Research Article

Research on the Effect of Big Data Flipped Classroom Combined with Scenario Simulation Teaching: Based on Clinical Practice of Medical Students

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With the rapid development of information technology and the deepening of education reform, flipped classroom, as a new teaching mode, has received considerable attention from the education circle as soon as it appeared. This paper analyzes the teaching design principles of big data flipped classroom combined scenario simulation, constructs the teaching design model of big data flipped classroom combined scenario simulation in medical clinical practice, and explores the application and effect of the teaching method of big data flipped classroom combined scenario simulation. In this paper, the experimental group takes care of fusion simulations combined with the flipped classroom teaching method, and the routine control group uses the traditional teaching method; the scores of the two groups on theory, learning initiative, clinical practice, and critical thinking ability allow comparing the teaching effect, concluding that health care integration scenario simulation combined with flipped classroom teaching methods is new. It is beneficial to improve the learning ability, improve the ability of medical cooperation, enhance the sense of humanistic care, and so on. Analysis and comparison concludes that turning medical fusion simulations combined with classroom teaching, promoting the medical students on medical students' clinical practice to master theoretical knowledge and practical operation ability, and improving the ability of critical thinking ability and care will lead medical students to make a study of basic knowledge of medicine helping to cultivate the graduate student's study enthusiasm, stimulating interest in learning, improving the comprehensive quality of medical specialty, and making it worth popularizing in practice teaching.

1. Introduction

With the progress of science and technology and the development of education, medical teaching in colleges and universities should not only adapt to the needs of social development in the new period but also introduce and fully implement the new teaching mode in the teaching concept classroom [1] in time, so as to improve the classroom teaching effect and cultivate students' comprehensive ability. On the teaching platform, the learning situation is statistically sorted, and the focus, time, habit, and effect of students' learning are analyzed online. From the educational field, students are provided with quality, personalized learning experience. In the context of the era of deep learning [2–4], learning analysis

can be used to collect and analyze data for each link in the teaching process, so as to use a more appropriate teaching mode to improve the teaching effect, improve students' learning environment, and improve their learning enthusiasm. With the deepening of research, the concept of big data is generally regarded as a huge data set; through the collection, processing, and analysis of the data set, valuable information is obtained. The big data involved mainly refers to information, data, and technology in the field of education. It refers to the rapid and efficient analysis and processing of the learning data through the collection of a large number of learners' learning data. It is the internal unification of the technology of big data and the application in the field of education [5], and the concept and means to realize human

development and the improvement of education and teaching with the ultimate goal of educating people [6]. With the support of the continuous development and progress of information network technology, the data information is analyzed and processed in scientific mode, and the value of data is found in the process of analysis. Big data technology in education provides reliable basis for education and teaching through data analysis. Current researches mainly focus on the theoretical discussion of big data in the field of education. There is still a lack of research on the practical experience and application effect of big data in teaching, and there is no more systematic research. Therefore, it is still very necessary and urgent to further develop the breadth and depth of research on big data in teaching practice, so that big data can play its unique role in the field of education as soon as possible.

Scenario simulation teaching method, as a virtual practical training method [7], has become an increasingly popular teaching method in the field of international education. This method can provide students with a safe, nonthreatening, efficient and realistic simulation environment [8]. Application in clinical practice is to make full use of the intuitiveness, practicability, effectiveness, repeatability, and control of drills [9]. Promoting clinical situational teaching can enable students to develop their abilities of observation, understanding, analysis, and problem solving in real cases and situations, and at the same time exercise and embody students' comprehensive qualities such as cooperation spirit, humanism, and critical thinking [10]. Bates and Ludwig pointed out that the clinical teaching method combined with the PBL model and scenario simulation cultivated the trainees' critical thinking ability, improved the trainees' comprehensive skills of emergency surgery cooperation, and enhanced the trainees' team communication ability and cooperation spirit [11]. Chen et al. pointed out that the situational simulation teaching method of medical record introduction improved the language communication and necessary change ability of nursing students, and enhanced their listening skills [12]. Choi et al. applied the scenario simulation teaching method of medical record introduction to students' teaching, and believed that the method improved students' theoretical exam results, strengthened students' teamwork spirit, and improved students' learning enthusiasm and teaching satisfaction with teachers [13].

Students are actively involved in learning, and personalized learning is designed for students. As a new teaching mode, the flipped classroom replans the roles of teachers and students in traditional teaching, which is an innovation of traditional teaching. Hanson combs and classifies the flipped classroom network AIDS that is popular among teachers and students, and makes a detailed introduction to AIDS [14]. Based on STEM concepts, Sandrone et al. constructed the MOOC-platform-based flipped classroom teaching mode and applied it to the university computer foundation, achieving good results [15]. Fahy et al. drew on the teaching model designed by a network platform to provide convenience and guidance for teachers in the teaching practice, studied the implementation of the model based

on the information platform, and put forward constructive suggestions [16]. Saunders et al. pointed out that after the flipped mode, students' attention became more focused, the classroom atmosphere became more flexible and interesting, and students could actively participate in the class in cooperative learning [17]. The existing research on big data in education is still only a "point" exploration, lacking a deep and comprehensive discussion on the development of education by big data, and the research on the practical application of big data in the field of education is also insufficient. Combined with the flipped classroom teaching mode, many problems are found in the implementation process. In this paper, the advantages of big data technology and the flipped classroom scenario simulation teaching mode are combined to explore the practical application of big data technology in flipped classroom teaching and new methods [18] to solve the flipped classroom teaching mode.

2. Big Data Flipped Classroom Combined with Situational Simulation Teaching

2.1. Flipped Classroom Combined with Situational Simulation. Flipped classroom refers to the reversal of the roles of the student and the teacher. The traditional classroom is mainly based on the teacher as the main body, through the teacher as the master, ignoring the students' subjective initiative and resulting in the lack of students' subjective initiative. It is difficult to have their own independent creative thinking, and such a teaching model not only weakens the students' interest in learning but also limits the development of students' innovative thinking and makes students' minds become rigid and become "robots" that can only accept passively but cannot innovate independently. However, if we turn in the classroom the study of sovereignty back to the students, students can grasp the knowledge in its heaviest and most difficult part, according to the needs of individuals for the consolidation and repetition of the target, while improving the learning efficiency to reduce many of the useless things done by the teacher in class, to a certain extent, reducing the financial burden on the teacher's teaching. On the other hand, a flipped classroom also means readjusting the time inside and outside the classroom and breaking the original time organization mode of the classroom. The comparison with a traditional classroom is shown in Figure 1:

Situational simulation teaching mainly refers to a method where the teacher imparts the teaching content according to the needs and sets up relevant teaching situations in advance in combination with the actual situation, and then guides the students to play different roles in the specific scene, so as to simulate the actual problems and solve them [19]. The combined teaching mode of FC and SST can fully arouse students' learning enthusiasm and initiative, and have more practical opportunities to improve students' ability to solve practical problems and improve the teaching effect. Flip joint scene simulation teaching is to turn class and class scene simulation teaching which is a combined application of a kind of teaching method. The teaching method is mainly realized with the help of

FIGURE 1: Flipped classroom versus traditional classroom.

multimedia technology, which requires teaching videos, teaching construction, and uses scenarios to guide students to learn accordingly. This can not only improve the interest of teaching activities but also promote the comprehensive quality of students [20]. Moreover, this teaching method is widely used in public health, teratology, clinical medicine, nursing, and pharmacy, which plays a very positive role in the realization of the goals of modern medical education in China.

2.2. Theoretical Basis of Flipped Classroom Combined with Scenario Simulation Teaching. From the perspective of a flipped classroom, constructivism education emphasizes the initiative and constructivism of students, the importance of group cooperative learning and situational learning, and the practical application of educational information technology in teaching [21]. The implementation of a flipped classroom is supported by mastering learning theory and emphasizes on facing all students to meet the learning needs of students. When making learning objectives, we should pay attention to the individual differences of students, choose different learning materials, and adopt different teaching methods for different students. The learning process focuses on students' emotional experience, so that students can get a sense of achievement and enjoy the happiness of learning, and develop students' self-concept deeply. The course promotes the cooperation between students as well as the communication between teachers and students and the cultivation of cooperative spirit.

Development zone refers to the distance between a student's actual level of development when solving problems independently and the potential level of development when

solving problems with teachers and partners. Therefore, the first level of development is the level of development that students can achieve through independent learning with their own abilities and without external help. The second level of development is the level of development that students cannot achieve by themselves with their own abilities, but can only be completed through cooperative learning with the help of teachers or partners. Therefore, the key of teaching design for teachers is to identify the nearest development area for students. On this basis, teachers intervene in students' learning and build a series of "scaffolding" for students' self-construction knowledge.

Flipped classroom focuses on the individualized development of students, and pays attention to the new view of individualized teaching and hierarchical teaching based on the theory of proximal development zone. While the classroom teaching mode of teaching design focuses on the discovery of students, the zone of proximal development focuses on the student's existing level; this is not only reflected in the setting of teaching content but also reflected in teaching in the teaching video speed where each student can make their own decision according to their own situation. It is repeatable, either for the students' personalized learning, or for excavating its potential and innovation ability. It allows students to move beyond the nearest development zone to a higher level. Based on the learning of this theory, the structure diagram of the flipped classroom combined scenario simulation teaching relationship based on big data is given, as shown in Figure 2:

2.3. Technical Characteristics of Big Data. To combine big data technology with education and teaching well, it is

FIGURE 2: Big data flipped classroom combined with situational simulation teaching relationship structure diagram.

necessary to understand the characteristics of big data technology so as to give full play to its strengths and advantages [22]. Big data technology can process a huge amount of data. In the era of big data, the data in people's life and study will grow every day. The use of big data technology can solve the accumulation of a large amount of data, such as text data, image data, and learning process data. Through various wired and wireless networks, communication between information subjects can take place anytime and anywhere, which inevitably brings information exchange. The key to the effectiveness of data and information lies in the improvement of speed, and big data technology can process data efficiently and quickly. The application of big data technology has the effect of low density and high value. Different types of data use big data analysis technology to mine out the hidden value in information, so as to facilitate study and research, and realize the convenience and depth of data mining.

The components of big data mainly include the process data of students' learning, including the viewing of teaching videos and teaching PPT and the completion of task lists. After the data is analyzed by the big data technology of the cloud platform, teachers will look for the starting point of teaching and create an appropriate teaching situation based on the data analysis result feedback from the cloud platform. This teaching situation can sort out, review, and consolidate the knowledge that students have mastered, and at the same time, introduce the knowledge content and ability points that most students do not know, so as to carry out classroom teaching, so as to realize the teaching of a flipped classroom under the background of big data.

3. Design and Implementation of Flipped Classroom Combined with Situational Simulation Teaching

3.1. Teaching Design Principles of Big Data Flipped Classroom Combined with Scenario Simulation. One of the basic jobs of a teacher is to prepare lessons before they begin. In order to have a good class, it is necessary to carry out reasonable and effective teaching design in advance, rather than simply reading the textbook. Flipped classroom is an emerging teaching mode. With the support of information technology, flipped classroom reverses the order of transmission and internalization of learning content and breaks the teaching mode of a traditional classroom. It is

necessary for teachers to replan the teaching design process of a flipped classroom. In the combined scenario simulation teaching design based on a big data flipped classroom, the roles of teachers and students have changed. Teachers are no longer the porter of knowledge, but the guide, giving play to the leading and organizational role of teachers. Students are the main body of classroom learning; the classroom should be returned to the students, transforming students from becoming passive to being active. Classroom learning is a bilateral activity between teachers and students, with teachers guiding and students actively participating. In class, the teacher should grasp the question before the students, and they can be understood by some students and allow them to speak their views, can encourage good students, and can stimulate the underachievers. This allows the students, in cooperation with teachers and peers, to complete the task process in-depth knowledge.

Classroom interaction communication refers to the process in which teachers use verbal or nonverbal information to stimulate one or more students' thoughts in class, so that teachers and students interact with each other. In turn classroom teaching, teachers should first have a deeper understanding to the essence of classroom interaction and accurately grasp the question, which cannot simply be equated to communication, but should be based on students' feedback learning before class, to understand their knowledge before class, put forward reasonable effective study, where students explore cooperation, communication between teachers and students during discussion, and personalized guidance. At the same time, the more communication, the better; teachers should control the overall situation and grasp the degree of classroom interaction, so as to ensure the effectiveness of interaction and communication.

3.2. Construction of Teaching Design Model of Flipped Classroom Combined with Scenario Simulation Based on Big Data. The contents of flipped classroom teaching design mainly include preclass knowledge acquisition and classroom knowledge internalization. At the preclass stage, students study and discuss the course content in advance. According to the essence of a flipped classroom, a combined scenario simulation teaching design based on big data flipped classroom is set. The visual influence of video and sound of the teaching contents is recorded, which repeatedly impact the visual memory of students, alleviate the thinking fatigue caused by students from simply reading books, and

deepen the firmness of knowledge storage in the brain. It provides a basis for students to further study theoretical knowledge after class, and can timely and accurately “answer questions” for students, timely correct students’ wrong views, and improve the accuracy of knowledge, as shown in Figure 3:

Normalize flipped classroom teaching model under big data thinking. Horizontally, the model includes three parts: before class, during class, and after class. Vertically, the model includes two parts: the normal flipped classroom teaching process and the learning analysis system. The data collected before class is the basis for effective classroom teaching, while the data collected during and after class is not only the basis for adjusting teaching pace and carrying out personalized guidance but also the evidence for teaching students in accordance with their aptitude and promoting hierarchical teaching.

Flip the classroom scene simulation teaching has related advantages in application of modern information technology; in network platform for related animation, film, video, and picture upload, the related knowledge points through multimedia are intuitively shown in front of the students, which improves students’ learning interest and participation in teaching, to help them better understand relevant knowledge. In clinical medicine teaching, students master the corresponding medical knowledge and have the corresponding knowledge application ability. In the teaching design, classroom organization form diversified designs, in order to create scenes, for example, using a computer to control patient models, and simulating signs and symptoms of the patients with students in the class to learn the knowledge, simulating the real clinical practice in the classroom, and carrying on the application of relevant knowledge, which enable students to further internalize the knowledge.

3.3. Teaching Research Tool. The active learning ability table mainly evaluates students’ initiative in learning for medical and related majors [23]. There are 21 items in the scale of active learning ability, including learning driving force, learning goal, deep learning, control learning, and solid learning. The expert content validity index and the consistency of the raters of the scale were both 0.861, and the overall consistency reliability coefficient A was 0.895. The learning initiative scale was divided into multiple dimensions, with 1-5 points for each question.

The Mini Clinical Exercise Evaluation Scale is a set of tools [24] developed on the basis of the traditional evaluation scale to evaluate and feedback clinical knowledge and skills. It has been used as a clinical teaching method for residents or medical students. The content validity index and the consistency of the raters of the scale were both 0.8675, and the overall consistency reliability coefficient A was 0.8933. The scale had a total of seven dimensions and was scored on a 9-point scale with 3 levels. Scores with 1-3 points are judged to be strengthened, scores with 4-6 points are judged to be in line with the requirements, and scores with 7-9 points are judged to be excellent.

The critical thinking trait scale has seven dimensions [25], and each dimension has 10 items, for a total of 70

items, with 30 positive items and 40 negative items. Each item was rated on a scale ranging from “strongly agree” to “strongly disagree,” with positive items being rated 6-1 and negative items being rated backwards. The scale had a maximum score of 420. A score > 350 indicates that the subjects have a strong trait of critical thinking, >280 indicates that the subjects have positive critical thinking, <280 indicates that the critical thinking is weak, and <260 indicates a lack of critical thinking skills. A score of less than 30 on each subscale indicates negative trait performance, a score of 31-39 on the subscale indicates moderate thinking ability, and a score of 40-49 on the subscale indicates positive trait performance. According to the research, the A value of CTDI-CV is 0.90, and the A value of trait is 0.54 to 0.77, which shows a high internal consistency and can more accurately reflect students’ critical thinking ability [26].

3.4. Preparations before Implementation. According to the clinical teaching syllabus of paediatrics in the hospital, classic clinical diseases of paediatric neurology were selected to explain children’s growth and development, paediatric common auxiliary examination, child convulsions, epilepsy, and paediatric viral encephalitis. Each disease was explained by the same teacher, and the class time was controlled within 90 minutes. According to the clinical practice of hospitals for clinical nursing practice teaching outline and the actual situation, the department wrote four scenarios for a simulation script: new hospital information collection of children with viral encephalitis, sedative drug retention enema for children with operations, families of children with high fever given measures of health education, and emergency treatment of children with convulsions. According to the content, each script has one child, one child’s family member, and one nurse. The content and lines of the script are made by the teacher through discussion, and then implemented after having been reviewed and modified by two neurologist nursing experts in our hospital. The role of the nurse is played by the teacher, and the role of the child and the role of the family member is recommended by the group. Each scenario simulation class is taught by the same teacher, and she has two teachers to help. The teaching teacher is a researcher, and there are two teachers from the department. Both of them have a bachelor’s degree and have the title of supervisor nurse. All of them have passed the hospital certification. Before the official classes taught by the teacher for two groups of students, the purpose is to ensure the smooth progress of the experiment, mainly aimed at the scene simulation teaching and the related content, matters needing attention in the video feedback teaching, and how to solve the incident for explanation, knowledge related to organize students to role play group. Before the training, we should follow the teacher’s arrangement, fully realize the importance and necessity of this study, and memorize the steps of the situation simulation and video feedback teaching. Nursing students should read the script carefully and be familiar with the relevant operation steps. Students who will role play should memorize the relevant lines and figure out the role psychology. The operation of nursing skills can be performed on the role of interpretation, and for operations

FIGURE 3: Big data flipped classroom combined scenario simulation teaching design model.

TABLE 1: Comparison of the basic situation between the observation group and the control group.

Project	Number of people	Gender		Age	Performance
		Men	Women		
Observation group	61	55	6	22.83 ± 1.235	77.45 ± 7.21
Control group	58	53	5	22.94 ± 1.345	78.48 ± 6.72
T			—	1.321	1.007
χ^2			0.053	—	—
P			0.801	0.179	0.423

that cannot be performed in related cases, such as enema, they can be practiced according to the nursing model.

3.5. Implementation Steps of Big Data Flipped Classroom Combined with Situational Simulation Teaching

3.5.1. Step 1: Script Walkthrough (60 minutes). First, the teacher and the role-playing students will perform the simulation of the relevant situation. During the performance, the teacher will explain the relevant theoretical knowledge, operation techniques and key points, communication skills, and matters needing attention while performing. Then, students were asked to play roles in assigned groups. The teacher gave guidance at the right time to guide students to think independently, solve problems in time during the exercise, set obstacles according to the level of the exercise, and record students' cooperation ability when encountering obstacles.

3.5.2. Step 2: Evaluate Each Other (20 minutes). At the end of the exercise, students' self-evaluation was carried out first. Each group member had to speak and tell about their feel-

ings for each role during the exercise, find out their own deficiencies, and put forward improvement methods. During this time, other members of the group recorded and summarized. Secondly, students' mutual evaluation, which includes both evaluation within groups and evaluation between groups, points out the advantages and disadvantages of other students to achieve resource sharing. The teacher leads in asking questions and guides the students to think more deeply. For the problems that students cannot solve by themselves, they are left as homework after the class. Students are allowed to consult related materials and consult related experts, so as to solve the problems and deepen their memory.

3.5.3. Step 3: Summary of Teacher Evaluation (10 minutes). The students will be evaluated in the process of different role rehearsals and discussions, and the students' own performance ability will be evaluated. The teacher summarizes one student's excellent performance and instructs other students to imitate it. In view of the deficiency of students, the

FIGURE 4: Comparison of theoretical assessment results between the observation group and the control group.

FIGURE 5: Comparison of clinical scores between the observation group and the control group.

teacher asked questions in time to activate students' thinking.

The entire teaching process is videotaped and the students copy the video after class to ensure that students can

watch the teaching video anytime and anywhere. After class, students are required to refer to the teaching videos for operational exercises and theoretical learning, to review and analyze the videos, and to find out their own mistakes and

FIGURE 6: Comparison of learning initiative score between the observation group and the control group.

deficiencies through the videos. After class, students can consult the teachers at any time, and hand in written records and exercise videos every week. In the control group, the students only took the abovementioned situation simulation teaching but did not videotape the teaching process. They could consult the teacher at any time after class.

4. Flipped Classroom Combined with Situational Simulation of Teaching Results

4.1. The Basic Data of Two Groups of Students Were Compared. Descriptive statistics and an independent sample test were performed on the three aspects of age and theoretical achievement when the two groups were admitted to the hospital. Chi-square test was performed on gender, and the results showed that there was no statistical difference between the two groups. The statistical results of age, sex, and achievement are shown in Table 1, where T is a statistic in mathematical statistics, χ^2 is the set sample statistic, and P value is probability, reflecting the probability of an event happening.

4.2. Theoretical Score Comparison. The results of descriptive statistics and an independent sample test showed that the scores of the observation group were higher than those of the control group, indicating that there was a significant difference between the two groups in the assessment of theoret-

ical scores, and the difference was statistically significant. The statistical analysis results are shown in Figure 4.

4.3. Comparison of Clinical Practice. The scores of the observation group and the control group in the Mini Clinical Exercise Evaluation Scale were tested by descriptive statistics and an independent sample test, and the results showed that in the main seven assessment aspects of the scale, namely, nursing evaluation, physical examination, operation skills, health education, clinical judgment, organizational effectiveness, and humanistic care, the observation group was better than the control group, and the difference of data was significant, with statistical significance. The specific score is shown in Figure 5.

4.4. Learning Active Initiative Comparison. Descriptive statistics and an independent sample test were conducted on the scores of the two groups, and the results showed that the observation group was higher than the control group in various ability indicators, and there was a significant difference between the two groups. See Figure 6 for details.

4.5. Comparison of Critical Thinking Ability. After training, the two groups of students were compared on critical thinking ability, and the results showed that the two groups of students' total score of critical thinking ability was >280 ; however, the observation group's total score of critical thinking ability was significantly higher than that of the control

FIGURE 7: Comparison of thinking ability between the observation group and the control group.

FIGURE 8: Teaching model satisfaction comparison chart.

group, and the difference was statistically significant. There was no statistically significant difference in truth seeking between the two groups, but there were statistically significant differences in open mind, analytical ability, systematic

ability, self-confidence, curiosity, and cognitive maturity between the two groups. The specific score is shown in Figure 7.

4.6. Teaching Mode Effect Comparison. On 18 aspects of teaching satisfaction statistics, according to the results by two methods of teaching, there was a certain effect; that is, it shows from comparison that the observation group is significantly higher than the control group. For the observation group of students, teaching methods satisfaction was from 90.2% to 100%, and the control degree of satisfaction was 77.6%-93.1%, from two groups of data tested. The test results showed that there was no statistical significance in the four aspects of timely discovery of knowledge weaknesses, improvement of literature retrieval ability, improvement of team cooperation ability, and improvement of professional identity, while the other 14 differences were statistically significant. Figure 8 shows the proportion of people who showed satisfaction.

5. Conclusion

Scenario simulation teaching can combine theoretical knowledge with practice, and it can apply theoretical knowledge to future practice while carrying out theoretical teaching. The results of this study show that, through the flipped classroom teaching mode, students in the

experimental group scored significantly better than the control group in the theoretical assessment, indicating that flipped teaching mode can more effectively strengthen students' mastery of theoretical knowledge. In addition, flipped classroom teaching mode is also conducive to the realization of the close connection between theory and practice, as well as between the major and clinical practice. It helps to train medical students to master the basic theoretical knowledge of diseases in their major, and improve their clinical thinking ability, practical operation ability, and clinical work ability. In this study, the experimental group students' clinical skills examination score is significantly higher than that of the control group, and the prompt turn classroom teaching model can guide students to actively participate in clinical practice skills of learning and training of operation. It is associated with many flip classroom teaching patterns where the results are consistent, and the turn classroom teaching model can improve medical students' knowledge of basic theory and clinical practice ability. It can obviously improve the teaching quality of clinical teaching for medical students. The disadvantages of this model should be overcome in future work: western cultural differences cause the students' deep-rooted educational concept difficult to change, scenario simulation teaching has high requirement on educational resources, and there is lack of an excellent test evaluation system for situational simulation teaching.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

All the authors do not have any possible conflicts of interest.

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