Journal of Clinical and Nursing Research, 2026, Volume 10, Issue 2
http://ojs.bbwpublisher.com/index.php/JCNR
Online ISSN: 2208-3693
Print ISSN: 2208-3685

# Research on the Construction and Application of an Integrated Teaching Platform Combining Virtual Simulation and High-End Simulators in Practical Obstetrics and Gynecology Teaching

**Shuo Feng[1], Ao Li[1], Chao Wang[1], Hui Wang[1], Yingui Sun[2]***

[1]Affiliated Hospital of Shandong Second Medical University, Weifang 261031, Shandong, China
[2]School of Anesthesiology, Shandong Second Medical University, Weifang 261053, Shandong, China

**Author to whom correspondence should be addressed.*



**Abstract:** *Objective*: To analyze the effectiveness of an integrated teaching platform combining virtual reality (VR) technology and high-end simulators in practical obstetrics and gynecology teaching. *Methods*: A total of 39 interns who underwent obstetrics and gynecology internships from March 2023 to March 2024 were included in the reference group and received conventional practical teaching methods. Another 39 interns who underwent internships from April 2024 to April 2025 were included in the observation group and received the integrated teaching platform combining VR and high-end simulators. The teaching effects of the two groups were compared. *Results*: The observation group achieved higher assessment scores than the reference group, with higher scores in self-directed learning ability and clinical thinking ability after teaching, as well as higher teaching satisfaction ($p < 0.05$). *Conclusion*: The integrated teaching platform combining VR and high-end simulators can improve the assessment scores of obstetrics and gynecology interns, cultivate their self-directed learning ability and clinical thinking ability, and achieve high teaching satisfaction.

**Keywords:** Virtual reality; High-end simulator; Integrated teaching platform; Obstetrics and gynecology; Practical teaching

**Online publication:** Mar 11, 2026

## 1. Introduction

There is a wide variety of diseases in obstetrics and gynecology, and patients exhibit diverse physiological and psychological characteristics. This necessitates that medical staff possess not only profound theoretical knowledge but also clinical communication skills and proficient practical operational skills, thereby enhancing the quality of obstetrics and gynecology services [1]. Practical teaching for interns is the primary approach to cultivating professionals in obstetrics and gynecology. Traditional teaching methods, which mainly focus on theoretical explanations and practical skill demonstrations, can improve the professional competence of interns but fail to stimulate their enthusiasm, presenting certain teaching limitations. In contrast, VR teaching methods can create a vivid and realistic teaching environment, enabling interns to immerse themselves and thereby cultivate their practical abilities. Combined with high-end simulators, it can guide interns in performing practical operations using the simulators, allowing them to repeatedly hone their skills in real-world scenarios with high levels of interest and safety [2]. Based on this, this study selected 78 interns to evaluate the application effectiveness of an integrated VR and high-end simulator teaching platform in practical teaching for obstetrics and gynecology.

## 2. Materials and methods

### 2.1. General information

The reference group consisted of 39 interns who underwent practical training in obstetrics and gynecology from March 2023 to March 2024, including 9 males and 30 females, aged between 20 and 26 years old, with a mean age of (23.15 ± 1.27) years. The observation group comprised 39 interns who trained in obstetrics and gynecology from April 2024 to April 2025, including 8 males and 31 females, aged between 19 and 26 years old, with a mean age of (23.28 ± 1.30) years. When comparing the data of the two groups, $p > 0.05$.

#### 2.1.1. Inclusion criteria

Interns in obstetrics and gynecology; having a college degree or above; participating in the entire internship process; actively complying with departmental rules and regulations; being informed about the study.

#### 2.1.2. Exclusion criteria

Leaving early or taking long-term leave; having communication or language barriers; participating in other studies; withdrawing from this study midway.

### 2.2. Methods

The reference group received conventional practical teaching methods: The departmental rules and regulations, job responsibilities, and learning tasks were explained using multimedia courseware. Interns were organized to participate in a case analysis meeting once a week to enable them to master knowledge related to classic cases. During the teaching process, the principle of starting from the simple and progressing to the complex was followed. Time was reserved in class for interns to ask questions and engage in discussions, and the supervising teacher provided professional answers to common questions raised by the interns. After the theoretical lectures, the supervising teacher led the interns to conduct ward rounds and consultation operations once a week, including gynecological bimanual examinations, Leopold's maneuvers, speculum examinations, examinations for gynecological acute abdomen, and obstetric fundal height measurements.

The observation group was provided with an integrated VR and high-end simulator teaching platform:

#### 2.2.1. Theoretical teaching

Theoretical teaching was conducted in the form of collective lectures, with the specific teaching methods being the same as those in the reference group.

### 2.2.2. Construction of an integrated teaching platform

Guided by VR technology and based on real-world cases in obstetrics and gynecology, a clinical rescue system for high-end simulators was established. The system covered knowledge points such as practical operational skills in obstetrics and gynecology, emergency response in critical situations, and the integrated application of theoretical and practical knowledge. While ensuring system stability and comprehensive teaching content, the principle of correct usage was adhered to, fully leveraging the teaching advantages of high-end simulators.

### 2.2.3. Practical teaching process

(1) Gynecological examinations

VR technology was connected to high-end simulators, and advanced equipment such as force feedback devices and trackers were used for practical teaching. This simulated gynecological examination procedures such as visual inspection and palpation of the vulva, visual inspection of the vagina, and speculum operations. The texture of the simulator's uterus, the presence of adnexal masses, and the condition of the cervix were made as close as possible to those of real patients. The force feedback system was utilized to create a relatively realistic tactile sensation, while the communication process between virtual medical staff and patients was simulated to create a realistic examination process.

(2) Emergency rescue drills

A rescue case library was established using VR technology and a big data platform, including cases such as ovarian corpus luteum rupture and ectopic pregnancy rupture. Case data was input into the high-end simulator system to simulate the rescue process for acute abdomen on-site. Interns were instructed to wear VR glasses to create a virtual emergency room, displaying the patient's medical history and disease symptoms. After the interns had a preliminary understanding of the patient's condition, they performed rescue operations on the high-end simulator, such as establishing intravenous access, performing needle biopsies, and conducting electrocardiographic monitoring.

(3) Midwifery drills

High-end simulators were used for midwifery drills, simulating labor processes such as fetal head descent and extension, with a focus on simulating special delivery scenarios such as shoulder dystocia and abnormal fetal heart rates. Interns used VR technology to observe the patient's pelvic and fetal positions and performed operations such as perineal protection and doula delivery. At the same time, the patient's vital signs such as respiration and blood pressure were monitored to dynamically understand the progress of labor and thus provide scientific midwifery assistance.

### 2.2.4. Teaching evaluation

After each practical teaching session, both VR technology and the high-end simulator system could automatically save data. The supervising teacher replayed the VR videos and used a three-dimensional perspective to review the practical operational procedures, identify operational errors, and provide targeted reinforcement training.

## 2.3. Observation indicators

(1) Assessment scores

A unified assessment was organized for the interns, including theoretical knowledge (40 points); practical operations (bimanual examination, Leopold's maneuvers, fundal height measurement, and external pelvic measurement, 10 points each); and case analysis (20 points), all scored positively.

(2) Self-directed learning ability

The Self-directed Learning Ability Evaluation Scale was selected, which included task analysis (6 items), self-evaluation (4 items), self-motivation beliefs (14 items), and self-monitoring and regulation (10 items). Each item was scored from 1 to 5 points, with a total of 170 points, scored positively.

(3) Clinical thinking ability

The Clinical Thinking Ability Evaluation Scale for Medical Students was selected, which included systems thinking, evidence-based thinking, and critical thinking, each worth 40 points, scored positively.

(4) Teaching satisfaction

A self-designed Teaching Satisfaction Scale was used, which included learning attitude, teacher-student relationship, teaching process, and learning interest, each worth 10 points. A score above 7 points was considered satisfactory.

### 2.4. Statistical analysis

The data were processed using SPSS 28.0 software. Measurement data were compared using *t*-tests, and count data were compared using chi-square tests. A statistically significant result was considered when $p < 0.05$.

## 3. Results

### 3.1. Comparative assessment scores between the two groups

The assessment scores of the observation group were higher than those of the reference group ($p < 0.05$). See **Table 1**.

**Table 1.** Comparative assessment scores between the two groups [$\bar{x} \pm s$, points]

| Group | No. of cases | Theoretical knowledge | Practical operation | | | | Case analysis |
|---|---|---|---|---|---|---|---|
| | | | Bimanual examination | Four-step palpation | Uterine height measurement | External pelvimetry | |
| Observation group | 39 | 35.52 ± 2.16 | 7.81 ± 1.05 | 7.78 ± 1.12 | 8.02 ± 0.97 | 8.11 ± 0.71 | 16.43 ± 1.61 |
| Reference group | 39 | 32.11 ± 2.12 | 6.90 ± 1.02 | 6.82 ± 1.10 | 7.37 ± 0.73 | 7.40 ± 0.66 | 14.09 ± 1.52 |
| *t* | | 7.036 | 3.882 | 3.819 | 3.344 | 4.574 | 6.600 |
| *p* | | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 |

### 3.2. Comparative scores of self-directed learning ability between the two groups

The self-directed learning ability score of the observation group after teaching was higher than that of the reference group ($p < 0.05$). See **Table 2**.

**Table 2.** Comparative scores of self-directed learning ability between the two groups [$\overline{x} \pm s$, points]

| Group | No. of cases | Task analysis | | Self-evaluation | | Self-motivational beliefs | | Self-monitoring and regulation | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pre-instruction | Post-instruction | Pre-instruction | Post-instruction | Pre-instruction | Post-instruction | Pre-instruction | Post-instruction |
| Observation group | 39 | 16.38 ± 3.21 | 24.72 ± 2.83 | 10.26 ± 2.14 | 16.83 ± 1.92 | 38.47 ± 5.62 | 59.34 ± 4.18 | 26.81 ± 4.73 | 41.26 ± 3.67 |
| Reference group | 39 | 16.51 ± 3.14 | 20.89 ± 2.97 | 10.33 ± 2.08 | 13.72 ± 2.31 | 38.92 ± 5.47 | 49.61 ± 5.22 | 27.04 ± 4.65 | 33.18 ± 4.52 |
| *t* | | 0.181 | 5.830 | 0.146 | 6.466 | 0.358 | 9.086 | 0.217 | 8.667 |
| *p* | | 0.857 | 0.000 | 0.884 | 0.000 | 0.721 | 0.000 | 0.829 | 0.000 |

## 3.3. Comparative scores of clinical thinking ability between the two groups

The clinical thinking ability score of the observation group after teaching was higher than that of the reference group ($p < 0.05$). See **Table 3**.

**Table 3.** Comparative scores of clinical thinking ability between the two groups [$\bar{x} \pm s$, points]

| Group | Cases | Systems thinking | | Evidence-based thinking | | Critical thinking | |
|---|---|---|---|---|---|---|---|
| | | Before teaching | After teaching | Before teaching | After teaching | Before teaching | After teaching |
| Observation group | 39 | 21.84 ± 4.16 | 31.62 ± 3.24 | 20.97 ± 4.33 | 30.18 ± 3.41 | 22.53 ± 4.08 | 32.47 ± 2.86 |
| Reference group | 39 | 22.11 ± 4.02 | 27.74 ± 3.78 | 21.26 ± 4.18 | 27.89 ± 3.92 | 22.79 ± 3.94 | 29.62 ± 3.55 |
| *t* | | 0.291 | 4.867 | 0.301 | 2.753 | 0.286 | 3.904 |
| *p* | | 0.771 | 0.000 | 0.764 | 0.007 | 0.775 | 0.000 |

## 3.4. Comparison of teaching satisfaction between the two groups

The observation group exhibited higher teaching satisfaction compared to the reference group ($p < 0.05$). See **Table 4**.

**Table 4.** Comparison of teaching satisfaction between the two groups [n/%]

| Group | n | Learning attitude | Teacher-student relationship | Teaching process | Learning interest |
|---|---|---|---|---|---|
| Observation group | 39 | 37 (94.87) | 38 (97.44) | 38 (97.44) | 37 (94.87) |
| Reference group | 39 | 30 (76.92) | 33 (84.62) | 32 (82.05) | 31 (79.49) |
| $\chi^2$ | | 5.186 | 3.924 | 5.014 | 4.129 |
| *p* | | 0.023 | 0.048 | 0.025 | 0.042 |

# 4. Discussion

Obstetrics and gynecology are highly practical discipline, with the operative sites being relatively concealed and difficult to access under direct vision, thus presenting certain challenges in practical operations. To enhance the professional skills of interns, obstetrics and gynecology departments place great emphasis on practical teaching, striving to cultivate comprehensive talents [3].

The conventional teaching method primarily involves collective lectures and regularly organizing interns to learn practical skills. However, its teaching process mainly focuses on passive listening and observational learning, making it difficult to improve interns' abilities in disease diagnosis and practical operations. Additionally, the delivery process is urgent and complex, and interns have limited opportunities for on-site observation, which directly affects their overall quality [4]. Based on this, this study selected an integrated VR and high-end simulator teaching platform. Among them, VR technology, with its strong interactivity, can create realistic teaching scenarios, enabling interns to master operational essentials in simulated situations and thus accumulate practical experience. VR technology can overcome the spatial and temporal limitations of conventional teaching methods, allowing interns to arrange their learning time according to their learning habits and personal abilities, thus offering high flexibility and promoting high learning enthusiasm. High-end simulators can realistically simulate the disease states in obstetrics and gynecology, assign clear roles to interns, and conduct skill training, thereby cultivating their overall quality and emergency response capabilities.

The results showed that the observation group had higher assessment scores, scores for self-directed learning ability and clinical thinking ability after teaching, and higher teaching satisfaction compared to the reference group ($p < 0.05$). The reasons are as follows: The integrated VR and high-end simulator teaching platform can set up disease states and rescue scenarios for high-end simulators under the guidance of VR technology and rigorous teaching content, highly replicating patients' disease symptoms and clinical signs, and simulating on-site rescue processes, thereby exercising interns' practical operational abilities [5]. During the teaching period, there are three modules in total. The gynecological examination module can simulate the entire examination process, replicating real scenarios in multiple aspects such as vision, touch, and on-site communication, providing interns with a relatively realistic operational experience. The emergency rescue drill module mainly targets obstetric and gynecological acute abdomen, simulating the onset process of acute abdomen and conducting immersive clinical rescue drills, thereby improving interns' rescue abilities for acute abdomen and enabling them to handle emergencies [6,7]. The midwifery drill module focuses on the delivery process, utilizing VR technology to three-dimensionally display the fetal delivery process, understanding the details of fetal delivery from multiple perspectives, and using high-end simulators to simulate real delivery scenarios and provide scientific midwifery operations, significantly enhancing interns' midwifery abilities. The above teaching methods can set specific scenarios in obstetrics and gynecology, giving interns a leading role in disease diagnosis and treatment, stimulating their learning enthusiasm, and cultivating their self-directed learning ability [8,9]. The integrated teaching platform allows interns to engage in repeated training, cultivating their clinical thinking through continuous practical operations and enabling them to effectively integrate theoretical knowledge with practical skills, thereby improving their assessment scores. In addition, this teaching method is highly interesting and the teaching process is safe, allowing interns to truly acquire professional and practical knowledge, thus resulting in high satisfaction [10].

## 5. Conclusion

In conclusion, the integrated VR and high-end simulator teaching platform can improve the teaching quality in obstetrics and gynecology, cultivate interns' self-directed learning ability and clinical thinking, and achieve high teaching satisfaction.

## Funding

2024 Undergraduate Teaching Reform Research Project, Department of Education of Shandong Province, 2025 Key Project of University-Level Education and Teaching Reform and Research, Research Title: Research on Talent Demand in the Biomedical Industry Chain and Strategies for High-Quality Higher Education Talent Cultivation in Shandong Province under the Background of New Quality Productivity (Project No.: Z2024208); Shandong Second Medical University, Research Title: Construction and Application of an Integrated Teaching Platform Combining Virtual Simulation and High-Fidelity Simulators in Obstetrics and Gynecology Practice Teaching, Project No.: 2025SJZX053)

## Disclosure statement

The authors declare no conflict of interest.

## References

[1] Lv M, 2025, Application of Mind Mapping Combined with Virtual Simulation in the Training of Obstetrics and Gynecology Residents. Life Science Instruments, 23(4): 108–110 + 117.

[2] Wei Z, 2024, Construction and Application of a Practical Training Teaching Model for Obstetrics and Gynecology Nursing Based on a Virtual Simulation Platform. Health Vocational Education, 42(1): 60–62.

[3] Li Z, Liu X, Yan Z, et al., 2023, Application of Scenario-Based Simulation Training with High-End Simulators in the Teaching of Anesthesia Residents. China Continuing Medical Education, 15(5): 122–126.

[4] Fu Z, Xian E, Nie L, et al., 2023, Analysis of the Application of Virtual Reality Technology Combined with Simulation Scenario-Based Training in Practical Teaching for Obstetrics and Gynecology Interns. Chinese Journal of Medical Education Exploration, 22(11): 1694–1697.

[5] Ge Y, Li W, Han Y, 2022, Construction and Application of a Virtual Simulation Experimental Teaching Model for Obstetrics and Gynecology Nursing. Continuing Medical Education, 36(3): 5–8.

[6] Yang X, Guo J, Yang A, et al., 2024, Construction and Application of a Virtual Simulation Practical Training Teaching Model for Obstetrics and Gynecology Nursing. Theory and Practice of Innovation and Entrepreneurship, 7(8): 132–134.

[7] Li X, Li Y, Wang D, et al., 2022, Research and Practice on Practical Teaching in Obstetrics and Gynecology Based on Virtual Simulation Technology. Chinese Journal of Medical Education Technology, 36(4): 426–430.

[8] Zhong W, Lu H, Qin Y, et al., 2022, Exploration of the Application of Scenario-Based Simulation Teaching Using the SimMom High-End Simulator in Obstetric Clinical Skills Training. China Health Industry, 19(10): 158–161.

[9] Li B, Chen J, Lin T, et al., 2025, Application Practice of Scenario-Based Teaching with High-End Simulators in the Cultivation of Core Competencies Among Anesthesia Training Subjects. Progress in Biomedical Engineering, 46(4): 591–598.

[10] Li X, Lin X, Zeng W, et al., 2023, Application of Scenario-Based Simulation Using Standardized Patients Combined with High-End Simulators in Resident Training Teaching. Continuing Medical Education, 37(9): 49–52.