

Application Analysis of Virtual Simulation Experiment in Nursing Teaching

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Abstract: In order to improve nursing teaching effect, a nursing teaching method based on virtual simulation experiment was proposed. In order to ensure the teaching effect, the nursing teaching content framework was optimized by combining the virtual simulation experiment technology, and the simulation evaluation parameters were set to improve the teaching quality parameters according to the parameters. Finally, the effective application of virtual simulation experiment in nursing teaching is realized. Finally, the virtual simulation experiment is proved to be more practical in nursing teaching than traditional methods.

Keywords: Nursing; Nursing virtual simulation experiment technology; Teaching reform

1. Introduction

In the traditional nursing experiment teaching, the teacher is responsible for teaching, and students are familiar with the operation sequence and method of animal experiment by watching the teacher teaching. Usually a big class teaching laboratory of our school, a laboratory students about 100 or so, through the teaching of the teacher teaching and make students master the operation of the animal experiment, the teaching effect obviously is not good, it's a hidden trap for students of animal experiments, for example: students operation is not standard, experiments result in abnormal death, etc. [1]. How to solve the current situation of large class teaching of nursing experiment and improve the teaching effect of experimental class is an urgent problem to be solved. By introducing virtual simulation experiment teaching system, students can make full use of the extracurricular time, combined with their own situation, the independent review and practice the online operation, the experimental operation of weak links can also practice in simulation test plates, thereby really familiar with the content and operation, the teacher in the classroom teaching on theoretical knowledge and presentation time is greatly reduced, let teachers from heavy teaching task, overcome the boring lecture abstract problems in traditional teaching, improved the nursing experimental teaching effect. Nursing teaching is an important basic course of medical colleges, and nursing experiment plays a very important role in nursing teaching, so experiment is an indispensable part of this course [2]. The traditional experimental teaching of this course is restricted by experimental animals, experimental hours, funds and other factors. The teaching method is still the traditional teaching model demonstrated by teachers and imitated by students. Medical students are not interested in experimental courses and do not have strong operability. The application of

virtual simulation experiment teaching system as a new teaching method in nursing experiment teaching and the favorable conditions for teaching.

2. Application of Virtual Simulation Experiment in Nursing Teaching

2.1. Virtual simulation nursing framework

In virtual simulation experiment teaching system includes the experimental principle, experimental purpose, simulation experiments, experimental video and questions, students through the virtual simulation experiment teaching system in a large number of video animation, man-machine interactive operation greatly stimulated the students' desire and interest in learning, at the same time convenient for students to review relevant principle and experiment purposes [3]. In addition, students can also summarize operational errors in animal experiments, optimize experimental operation time, and design new experiments through simulated experimental operations, so as to draw inferences from one example and promote the in-depth development of experimental teaching and improve students' ability and spirit of innovative experimental design [4]. In addition, the virtual simulation nursing experiment system to build a contextualized, immersion training in clinical interactive space, with three dimensional records the teaching process, training process intelligent feedback, evaluation process intelligent analysis, intelligent evaluation test process, and other functions, make the whole teaching content vivid and visual, concrete, make up for the deficiency of the traditional teaching, improve the students' interest in learning, improve the effect of the nursing training. After each student carries on the nursing training, the system will automatically score, forms the experimental teaching pattern which pays attention to the process appraisal. The

teaching process of virtual simulation experiment is shown in the figure below.

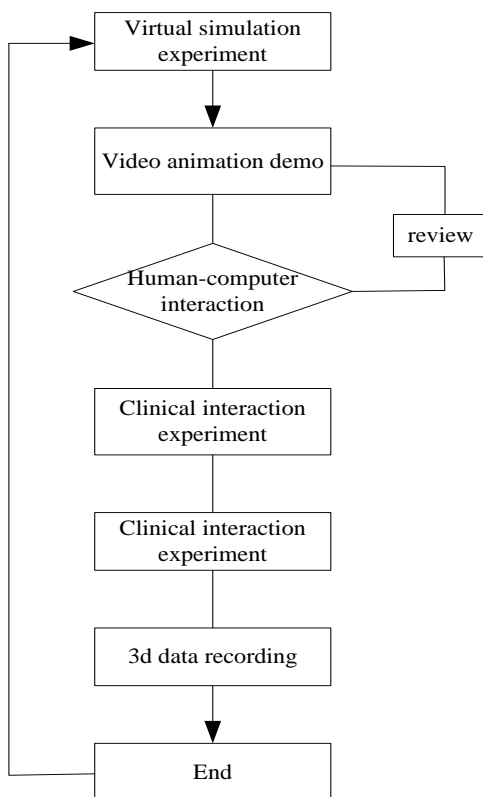


Figure 1. Teaching process of virtual simulation experiment

According to the above virtual simulation experiment teaching process, the use of virtual simulation experiment teaching system in the nursing experiment teaching process has avoided the traditional teaching students in the experimental operation difficulties to ask the teacher, and then the teacher is responsible for answering or even replace the students to operate the specific experimental steps; Instead, by using the virtual simulation experimental teaching system, students are allowed to try to operate the specific operation steps when encountering difficulties, find out the reasons for the operation errors, and finally solve the problems before specific operation on animals [5]. In order to make students Form the good used of active learning, the teacher in the first few times in the guide, a few times after class, the students gradually adapted to the virtual simulation experiment teaching mode, and then meet with difficulties, students will first try to solve, or fellow classmates and discuss the solution, gradually form the good habit of autonomous learning[6]. The design of clinical practice teaching management system for nursing major adopts B/S mode architecture based on Web application. The development platform of.net is used. The development environment is Visual Studio 2010 and the development language is ASP.NET. The control module of the system is shown in the figure.

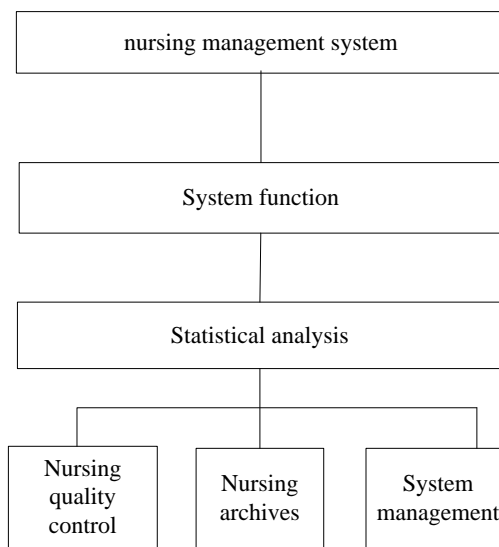


Figure 2. Virtual simulation teaching framework

Through the virtual simulation experiment teaching system, the teaching method of nursing experiment is enriched, the learning interest of students is improved, and

the teaching effect of nursing experiment is better. Through the operation of the virtual simulation experiment teaching system, the hands-on ability and innovative experiment design ability are also improved.

2.2. Parameter setting of virtual simulation experiment evaluation

The evaluation of virtual simulation experiment is a complex and humanized process, and the traditional evaluation method cannot reflect the logical relationship between the evaluation index and the evaluation conclusion. For example, the commonly used method of weighted sum of each index score simplifies the non-linearity by linearity, and the determination of index weight is more subjective, etc. [7]. Therefore, virtual simulation experiment evaluation algorithm is introduced. Evaluation algorithm is a kind of typical global optimization algorithm, is the result of simulation of metal annealing process, the metal atoms under high temperature condition will be fierce disorderly movement, after cooling, the games constantly tends to lower energy state, eventually arrived at the lowest possible global energy state, the annealing process energy state probability distribution determined by the following relationship:

$$P(E) = \exp(-\frac{E}{kT}) \tag{1}$$

P (E) is in a state of energy E of probability, T is the absolute temperature, k is the Boltzmann factor, the characteristics of evaluation algorithms tend to be the lowest energy state joined the global search ability for algorithm, the energy function of evaluation algorithm equivalent error function, the role of evaluation algorithm is the introduction of random disturbance parameters, have the opportunity to keep their weight from local minimum error area, eventually converge to the global minimum of the error at higher probability[8]. Let the input of the network be {0,1, 2,3... ,n}, the output of hidden layer neurons is {0, 1,2,3... ,n}, the actual output of the network is {y1,y2,y3... ,yn}, the expected output of the network is {d1,d2, d3... , dn}, n, r and m are the number of nodes of input layer, hidden layer and output layer respectively. The weight from input layer to hidden layer is wij, the threshold is wj0, the weight from hidden layer to output layer is WJK, the threshold is wk0, I, j and k are the node Numbers corresponding to the input layer, hidden layer and output layer, and the activation function of the network is. The forward propagation of the signal, the input signal successively passes through the hidden layer and the output layer, and the output of the hidden layer is:

$$x_j = \varphi (\sum_{i=0}^n w_{ij} x_i) , j=1,2,\dots, r \tag{2}$$

The output of the output layer is the actual output of the network, the back propagation of the error, the difference between the expected output and the actual output of the

network is the error signal, and the instantaneous error of the output layer of a single training sample is:

$$E^p = \frac{1}{2} \sum_{k=1}^m (d_k^p - y_k^p)^2 \tag{3}$$

Use Ep as the objective function of weight adjustment, learn in batches to use E as the objective function of weight adjustment. The virtual simulation experiment USES the error gradient descent method to adjust the weight, and the weight adjustment is

$$w_{ij} = -\eta \frac{\partial E}{\partial w_{ij}} \tag{4}$$

Through this formula, the weight of the output layer is derived, that is, the product of all inputs and weights of node k. Through the alternating iteration of the above two processes, the network weight will eventually converge to an extreme point of the error, which is the evaluation value of virtual simulation experiment. The design of teaching management organization should follow euler's algorithm, and let the derivative of the management program at the teaching program be replaced by a two-point formula, i.e:

$$y'(x_n) \approx w_{ij} \frac{y(x_{n+1}) - y(x_n)}{h} \tag{5}$$

The initial value problem becomes

$$\begin{cases} y_{n+1} = y_n + hf(x_n, y_n) \\ y_0 = y(x_n), n = 0, 1, 2 \dots \end{cases} \tag{6}$$

From the perspective of management design, euler is used to solve the initial value problem of the design, which is to find a curve passing through the point on the plane and make the slope of the tangent line at any point on the curve be. The design meaning of euler's formula is to start from a point and make a line with slope is intersecting the line at the point, and the ordinate of the point is the approximate value of; And then you take a line that has slope zero from that point and it intersects that line at that point, and the y-coordinate of that point is going to be an approximation of theta; So go on, get a broken line, get the design of teaching management organization from this.

2.3. Implementation of virtual simulation experiment in nursing teaching

Nursing experiment, as an important basic course of medicine, plays an important role in medical education. How to combine new teaching methods with this traditional course, better serve the teaching and improve the teaching effect of nursing experiment is the top priority of nursing experiment teaching. The virtual simulation experiment teaching system combines computer virtual simulation technology with the Internet, without the need for experimental animals and instruments, and USES the computer to simulate the operation process of medical experiments, which is an advanced teaching method with the development of science and technology [9]. With the

aid of modern computer technology and simulation technology research physiological characteristics of the body, is one of the medical experiment teaching in colleges and universities at home and abroad research, the domestic many colleges and universities in the experimental teaching courses using the virtual simulation technology, virtual simulation technology in the course of nursing teaching advantages especially in experiment teaching, virtual simulation technology can in the teaching process to create a feeling of intimacy, enhance students' understanding of knowledge, memory and experience to improve teaching effect further, enhance the comprehensive quality of teaching of. Virtual simulation evaluation consists of input layer and output layer, one or more of the hidden layer of the multilayer forward network, the algorithm of

gradient descent is a "greedy" strategy, it's every step in the direction of the local error decreased fastest weight adjustments, and virtual simulation evaluation of error curved surface of highly complex, there are usually more extreme value point, led to the evaluation algorithm is easy to fall into local minimum error. From the perspective of content analysis, virtual simulation experiment includes four aspects: basic management, professional management, comprehensive management and innovative management. It takes management theoretical knowledge as the core and achieves the open purpose of practical ability [10].

The contents of virtual simulation experiment are shown in table 1.

Table 1. Contents of teaching management practice reform

Teaching form	Module	Reform of the content	Goal
In class teaching	Classroom	Combined with theoretical teaching, practical cases are introduced, and the experience mode runs through the process of data collation and analysis	Basic knowledge training
	Laboratory	Data collection, experiment entry, data description and statistics	Basic knowledge training
		Parameter estimation, hypothesis analysis, correlation and regression analysis, time series	Basic knowledge training
		On the basis of basic knowledge training, combined with professional knowledge to design the experimental project, and applied statistics to the professional field	Professional skills training
Extracurricular teaching	Social practice	Professional research Off-campus statistics	Professional skills training
	Internship	Graduation internship	Comprehensive skills training
	Activity and competition	Professional skills competition. Student entrepreneurship activities	Innovative skills training

The practice of professional competence should be combined with the characteristics and professional skills of students to expand the teaching management, improve the teaching mode of student management from different directions, timely adjust the content of practice management, and ensure the rationality of the reform of teaching methods. By setting up professional skill competition and student entrepreneurship activities, students' practical ability can be improved, and students can be actively encouraged to carry out innovative activities, spread innovative thinking and cultivate innovative spirit, so as to effectively improve the efficiency of teaching management.

course scope Virtual simulation experiment teaching is an open teaching management mode based on idea theory and network learning, which, like the traditional management mode, enables students to grow from beginners to senior talents. Virtual simulation experiment teaching courses do not provide credits to students. Usually, participating in virtual simulation experiment teaching and learning is free of charge. If learners want to obtain some kind of certification, they need to open large-scale online courses through a certain tuition fee.

With the introduction of virtual simulation experiment teaching into the reform of full-time undergraduate teaching management, the virtual simulation experiment teaching technology is adopted to break down the campus walls and make the sharing of high-quality resources an inevitable product in the era of big data. Teachers of this course can customize the personalized course space, and the school will upload the courses of this school to the network, and realize the course online study through the credit platform. All learning services will be turned into APP forms to enjoy resource management anytime and anywhere. In the era of big data, a course sharing alliance will be established to realize course resource sharing among colleges and universities.

3. Experimental Methods and Results

3.1. Sharing degree of teaching resources

The class of group A adopts the traditional teaching mode of nursing, that is, the teacher USES multiple nursing media courseware in the nursing class to teach the students to watch the teaching video, the nursing teacher demonstrates again, and the nursing students practice

nursing and conduct nursing assessment. Nursing students in group B adopted the teaching method of nursing combined with virtual simulation experiment. Nursing teachers used multiple nursing media courseware in nursing class to teach nursing, and nursing students used nursing xf-bt nursing cardiopulmonary examination sim-

ulator and supporting virtual software to practice nursing post assessment. Nursing includes teaching resources sharing degree, nursing students' active participation in teaching degree, nursing operational skills proficiency, nursing clinical thinking satisfaction, nursing teaching method satisfaction and assessment.

Table 2. Questionnaire on sharing degree of teaching resources

Survey content	Group A (control group)	Group B (experimental group)
The sharing of teaching resources cannot be realized	75	0
Light realization of teaching resource sharing	47	13
Universal implementation of teaching resources sharing	20	87
Highly realize the contribution of teaching resources	8	50

According to the survey in the above table, 50% of the students in the control group thought that the traditional teaching mode could not realize the sharing of teaching resources, and 31% thought that the sharing of teaching

resources could be slightly realized. 100% of the students in the experimental group thought that the experimental teaching resources could be Shared to different degrees.

3.2. Students' active participation in teaching

Table 3. Questionnaire of students' active participation in teaching

Take the initiative to participate in teaching time	Group A (control group)	Group B (experimental group)
0-10minutes	86	3
10-20minutes	47	7
20-30minutes	10	9
30-40minutes	7	18
40-50minutes	4	20
50-60minutes	0	31
60-70minutes	0	58
70-80minutes	0	4

According to the survey in the table above, 57.3% of the control group could attract students to actively participate in active learning for 10 minutes, and 28.7% could insist on active learning for 10-20 minutes, that is, most students entered passive education after 20 minutes. The

number of students in the experimental group who can actively participate in active learning for more than 30 minutes accounts for 87.3%, among whom 38.7% can actively study for 60-70 minutes.

Table 4. Questionnaire of proficiency in operating skills

Operational skills proficiency	Group A (control group)	Group B (experimental group)
Don't have	39	3
General	86	34
Be familiar with	20	92
Master	5	21

According to the above table, 26% of the control group did not master the operation skills, and 57.3% of the students were able to carry out general operations, and only 3.3% of the students were able to skillfully complete the examination. Only 2% of the experimental group did not

master the operation skills, and 61.3% of the students were able to complete the physical examination of the whole heart successfully, although they still lacked the skills.

3.3. Ability to establish clinical thinking satisfaction

Table 5. Establishment of clinical thinking satisfaction questionnaire

Establish clinical thinking satisfaction	Group A (control group)	Group B (experimental group)
Not satisfied with	86	19
Satisfied with the	64	131

According to the above table, 57.3% of the students in the control group thought that traditional teaching mode

could not cultivate clinical thinking mode. Eighty-seven percent of the students in the experimental group thought

that virtual simulation experiment teaching was helpful to cultivate clinical thinking mode. It can be seen from the above results that the application of virtual simulation experiment in nursing teaching is superior to the tradi-

tional teaching mode. In order to verify the accuracy of this method, the accuracy of this method was simulated, and the results are shown in the following figure.

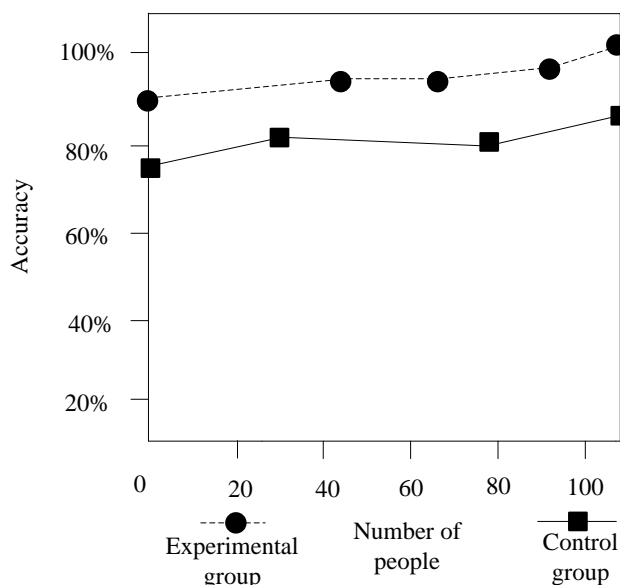


Figure 3. Experimental results

Can be seen from the results, the accuracy of the experimental group is better than that of control group, the virtual simulation technology can realistically simulate the real world of things and the environment, students through the nursing experiment of concrete operation can not only master animal experimental technology, but also through the experiment to verify the theory class school content, deepen impression of theoretical knowledge to improve experiment teaching effect.

4. Conclusion

Virtual simulation experiment teaching is an important part of higher education informationization construction, and it is also a major project promoted in experimental teaching in colleges and universities in recent years. Traditional nursing experiment teaching method were less, university-enterprise cooperation is not thorough, platform management system, a problem such as using virtual simulation experiment teaching, therefore, the simulation experiment proves that the virtual simulation in nursing teaching has greatly improved the teaching effect, especially in high-risk, expensive materials, emergency, high skill of experiment played a huge role in training.

5. Acknowledgments

Henan medical education research project in 2018 (project number: Wjlx2018230)

Henan medical education research project in 2018 (project number: Wjlx2018229)
 Zhengzhou sias college 2018 educational reform fund funded project (project number 2018JGYB16)
 Zhengzhou sias university key professional support project (project number: 201711)
 University-level teaching team support project of zhengzhou sias university (project number: 201624)

References

- [1] Li H.Y., Ding P, Song Z, et al. Progress in the application of micro-classes in nursing teaching mode and practice. *Anhui Medicine*. 2017, 21, 204-207.
- [2] Ding Y., Li W.Y., Song X.W., et al. Probe into the problems and teaching mode of clinical nursing teaching in China. *Contemporary Nurses (Preliminary Journal)*. 2017, 5, 12-14.
- [3] Zhang L. Application of systematic nursing teaching in the training of junior nurses in neurosurgery. *World Clinical Medicine*. 2017, 11, 22-24.
- [4] Deng W.F., Sun R., Li L.P., et al. Application of high simulation scenario simulation teaching in emergency nursing teaching. *Qilu Journal of Nursing*. 2017, 23, 14-17.
- [5] Zou J.M., Zeng X.Q., Sun T.C., et al. Evaluation of the application of tracking methodology in quality management of nursing teaching in higher vocational colleges. *Journal of Nursing Management*. 2017, 17, 47-49.
- [6] Zhang J.Y., Zhou J. Practical research on micro-course in basic nursing teaching. *PLA Journal of Nursing*. 2017, 34, 65-68.
- [7] Huang Y. Application of ward-round group assessment in intensive nursing training in secondary vocational schools. *Nursing Research*. 2017, 31, 2512-2514.

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- [8] Zhang D., Chen Yi. Application of three-level nursing teaching management model in nursing teaching in operating room. *Health Road*. 2017, 5, 153-154.
- [9] Zhang H.M., Wu X.W., Shao Z.Z. The application of flip classroom model based on micro-class in basic nursing teaching. *Nursing practice and research*. 2017, 14, 127-129.
- [10] Liao J., Huang L.Y., Shen Q.Y., et al. Application of flip classroom in clinical nursing teaching of peritoneal dialysis fluid exchange for intern nursing students. *Journal of Nursing*. 2017, 24, 14-17.