowledge scores [29], autonomous learning ability, learning cooperation ability, learning motivation, and satisfaction. During face-to-face sessions, the BOPPPS structure's participatory learning component was used to organize role-play, situational simulations, and group reflection. For example, in the unit on diabetic patients, students simulated providing psychological support to anxious patients or patiently explaining treatment plans to elderly patients. This "online perception – offline practice – immediate feedback" blended learning pathway allowed students to practice caring behaviors repeatedly in a low-risk environment. Timely feedback from teachers and peer evaluation further reinforced correct behaviors and corrected indifferent or perfunctory communication styles.

Third, the "post-assessment" and "summary" steps in the BOPPPS model provided structured opportunities for reflection. After each class, students wrote reflective journals in which they self-evaluated their caring behaviors against prompts such as "Did I respect the patient today?" and "Which of my words and actions demonstrated empathy?". A study by Chen et al. (2025) revealed that the SPOC combined with BOPPPS model significantly enhances theoretical knowledge, practical skills, and self-efficacy among nurses compared to traditional methods. Evidence from quasi-experimental studies also indicates that BOPPPS-based teaching effectively enhances nursing students' academic performance, professional values, and critical thinking abilities [30]. This metacognitive training helped transform external caring behaviors into internal caring dispositions. Moreover, the discussion forum on the SPOC platform featured a "caring stories" column where students anonymously shared touching moments or dilemmas encountered during simulations or clinical practice. Teachers and classmates offered emotional support and advice, creating a mutually caring learning atmosphere that itself served as a form of implicit humanistic education. Research by Xiao et al. (2025) found that reflective journaling significantly enhances participants' caring behaviors and compassionate empathy skills, highlighting its effectiveness as a valuable tool in nursing education to promote meaningful change [31].

In summary, the OBE concept clarified objectives, the SPOC platform provided resources and interaction spaces, and the BOPPPS structure ensured participation and reflection. A BOPPPS-structured narrative medicine intervention has also been shown to enhance empathy and reduce ageist attitudes among undergraduate nursing students, providing further evidence that BOPPPS-based pedagogical frameworks can effectively foster humanistic competencies [32]. The synergistic effect of these three components systematically promoted the development of humanistic caring ability in higher vocational nursing students [33].

4.2 Effect of the BOPPPS Teaching Model Based on the OBE Concept and SPOC Platform on Improving Clinical Communication Competence in Higher Vocational Nursing Students

This study found that the intervention group scored significantly higher than the control group in all six dimensions of clinical communication competence (establishing rapport, attentive listening, identifying patient problems, mutual participation, delivering effective information, and validating feelings) as well as the total score (all $P < 0.001$). This result suggests that the teaching model is equally effective in fostering communication competence, and the underlying mechanisms can be explained by the nature of communication skill acquisition and the design of the instructional approach.

From the perspective of communication skill acquisition, clinical communication competence is a combination of procedural knowledge and social skills, which requires a complete cycle of "observation - imitation - practice - feedback - transfer" to be effectively mastered. In traditional classroom settings, communication training is often limited to theoretical lectures or teacher demonstrations, giving students insufficient opportunities for deliberate practice and personalized feedback. A systematic review and meta-analysis by Peng et al. (2021) demonstrated that SPOC-based blended teaching in nursing education significantly improves students' autonomous learning ability, learning cooperation ability, learning motivation, and satisfaction, providing robust evidence for the effectiveness of SPOC platforms in addressing the limitations of traditional instruction [29]. The teaching model used in this study precisely addressed these deficiencies. Micro-videos on the SPOC platform demonstrated standard dialogues and non-verbal techniques for various common clinical communication scenarios, such as how to ask open-ended questions, how to show attentive listening through nodding and eye contact, and how to validate patients' feelings. Students could watch and imitate these videos repeatedly before class, forming initial cognitive representations.

During face-to-face sessions, the participatory learning component of the BOPPPS model was designed as structured communication training tasks. For example, in the unit on heart failure nursing, students worked in pairs, one playing the nurse and the other the patient (or family member), and simulated explaining a diagnosis, discussing treatment plans, or asking about medication adherence. After each simulation, other students and the teacher provided quantitative ratings (based on the six dimensions of the clinical communication competence scale) and qualitative feedback. A systematic review and meta-analysis by Zhu et al. (2025) confirmed that the BOPPPS teaching model significantly improves student academic performance (Standardized mean difference [SMD]: 1.14, 95% CI 0.84-1.43; $P < 0.001$), classroom interaction (SMD: 0.83, 95% CI: 0.46-1.21; $P < 0.001$), and learning initiative (SMD: 0.73, 95% CI: 0.48-0.98; $P < 0.001$) in clinical and health education [34]. This high-density deliberate practice combined with immediate feedback allowed students to quickly identify their weaknesses, for instance in establishing rapport or validating feelings, and make targeted improvements in the next simulation round. A qualitative study by Tan et al. (2025) also found that nursing students reported the BOPPPS model combined with network platform significantly enhanced their communication ability, professional confidence, and empathy ability. After several cycles, deliberately practiced communication skills gradually became automatic behavioral habits [28].

Furthermore, the outcome-oriented assessment mechanism under the OBE concept played an important role. Communication competence was included as a component of the final summative assessment. Each student was required to submit a video of a communication session with a standardized patient (SP), which was then jointly rated by the teacher and peers using the scale. This high-stakes assessment motivated students to spend additional after-class time practicing on the SPOC platform. A study by Fang et al. (2023) demonstrated that applying the OBE concept in nursing clinical practice education significantly improves students' clinical communication ability, particularly in the five dimensions of establishing rapport, confirming patient problems, active listening, mutual participation, and validating feelings [35]. A systematic review by Zhou et al. (2025) further confirmed that OBE concept introduction in clinical teaching effectively enhances intern nursing students' core competencies, with clinical communication skills showing a significant improvement (SMD: 1.75, 95% CI: 1.00-2.49; $P < 0.00001$) [36]. The platform also provided a communication case bank and exemplary student videos, creating a virtuous cycle of "imitation - practice - evaluation - re-practice".

Notably, the largest improvements were observed in the dimensions of "establishing rapport" and "validating feelings". This may be attributed to the empathy training module on the SPOC platform, which guided students to analyses emotional cues in patients' statements and practice empathic responses. A quasi-experimental pilot study by Sung and Kweon (2022) on a nonviolent communication-based empathy education program for nursing students found that the experimental group showed significant increases in empathic ability ($t = 5.22$, $p < 0.001$) and communication competency ($t = 5.27$, $p < 0.001$) compared to the control group, supporting the effectiveness of structured empathy training in nursing education [37]. After sustained training, students not only learned "what to say," but also "how to listen and how to feel", which is the essence of clinical communication competence.

5 ETHICAL STATEMENTS

All participants were voluntarily recruited through an announcement and provided informed consent prior to their engagement in this study, which guaranteed anonymity and strictly limited the use of responses to research purposes in compliance with standard ethical guidelines.

6 LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

This study has several limitations. First, the sample was drawn from a single course at one college, limiting generalizability. Second, the intervention lasted only one semester, so long-term effects on clinical internship performance remain unknown. Third, the use of self-report scales may introduce social desirability bias. Fourth, the Hawthorne effect could not be fully controlled. Future research should validate the model across multiple institutions and longer follow-up periods, and include objective measures such as patient evaluations, or preceptor ratings to complement self-reports.

7 CONCLUSIONS

The BOPPPS teaching model based on the OBE concept and SPOC platform, when applied to the Internal Medicine Nursing course for higher vocational nursing students, significantly improves their humanistic caring ability and clinical communication competence. By clarifying outcome-oriented goals, enriching online learning resources, and strengthening offline participatory practice with reflective feedback, this model effectively promotes the integrated development of nursing students' affective attitudes and communication skills. It is recommended that this teaching model be further disseminated in nursing education, and its applicability and optimization strategies in different courses and learning stages be explored in future research.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

FUNDING

This research was supported by the Department of Education of Guangxi Zhuang Autonomous Region (Guangxi Vocational Education Teaching Reform Research Project [Grant No: GXGZJG2024B267] and [Project Name: Application of the BOPPPS Teaching Model Based on the OBE Concept on the SPOC Platform in Higher Vocational Education: A Case Study of the "Medical Nursing" Course]).

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