Effectiveness of Virtual Simulation System in Emergency Nursing Course to enhance CPR for Vocational College SiChuan Vocational College of Health and Rehabilitation (SVCHR), SiChuan Province, China

Xuemei Ni

A Thesis Submitted in Partial Fulfillment of Requirements for
degree of Master of Education in Curriculum and Instruction
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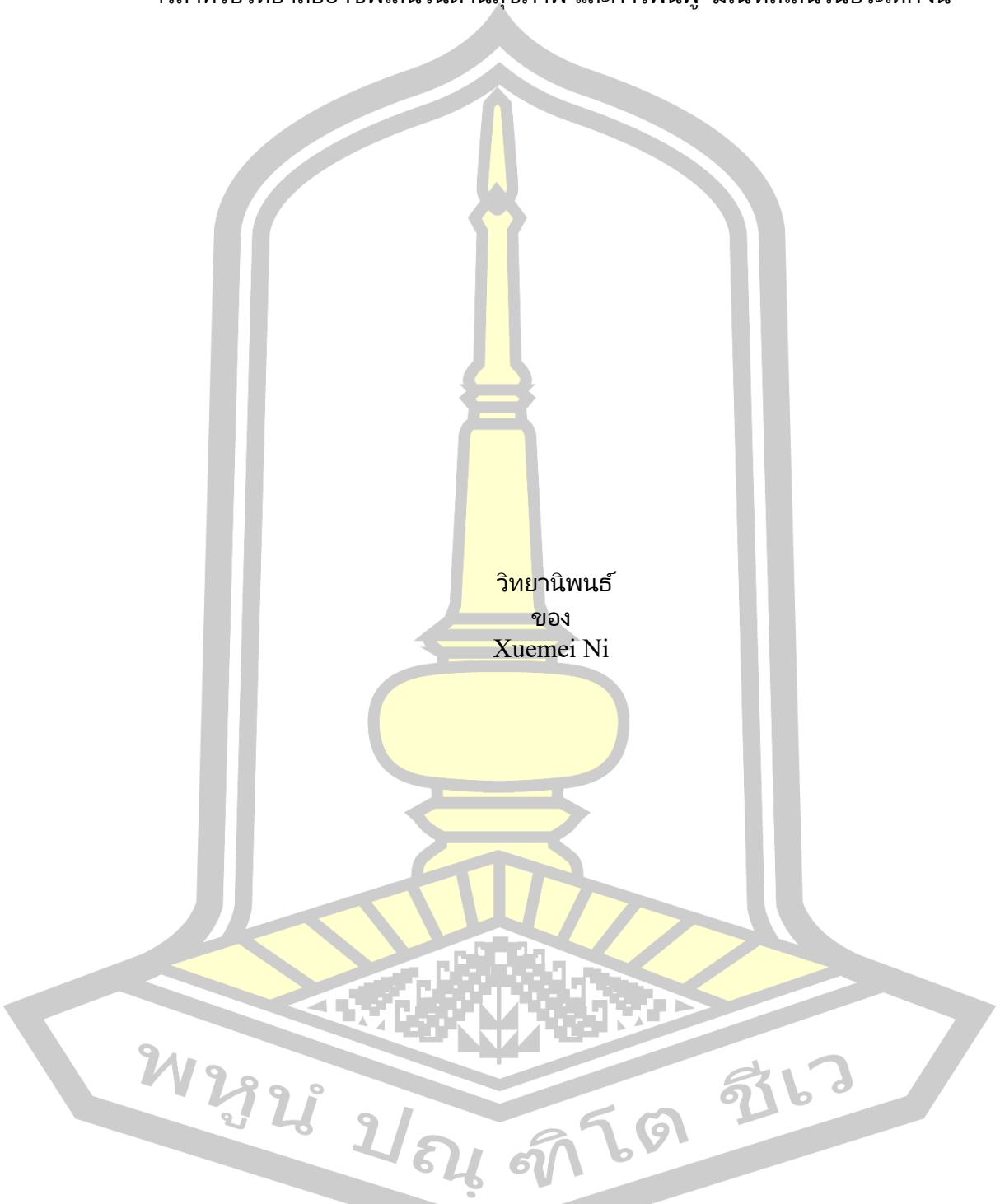

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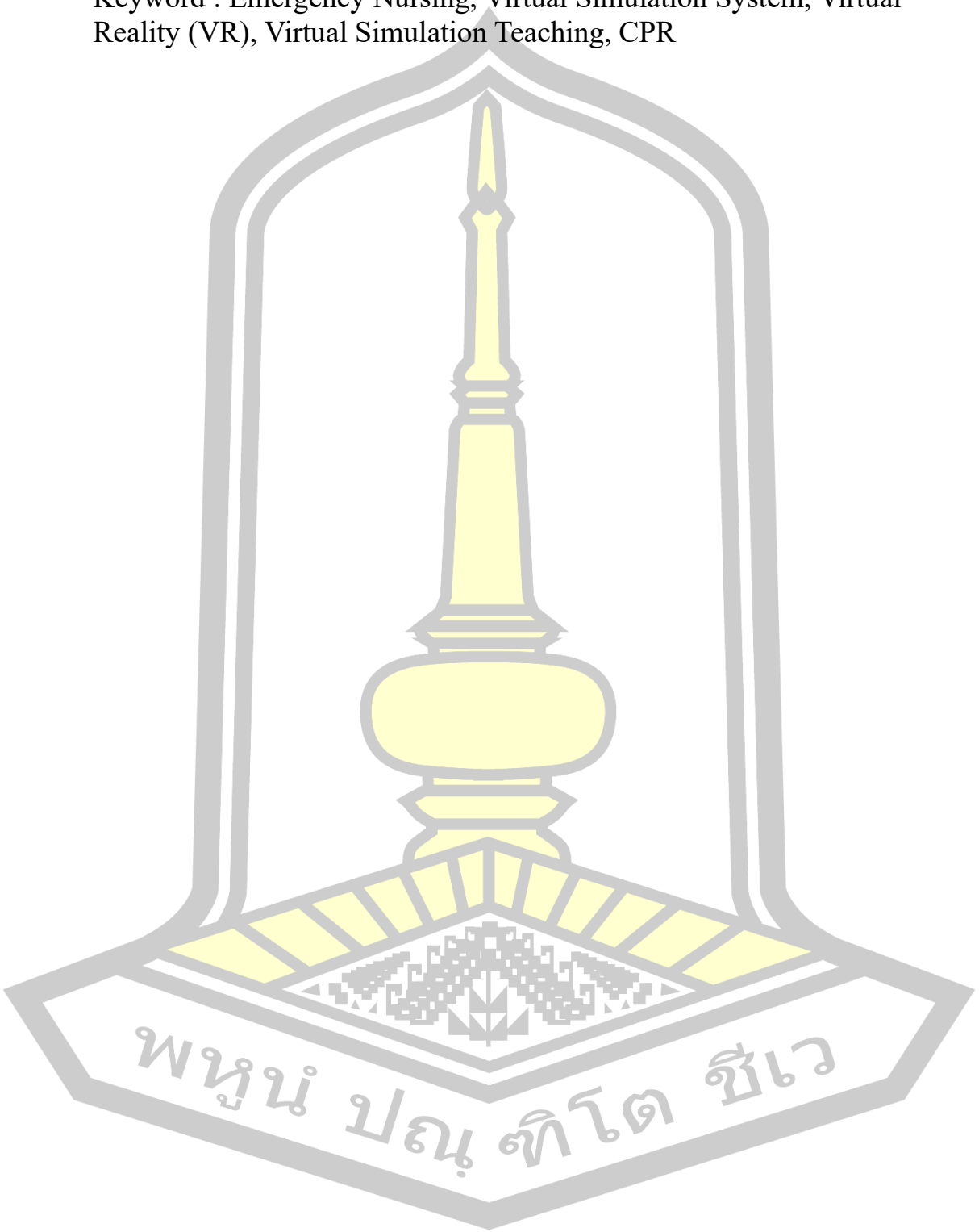
ABSTRACT

Emergency nursing is an important part of nursing, and with the rapid development of modern medical technology, emergency nursing has become increasingly important in clinical practice. However, the teaching of emergency nursing faces many challenges, such as the complexity and variability of patients' conditions, and sudden and critical events, all of which indicate the urgent need to improve the professional knowledge, operational skills, and adaptability of nursing staff. The traditional teaching methods mainly focus on explanation, demonstration, and practice, neglecting improving students' practical and emergency abilities. This article is based on the background of educational informatization, guided by the comprehensive quality of emergency nursing, supported by virtual simulation experiments, and aimed at improving students' operational skills in talent cultivation. It explores the application of virtual simulation experiment teaching in the emergency nursing discipline experimental teaching of a medical vocational school - Sichuan Health Rehabilitation Vocational School. It conducts a survey and analysis of its application effect. The research results indicate that both virtual simulation systems and traditional teaching methods have a positive impact on improving students' knowledge, skills, and classroom satisfaction to a certain extent. However, incorporating virtual simulation systems in teaching is more effective than traditional methods in improving these aspects, with a significance level of 0.05.

Keyword : Emergency Nursing, Virtual Simulation System, Virtual Reality (VR), Virtual Simulation Teaching, CPR



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CHAPTER I
INTRODUCTION

1.1 Research background

With the development of society, people's demand for health is increasing, and the implementation of the current national big health strategy puts forward new requirements for the goal of medical education. Nursing staff are required not only to have strong operational skills and service abilities but also to have higher standards for their comprehensive quality. Employers have expressed an urgent need to improve students' job competence.

At present, according to the survey, the teaching of emergency nursing mostly adopts the traditional teaching methods, mainly with the combination of theoretical learning and practical operation. There are the following problems: First, the process of teaching in the classroom takes most of the time, the practical operation class was forced to become a theoretical class and the time of students' operation practice is greatly reduced. Secondly, due to the small number of models, a small number of students do not have the opportunity to practice the operation on the model, which also leads to a low interest in learning the operation skills and a decreased desire for hands-on exercises. Finally, 1-2 teachers face 50 students, and there is insufficient teacher guidance.

Therefore, this method has significant limitations in terms of time and resources. Critical care nursing is a core course in nursing, covering various theoretical knowledge and emergency skills related to critical care required for clinical emergency nursing positions. It is an important part

of cultivating students' competence in clinical emergency work positions. (Horton, K., Tschudin, V, & Forget, A. 2007).

However, There are some problems in the traditional teaching of critical care nursing, such as rigid and not innovative teaching forms, insufficient classroom interaction, limited equipment and facilities, and insufficient practice time, which cannot meet the learning and clinical practice needs of nursing students. Therefore, some undergraduate institutions are increasingly applying virtual simulation technology, supported by computers, to replicate realistic scenes including visual, auditory, and tactile experiences. In a given environment, the interaction between users and devices allows for an immersive experience, thereby addressing the challenges faced in nursing education. Therefore, there has been a surge in the use of virtual reality as a medium for acquiring skills and knowledge (Yang, Meng &He, 2023). Specifically, Virtual Simulation System applications have been proven to effectively train nurses to cope with various career challenges they may encounter in their careers. In addition, the continuous advancement of virtual reality technology helps students effectively participate in simulated real-life scenarios, enabling them to experience increasingly specific situations and improve their adaptability. Meanwhile, virtual simulation experiments can enable learning

Completing high cost and high-risk practical projects is not limited by space or time. Constraints such as space and manpower are beneficial supplements to traditional experiments. (Zu &Wei, 2018) The importance of this issue is particularly evident in the field of nursing education.

So blended learning combines the advantages of both traditional learning methods and online learning methods. It heightens the leading role of teachers in guiding, motivating, and supervising the teaching process, fully reflecting the initiative, enthusiasm, and creativity of students as the main body in the learning process. (Li, et al., 2024)

This study aims to compare the effects of using virtual simulation technology and traditional teaching methods on students' knowledge, skills, and classroom satisfaction in cardiopulmonary resuscitation courses.

1.2 Purpose of the Research

1) To compare the theoretical knowledge teaching effectiveness between the experimental group (virtual simulation system) and the control group (traditional teaching) of two groups of students.

2) To compare the skill teaching effectiveness between the experimental group (virtual simulation system) and the control group (traditional teaching) of two groups of students.

3) In order to understand the satisfaction of students in the experimental group with the teaching method using virtual simulation system in the classroom

1.2.1 Specific objectives:

The main objective of this study is to evaluate the application of virtual simulation system in cardiopulmonary resuscitation course in emergency nursing. I will collect students' opinions on the effectiveness of the course through two classes, namely the experimental group and the control group, including course materials, course objectives, dimensions of teaching methods, teaching mode positions, course schedules, and

student's attitudes towards the course. Then compare and analyze the results of theoretical testing and skill testing. Verify the effectiveness of the virtual simulation system in improving the CPR skills of emergency students. Discuss the impact of adding virtual simulation systems to traditional teaching on first aid knowledge, CPR skills, and overall classroom satisfaction. Finally, this article proposes corresponding measures for further reforming the emergency nursing curriculum and explores the necessity of adding virtual simulation systems in traditional teaching to better cultivate high-quality nursing students.

1.3 Hypothesis of the Research

There are three research hypotheses regarding students' knowledge, CPR skills, and Classroom satisfaction:

H1: After receiving guidance through the virtual simulation teaching system (experimental group), students showed better results compared to traditional teaching methods.

H2: Students who received guidance using traditional teaching methods (control group) had lower knowledge outcomes than those who learned through virtual simulation teaching systems (experimental group).

H3: Students' knowledge, CPR skills, and classroom satisfaction follow the guidance of the virtual simulation teaching system (experimental group), which is superior to traditional teaching methods (control group).

1.4 Scope of the Research

This study belongs to the research scope of vocational education in emergency nursing at the college level. It not only includes basic emergency techniques and theoretical learning, but also the cultivation of

highly professional practical operations and emergency response abilities, aiming to cultivate emergency nursing personnel with professional knowledge and CPR skills. I will incorporate a virtual simulation system into the teaching of nursing students at Sichuan Health Rehabilitation Vocational College, making traditional teaching more diverse and improving students' knowledge, skills, and overall classroom satisfaction. The research and development method used in this study: Two classes with the same learning environment, hardware, and facilities were randomly selected from the second year of nursing major at Sichuan Health Rehabilitation Vocational College where I work. The grade has 15 classes with 50 people each, for a total of 750 people. Participated in the experiment in total: 100 students. According to the survey, students in both classes had never studied (or had contact with) virtual simulation systems or related learning. Firstly, a pre-test was conducted, and there was no significant difference in knowledge level between the two classes. Each class has 50 students, totaling 100 students. They are randomly divided into an experimental group (virtual simulation teaching method) and a control group (traditional teaching method). The specific development process is as follows:

1) Investigate and research relevant information.

2) Instructional steps to create instructional models.

3) Implement instructional models.

4) Evaluate and track instructional models.

1. Research and development methods: first, the definition of the research problems and the problems to be solved in the research process, second, the difficulties to be solved in the research problems, and finally,

the use of research and development methods to solve and answer the research questions.

There are four steps:

1.1) Basic data of the investigation and research. The main methods include literature research, student interviews, expert interviews, etc. The purpose is to understand the needs of students in the course and their skills.

1.2) The main way to develop the teaching mode is to use the basic information to define the curriculum structure. The purpose of the expert evaluation of the teaching mode syllabus is to determine a complete and implementable teaching mode syllabus.

1.3) Implement the teaching mode. The syllabus of the teaching model was applied to the course content of the CPR section studied. The experimental class adopts the experimental teaching method based on virtual simulation + operation skills training, while the control class adopts the traditional teaching method, mainly taught by teachers, supplemented by video and slide display and group practice. After the completion of the teaching practice, the related test of two classes, namely theory evaluation results, skills operation evaluation performance, namely the test group (virtual simulation system) and control group (traditional teaching method) teaching effect of comparison, comparison range is: theoretical knowledge, CPR skills, students class satisfaction, and statistics and analyze the collected data, can understand the expected effect of teaching mode, further improve the teaching mode.

1.4) Evaluation and further track the teaching model. The teaching records, teaching effects, and the overall satisfaction of the CPR class teaching mode were evaluated and tracked, and the teaching mode

of emergency nursing was constantly improved together with the emergency nursing teachers and students.

1.5 Variable to study

1.5.1 Independent

Virtual simulation system

1.5.2 Dependence

CPR skill

1.6 Duration Time

I randomly selected all students from Class 5 and Class 6 of the 2022 cohort at Sichuan Health and Rehabilitation Vocational College, who are in their second year of university. The research is divided into three stages: the first stage is the preparation stage. In September 2023, the research objectives will be determined through a relevant literature search based on the actual teaching situation of our school. The next stage is the implementation phase, where both classes receive 4 weeks of guidance. The specific period is from May 27th to July 8th, 2024, with a total of 8 class hours and approximately 1.5 months. Finally, the summary and analysis phase will take place from July 9th to July 30th 2024. To ensure the adequacy of the data and the accuracy of the analysis, this study lasted for a long time, approximately one year in total.

1.7 Definition of Terms

This section provides a definition and clarification of the terms used in this study. Definition of terms helps prevent confusion that can arise when multiple terms and concepts are in the literature.

1.7.1 Cardiopulmonary resuscitation (CPR)

Cardiopulmonary resuscitation: Abbreviated as CPR, it refers to the rescue measures such as external chest compression and mouth-to-mouth artificial respiration or assisted respiration with a simple respirator for patients with cardiac and respiratory arrest caused by various reasons. The aim is to maximize the restoration of the patient's spontaneous breathing and circulatory system and maintain the patient's vital signs. This process mainly includes external chest compression and assisted respiration.

As one of the required courses of a nursing major, it is very practical and has high requirements for students' practical operation ability.

1.7.2 Emergency nursing (First aid nursing)

It is a subject with high requirements for first aid operation skills, and practice courses account for a large proportion of teaching. Follow the first aid nursing concept of "life first, time is first", with "cultivating ability" as the overall goal, so practical skills and comprehensive quality are particularly important. It also requires students to promote the cultivation of students independent learning ability when they can master the knowledge and skills of emergency nursing. At the same time, help students to establish the concept of love injury, first aid awareness, emergency ability, professional quality (calm, foresight), and so on.

1.7.3 Emergency nurse

Emergency department is the forefront of hospital rescue of patients' lives. It is the department with the most concentration of urgent, dangerous and severe patients, the most diseases and the heaviest rescue and management tasks. It is also a place easy to produce conflicts,

disputes and complaints. The nurses who work in emergency units not only work in patient care but also with their treatment, coordinating and leading the nursing staff, and also acting in bureaucratic functions.

1.7.4 Virtual reality, (VR)

Mainly by the computer system building a 3 d virtual environment, to provide users with tactile, auditory, and visual 3 d simulation, making it immersive feeling, the user observes the virtual space things can be real-time and unlimited, and with the help of human-computer interaction equipment, real-time control and design transformation virtual environment object。

1.7.5 Virtual simulation system

Virtual simulation system is based on 5G technology, communication technology, and other advanced technologies, to create a virtual scene of the collection of touch, visual, and auditory. The application of virtual simulation technology to teach students in emergency nursing and nursing science can make students feel immersive and feel the real operation, so as to gain skill progress and accumulate practical operation experience.

1.7.6 The composition of virtual simulation system：

The equipment of the virtual simulation system is mainly composed of the virtual world, a computer, virtual reality software, input devices, and output devices. In addition, the hardware of the virtual simulation system is diverse, including a head-mounted display system (such as a virtual reality headset), desktop display system (such as holographic station, AR station, etc.), and large screen display system (such as multi-channel projection display). These hardware forms offer different levels of immersion and interaction.

1.7.7 The virtual world:

Is an interactive virtual environment, involving model construction, dynamic characteristics, physical constraints, lighting and collision detection, etc. providing users with an immersive virtual learning or work environment.

1.7.8 The computer

Is the core of the virtual simulation system, including processor configuration, I/O channel, and real-time operating system. It is responsible for the real-time construction and participation of the virtual world.

1.7.9 Virtual reality software:

Provides the ability to construct and participate in virtual worlds in real-time, involving modeling, physical simulation, etc., ensuring that users can interact with the virtual environment naturally.

1.7.10 Input devices and output devices:

Are used to observe and manipulate the virtual world, including tracking system, image display, sound interaction, haptic feedback, etc. Users can interact with the virtual environment through these devices.

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CHAPTER II
LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Background (Status quo at home and abroad)

2.1.1 International Research Background

The concept of Virtual Laboratory (VL) was first proposed by Professor William Wolf of The University of Virginia in 1989. The idea is to make it easier for researchers in different laboratories to share data and instruments, exchange ideas, and collaborate remotely. Now, through virtual simulation technology, a variety of complex subject scenarios can be constructed, so that students can immerse themselves in these scenarios to break through the limitations of traditional experimental teaching. In this way, students can practice their operations anytime and anywhere, improve their learning efficiency, master various professional skills more quickly, and improve the comprehensive quality of students. (Wang & Wu ,2000). Currently, VR has also been proven to be an effective teaching resource for teaching knowledge in different fields at all levels of education, especially in higher education. (Vergara & Gómez, 2019)

Since the 1880s, foreign scientists have been conducting virtual simulation experiments, mainly using computers to operate control, and evaluate virtual experiments. So the development of virtual simulation technology abroad is quite rapid, with a wider range of applications. Through the analysis of relevant data at home and abroad, this article believes that although virtual simulation experiments have been widely applied in fields such as engineering, chemistry, and physics, their research in medical teaching is relatively limited, and teaching resources

are also relatively limited. Later, with the increasing attention to virtual simulation in the education industry, virtual simulation technology was widely applied in the education and teaching of major medical disciplines, such as basic nursing, surgical nursing, pediatric nursing, emergency nursing, and so on. It also requires students to promote the cultivation of students independent learning ability when they can master the knowledge and skills of emergency nursing. At the same time, help students to establish the concept of love injury, first aid awareness, emergency ability, professional quality (calm, foresight), and so on. (Zhang & Zhang, 2000)

In this context, more and more universities and research institutions are applying virtual simulation technology to various types of education and teaching.

Related analysis shows that Robson et al. (131) believe that gamification is the application of design methods in the gaming field to education, making traditional teaching processes rich, interesting, and bringing joyful experiences. Nursing education games refer to a technical means of integrating nursing-related knowledge and skills into the game to achieve training goals. At present, countries such as Canada, the United States, South Korea, and Iran have applied gamified teaching to courses such as surgical nursing and basic nursing. (Robson et al., 2014) However, the development of educational game software in China started relatively late Nowadays, some key undergraduate universities in China have used virtual simulation systems in emergency nursing courses to facilitate teaching. It has been found that virtual simulation systems are more convenient for students to understand and construct knowledge, which not only enhances their learning interest, but also stimulates their

subjective initiative and operational skills, enhances their clinical adaptability and adaptability, greatly improves their self-learning ability, and can also enhance their theoretical knowledge to a certain extent. Secondly, the virtual system, with both online and offline operations, not only saves the practical operation of consumables, but also helps students master the operation process, key points of operation, and theoretical difficulties.

2.1.2 Background of Chinese Research

However, the development of educational game software in China started relatively late and only entered a period of rapid development at the end of the 20th century. Currently, it is still in the exploratory stage. (Xiao, Yu & Sun 2020). Some teachers' education concepts are relatively backward, and they can not accurately grasp the importance of experimental teaching. They still use the traditional teaching method to teach the experimental course of emergency nursing. The students have less time to carry out the actual experiment, and intuitively feel the experimental process and results. The interactive classroom of "doing experiments" will be forcibly changed into a monotonous classroom of "speaking experiments". In this traditional experimental teaching mode, teachers lack personalized guidance for students, which is not conducive to teaching students in accordance with their aptitude, and the teaching mode is relatively simple, so students are not interested. Although some teachers realize the importance of experimental teaching, in practice, the effect of experimental teaching is not ideal due to various reasons, For example, insufficient class time or inadequate laboratory equipment in schools. Nowadays, some key undergraduate universities in China have used virtual simulation systems in emergency nursing courses to facilitate

teaching. It has been found that virtual simulation systems are more convenient for students to understand and construct knowledge. They can not only improve students' learning interest, but also stimulate their subjective initiative and operational skills, enhance their clinical adaptability and adaptability, greatly improve their self-learning ability, and also enhance their theoretical knowledge to a certain extent. Secondly, the virtual system, with the number of online and offline operations, not only saves the actual operation of consumables, but also helps students master the operation process, key points of operation, and theoretical difficulties. Research has shown that using simulation in science education is a more effective method compared to traditional teaching methods.

2.1.3 Fields involved in virtual simulation technology

At present, from the research and development of virtual simulation experiment teaching resources, it is mainly used in 1) Military and national defense. Used for training, tactical simulation, weapon system performance evaluation, etc. 2) Engineering disciplines: such as mechanical engineering, aerospace engineering, automotive engineering, etc. In these fields, virtual simulation courseware can be used to simulate the behavior of physical systems under different conditions, such as mechanical systems, electrical systems, and fluid dynamics systems. 3) Computer Science: Virtual simulation courseware can be used for teaching in computer science and engineering fields, such as artificial intelligence, machine learning, computer graphics, and software engineering. For example, students can use virtual simulation platforms for programming practice, algorithm design, and graphic rendering tasks. 4) Medicine: Virtual simulation courseware has applications in fields such

as medical biology, anatomy, physiology, pharmacology, and surgery. For example, a virtual simulation platform can help students understand human anatomy and physiology, as well as assist them in surgical simulation and drug development. 5) Manufacturing: Virtual simulation teaching platform software also plays an important role in training in the manufacturing industry. Through virtual simulation technology, students can perform various operations in virtual factories, such as equipment maintenance, production scheduling, etc., thereby mastering practical operational skills. Overall, the application field of virtual simulation is very extensive, covering almost all areas that require simulation and practice. They provide opportunities for practice and interaction, stimulate students' interest in learning, and enable them to conduct experiments and simulations in real environments to deepen their understanding of complex topics. However, due to its expensive construction cost and long construction period, as well as the need to update the content in a timely manner in the later stage, there are more resources for full-time undergraduate engineering education, and fewer resources for vocational education, especially for virtual simulation teaching for vocational medical education. It can be said that the application of virtual simulation teaching resources in emergency nursing is in the initial exploration stage. However, after being first used by various undergraduate institutions, according to relevant research, the results show that virtual simulation experiments can effectively solve some problems that cannot be done, cannot be done well, and cannot be done in medical school experiments. Most students can adapt well to and accept virtual simulation experiment teaching, believing that it is helpful for their experimental learning; Through a virtual simulation experiment

teaching in one class, students can significantly improve their learning interest and concentrate more energy during the learning process; Moreover, virtual simulation experiments can enhance students' experimental design abilities, promote their understanding of experiments, mastery of experimental skills, and cultivation of innovative abilities.

Therefore, the virtual simulation system is a safe, low-cost, and highly effective teaching method for emergency nursing courses. How to carry out the construction and application of virtual simulation system teaching in emergency nursing discipline has become an important research topic in education and teaching in our school.

The use of virtual reality technology in teaching began in the 1990s. American researchers introduced virtual reality technology into basic and higher education and carried out multiple teaching projects such as Cell Biology, Global Change, and Virtual Gorilla Exhibition. Virtual Reality (VR), also known as "spiritual realm technology," is also known as virtual reality technology. It is an interdisciplinary field that integrates computer technology, artificial intelligence technology, and electronic information techno. At present, from the research and development of virtual simulation experiment teaching resources, it is mainly used in: 1. Military and national defense. Used for training, tactical simulation, weapon system performance evaluation, etc. technology, and other technologies to build an artificial environment. VR technology has the "3I" characteristics (Interaction, Immersion, Imagination), which are immersion, interactivity, and conceptualization. These three major characteristics are important features of virtual reality technology. Through technical means and related devices, combined with human

sensory functions such as vision, hearing, and touch, simulation construction is carried out, allowing us to immerse ourselves in the virtual world, and conduct unrestricted observation and timely interaction. Virtual reality technology is at the forefront of scientific and technological development today and can be widely applied in various research fields.

The application scenarios and advantages of virtual reality technology Virtual reality technology is a technology that simulates real environments through computer generation. Through this technology, users can experience various experiences in virtual environments, such as games, interactive movies, training, and education. Specifically reflected as:

Games are one of the most commonly used scenarios in virtual reality technology. Virtual reality games can immerse players in a virtual environment, interact with characters, and explore the environment, providing a very realistic gaming experience. The advantage of virtual reality games is that they can provide a highly realistic immersive gaming experience, making players more engaged in the game. In addition, virtual reality games can also help players improve their physical coordination, reaction ability, judgment ability, etc., suitable for people of all ages.

Virtual reality technology is used for training and education. For example, medical students can perform surgeries and simulate operations in virtual environments to enhance their skills and knowledge in the real world. In addition, military and police training can also be conducted using virtual reality technology to make the training more realistic and effective. There are also many applications of virtual reality technology in the field of education, such as architecture and engineering learning,

language learning, and history learning. Through virtual reality technology, learners can better understand and remember learning content, as well as improve their ability to master practical skills.

Virtual reality technology in healthcare also plays an important role in the field of healthcare. For example, in psychotherapy, virtual reality technology is used to simulate various scenarios to help patients master self-control skills. In addition, virtual reality technology can also be applied to physical therapy to assist patients in rehabilitation training.

Virtual reality technology for tourism and entertainment is equally feasible in the field of tourism and entertainment. For example, in scenic areas, tourists can use virtual reality technology to understand their history and culture and explore the attractions. In addition, virtual reality technology can also be used to simulate various entertainment scenarios, such as sports such as skydiving or skiing. Through this approach, users can enjoy more fun and excitement in scenarios that cannot be experienced in the real world.

2.1.4 Current achievements of virtual simulation technology

In China, 2016 is the "Year of Virtual Simulation". This year, the State Council issued the "Thirteenth Five Year Plan for National Informatization". The fourth part of the plan clearly states that it is necessary to strengthen the basic research and development of virtual reality technology and the layout of research frontiers as a key project and major task. Virtual reality technology has been included in the national plan. China attaches great importance to the educational application of virtual reality technology, and as of 2016, the Ministry of Education has approved 300 national-level virtual simulation experimental teaching centers. Virtual simulation experimental teaching is an important part of

higher education informatization and laboratory construction, which can better meet the learning needs of authenticity, immersion, and interactivity that traditional experimental teaching cannot meet. " (Zhu, 2016).The panoramic teaching environment constructed by virtual simulation technology (Wu et al., 2023) can help students break through the barriers of time and space, achieve the effect of "immersive learning", and improve learning efficiency in various classrooms. Combining virtual reality technology and "history teaching" can change the classroom context. Virtual reality technology has advantages such as "stimulating learning motivation", "enhancing learning experience", "creating psychological immersion", "achieving situational learning" and "knowledge transfer" in the "classroom". Virtual reality technology can first create a better teaching environment to a certain extent. For example, when introducing the uses of different bronze ware, virtual reality technology can restore the usage scenarios of different bronze ware, which will undoubtedly promote students' understanding of bronze ware and leave a deeper impression; Secondly, virtual reality technology can enhance the "interactivity" of the classroom and create a more vivid and positive classroom atmosphere. Virtual reality technology provides more possibilities for teaching methods, teaching content, and teachers' teaching philosophies, which greatly helps to change the shortcomings of traditional teaching models such as rigidity and conservatism, avoid a single "indoctrination" teacher-student relationship, and promote the common development of teachers and students in the experience of virtual reality technology; The emergency nursing virtual simulation experimental teaching system simulates sudden emergency situations through VR technology, fully integrating visual and tactile senses,

allowing learners to understand various sudden symptoms of illness in a virtual environment, improve their ability to respond to emergencies, and enhance their emergency nursing operation skills. In recent years, visual immersion technologies such as virtual reality, augmented reality, virtual worlds, and digital twins have been constantly reshaping online education in terms of learning resources, teaching organization, and system platforms (Liu et al., 2020).

The reform of teaching mode brought about by this technology has become an important question of teaching development. Previous research has fully demonstrated the unique advantages of virtual simulation teaching in experimental skills training. Wang Ziwei et al. introduced the "Medical Imaging Technology and Imaging Principles Simulation Teaching Platform" into the virtual simulation teaching practice of medical imaging technology, which improved the enthusiasm of students to participate in experimental teaching, improved the effectiveness of experimental teaching, achieved low-cost, batch, scale, and standardized experimental teaching, solved the bottleneck problem of cultivating medical imaging technology professionals, and achieved good teaching feedback effects (CAI et al., 2020) . Xiao Qian et al. conducted a detailed comparison of the advantages and disadvantages of virtual reality technology in the application and research progress of medical nursing, summarized the application and research progress of virtual reality technology in the field of medical nursing, analyzed the advantages and disadvantages of virtual reality, and provided a reference for medical staff and educators (Xiao, Yu & Sun, 2020). In 2019, domestic scholar Wang Siyao (Wang, Zhang, Peng, Xie & Wang, 2020). Conducted a randomized controlled study using Lifesaver VR software and related equipment

designed by the UK Recovery Association. 56 medical students were divided into two groups, receiving scenario-simulated CPR training and VR virtual training. The content and duration of the training were the same for both groups, and the students who participated in the training were followed up for 6 months after the end of the training. The results showed that the theoretical knowledge scores of the VR group were higher than those of the scenario-simulated group immediately after training, 1 month after training, and 6 months after training. The repeated analysis of variance showed that although the skill scores of both groups decreased to some extent after 6 months of training, the skill scores of both groups showed a certain degree of decline. However, the retention of skills in the VR group was significantly better than that in the scenario simulation group. It can be inferred that using VR for CPR training can delay the decline of training memory and maintain the retention time of trainees for theoretical knowledge and first aid skills. Sun Huafei integrates virtual simulation classes into Taekwondo teaching. Through interacting with the virtual environment, students form correct knowledge and skill models in their brains, which can effectively help them master motor skills, overcome psychological barriers, and form self-directed learning habits, effectively overcoming psychological barriers in practical combat. (Sun, 2019). Based on virtual reality technology, the experimental teaching software of nursing science is independently developed, the experimental teaching platform of virtual simulation of nursing science is constructed. the experimental reaching system of " Real person training + model assistant + virtual solidification" is created. and a diversified practical teaching mode oriented by post competency is formed. This platform avoids the ethics of medical experimental reaching,

realizes the standardization of nursing technical training, improves the interaction, situation and immersion of experimental teaching, and is conducive to cultivating students' practical and innovative ability. (Wang, Yan, Cai, Luo, Chen & Zhao,2019). This article reviews the current application status of virtual simulation technology in basic nursing, critical care nursing, and specialized nursing training teaching. It analyzes the challenges faced by nursing virtual simulation experiment teaching and proposes sustainable development strategies for nursing virtual simulation experiment teaching, in order to provide reference for the reform and innovation of nursing training teaching in higher education institutions and the construction of scientific and efficient new models of nursing training teaching.

In fact, the use of virtual simulation technology to better combine clinical and practice. These variables are maximized when students begin placements because sometimes, they are rarely exposed to critical situations before graduation. Usually, when there is no good correlation between theory and practice, and therefore no critical reasoning develops, students may develop negative feelings about clinical practice, namely, insecurity, frustration, guilt, helplessness, sadness, or devaluation. (Wang, 2011; Gao, Liu, Huang & Huang, 2016)

Therefore, compared with traditional first aid training, virtual simulation system has obvious advantages. First, it addresses the limitations of real-world scenarios, allowing students to be exposed to a wider variety of first aid situations and increasing learning opportunities. Secondly, the virtual simulation system can provide a safe practice environment, avoid possible accidents between patients and students due to improper operation, and reduce students' anxiety. In addition, the

intelligent guidance function can also help students master first aid skills faster. Through the use of the virtual simulation system, students are able to better master first aid knowledge and CPR skills, improve emergency handling ability, and prepare for future emergencies.

2.2 Theory or Principle Used

2.2.1 The Constructivist Theory

This theory originated in the 1930s and is known as a revolution in contemporary educational psychology as a new cognitive theory. It developed based on the ideas of Piaget, Vygotsky, and others, firmly believing that knowledge is the result of active construction by cognitive subjects, learning is a process of meaning construction by cognitive subjects, teaching is a creative activity that cultivates student subjectivity and is a process of guiding students to grow new knowledge experiences from existing knowledge experiences. Teachers should be promoters, collaborators, and guides for students to actively construct meaning. The constructivist learning theory proposes new ideas and perspectives on knowledge, learning, and teaching, which better illustrates the cognitive laws of the human learning process and is an important theoretical basis for contemporary teaching reform. A scientific and objective understanding of this new methodology has important practical value for teaching practice. (Homas et al., 2014)

This theory aims to emphasize the subjectivity of students, as learning is not a one-way transmission process from teachers to students, but rather students themselves should actively construct knowledge. The value of media is not to help teachers spread knowledge, but rather a tool for creating situations and collaborative exploration. Therefore,

integrating virtual simulation teaching systems into traditional teaching aims to stimulate students' subjective initiative in learning. Through meaningful and purposeful problem scenarios, students can continuously discover and solve problems, learn knowledge related to the problems being explored, and develop problem-solving skills and self-learning abilities. In other words, it is to encourage students to actively participate and experience virtual simulation systems, through these activities, stimulate learning interest and thirst for knowledge, and form a conscious and proactive learning approach. Constructivism believes that learning is not simply imparting indirect knowledge to students, but should promote their autonomous construction of knowledge based on their different knowledge backgrounds. In the process of teaching, teachers should purposefully guide students to explore and learn independently, actively collect, analyze, summarize, verify knowledge, and finally discuss and display learning results. Teachers should provide feedback to achieve the ultimate goal of learning, which is meaningful construction. Scenario cognition theory.

2.2.2 Scenario cognition theory

It originates from foreign educational circles. According to the research of foreign scholars on situational cognition theory, it is more suitable to translate "situated cognition" into "situational cognition". As for the Chinese meaning of "situation" and "scene", different dictionaries have different meanings. According to the definition of Webster's Dictionary, context means "the whole situation, context, or environment related to an event." In other words, context refers to the social environment in which a person takes an action, which is the specific

condition of people's social behavior; and the situation refers to the situation and the scene. (Wang, 2008).

Emphasize the interaction between "knowledge" and "line", where knowledge is not a mapping of independent entities, but a situational application. The virtual simulation teaching system is a modern teaching method based on computer technology and virtual reality technology. It integrates knowledge into virtual situations by simulating real environments, allowing students to practice in the virtual world, improving their understanding ability, increasing their interest in learning, and overcoming psychological fears in certain scenarios. So as to better combine theoretical knowledge with practical operations, and improve students' understanding, practical ability, and innovation ability. Research has shown that it is beneficial for enhancing students' interest in learning, and plays an important role in cultivating their comprehensive abilities and forming a knowledge structure that combines theory and practice.

2.2.3 Do middle school theory

“Do middle school theory” by American educator John Dewey. Dewey believes that " all learning is a by-product of action, so teachers should encourage students to think and learn knowledge. In teaching, teachers should regard students as concrete and active people, and respect their personality and life. In class, teachers should follow the principle of discovery and inquiry, do everything possible to arouse students' interest in learning knowledge, discovery and inquiry of knowledge, and effectively combine some selective extracurricular activities and creative social practice activities, to form an open and multidimensional extracurricular activity system, to provide students with discovery, Free time and space to try, exercise, and express your talents and talents.

The virtual simulation teaching system is used for education in a gamified way, making the traditional teaching process rich, interesting, and bringing joy, greatly stimulating students' interest in learning. It can also practice without restrictions on time, venue, frequency, etc, providing students with a free and multi-dimensional extracurricular practice space.

Therefore, the virtual simulation system is a safe, low-cost, and highly effective teaching method for emergency nursing courses. How to carry out the construction and application of virtual simulation system teaching in emergency nursing discipline has become an important research topic in education and teaching in our school.

2.2.4 Current status of emergency nursing teaching:

The current situation of emergency nursing teaching: Emergency nursing is one of the core courses in the nursing profession, with strong operability, practicality, and comprehensiveness. It requires every nursing student to have a complete theoretical foundation and solid first-aid skills. The former can be completed through students' daily learning, while the latter requires students to undergo comprehensive repetitive operation training to meet the requirements, which is often difficult to achieve. The main reason is the lack of teaching conditions, such as time and space, and limitations in model equipment. Virtual simulation systems can better solve the limitations in nursing teaching time, location, equipment, clinical cases, and other aspects. It can be used for college students to practice repeatedly, thus forging excellent emergency nursing skills. In clinical practice, it is necessary to be calm and composed in case of emergencies, and more importantly, to have emergency rescue ability, clinical adaptability, and even the ability to handle independently.

Because nurses working in the emergency room not only work in patient care, but also participate in their treatment, coordinate and lead nursing staff, and perform bureaucratic functions. (Wehbe, 2001) In this way, after entering the clinical internship, students can adapt well to the fast-paced environment of clinical first aid, improve the success rate of rescue, patient satisfaction, and employer satisfaction, give students a sense of belonging, happiness, and achievement, and thus grow more quickly into qualified and excellent nursing staff.

So, many key undergraduate nursing colleges and universities in China have actively used virtual simulation in all kinds of teaching, especially in the strong comprehensive disciplines, such as surgical nursing, emergency nursing, and so on. Even by themselves building and developing some situational, vivid, interactive virtual systems, can give students a new learning environment, and greatly improve the enthusiasm and initiative of learning. (Artero, 2024) The virtual clinical scene can not only make up for the shortage of teaching conditions, but also break through the limitation of time and space, and better solve the limitation of nursing teaching time, place, equipment, clinical cases, and so on. In addition, repeated training in the virtual environment can avoid risks brought about by real operations, reduce trainees' psychological pressure, and build up certain professional confidence (Hubail, Mondal, Al Jabir, & Patel, 2022).

It can promote the development of practical teaching to the network, intelligent and interactive direction, and it also plays a positive role in improving the teaching level and stimulating students' interest in learning. Deepen the student's rights. The virtual simulation system makes the operation of the emergency nursing discipline more vivid and

easy to understand and put into practice. Breaking the traditional nursing training is limited by the space and equipment- -students can only practice in a limited space, at a fixed time. The virtual simulation software can enable students to carry out diversified nursing operations and skills training in the simulated practice environment anytime and anywhere, make good use of the fragmented time, consolidate the students 'theoretical knowledge and further deepen the details of the operation, and greatly improve the students' operational skills. (Wu, Zhou, Li, Ke & Zhang, 2016). Therefore, after the previous domestic and foreign background checks, and focus on the effect of other universities to apply virtual simulation to teaching, I think it is very necessary to do this research. Therefore, I think virtual simulation teaching will be introduced as an intervention means in the first aid course in our school to observe the impact and changes of the virtual simulation teaching method on students' operation skills, theoretical knowledge, and overall class satisfaction in the first aid course.

2.2.5 Specific implementation methods:

In traditional teaching methods, students majoring in demonstration emergency nursing take the teacher as the main body, explaining operations while repeatedly correcting errors. Especially in each group's round of error correction, students also feel that it is too abstract and not specific, and their understanding and absorption are not very good. Even after a class, many knowledge and operation processes are chaotic, and the learning effect is poor. Therefore, students lack interest in this course and are afraid of encountering difficulties. Some students only focus on rote memorization, resulting in insufficient logical thinking ability, weak sense of role involvement, teamwork ability,

communication ability, etc. The application of a virtual simulation teaching system can serve as a preview for the corresponding classroom, including integrating teaching knowledge through video and audio and then dividing complex operations into multiple virtual operation steps. In the form of answers and knowledge assessment points, the learning situation of students and the proportion of errors in answers are summarized in the teacher's background, which plays a role in urging students to preview before class. Usually in the preview stage, students will answer some of the questions correctly because they have already learned theoretical knowledge. This is also a review and consolidation of the theoretical knowledge in the first two sections. However, it involves more content that has not been learned, so students will constantly make mistakes when choosing. They must keep trying until they choose the correct answer before entering the next stage. This can give students a detailed understanding of the knowledge they are learning today, and thus make an overall learning plan. Some students are even aroused with great desire to win or lose, and through repeated practice in the virtual system, they finally succeed in completing all the knowledge points and questions in the virtual simulation system within the prescribed time, and all of them are correct. The teaching content of this section feels inevitable, I will bring the questions sorted out in the system to the classroom and actively ask questions, breaking through myself. The sovereignty of the classroom is no longer in the hands of the teacher but has been returned to the hands of the students, thereby driving the learning atmosphere of the entire class, so the vast majority of students can actively participate. When the teacher demonstrates and explains again, students will not feel that the whole process is too long, there are many knowledge points to

remember, and they will not have difficulty or thoughts of not wanting to learn or participate. At this point, students are familiar with the entire process of operation, and they will now be more eager for the teacher to demonstrate and explain, and to check and fill in their own gaps. Students will be better able to self-break through their weak links. Leadership is not just in the hands of teachers both teachers and students can become the masters of the classroom.

Moreover, teachers can understand the mastery of students' knowledge points before formal classes. For students who are prone to errors and have poor mastery, they can focus on explaining them. Then, when practicing in groups, they can use the operating frequency prompt sound of the virtual system to accompany students in their operations, and can also engage in human-machine interaction at any time to ensure the smooth and accurate operation process of students. Of course, the teachers are also patrolling and guiding, which avoids the situation where 1-2 teachers face insufficient guidance from 50 students, lack attention to students, and inability to correct mistakes in a timely manner, and can better improve the quality of the classroom. The most important thing is that after class, the virtual simulation system is not limited by time and location (most schools have a shortage of models in their training rooms, which cannot meet the requirements of students for self-study classes, rest, and other spare time for operational exercises). Students can log in to complete virtual simulation experiments at any time using fragmented time, and teachers can also check the results of students' exercises at any time. Based on the number of exercises and operational results, students can add points to their usual grades. Of course, students can practice multiple times and choose the most satisfactory grades to submit to the

online platform, which not only consolidates their knowledge points but also promotes their learning enthusiasm.

After applying the emergency nursing virtual simulation system to teaching, I found that its simulated and created scenes were highly realistic, even stimulating, and causing panic among students, but not dangerous. It can even simulate different types of injured individuals, enhancing students' sense of tension, participation, and crisis. Conducting practical exercises in virtual scenes, virtual reality technology also enhances the fun of learning and stimulates the enthusiasm of students. Creating an immersive experience for students, providing them with more colors, dimensions, and other sensory organs, is also to some extent a way to exercise their imagination, sensory ability, practical ability, psychological quality, and other aspects. This will encourage students to actively think, break through various limitations in traditional teaching models, exercise students' more comprehensive problem-solving abilities, greatly enhance their learning interest, Enhance students' adaptability and psychological quality, Students show a thirst for knowledge in class, and show a satisfactory attitude towards the use of virtual simulation system.

At the same time, the system enables students to learn independently before and after class, as well as a formative evaluation system; the content and scenes within the system can also be edited and modified according to the ideas of the user teacher. Teachers can view the formative evaluation of the experimental process, statistics of experimental teaching activities, query of experimental results, and interactive communication between teachers and students at any time. It can be trained, practiced, and assessed at any time regardless of time or location. Enable students to undergo repeated training in various nursing

operations anytime and anywhere without the need for teacher guidance. For nursing colleges like ours, it not only reduces teaching pressure but also improves teaching quality better.

2.2.6 CPR teaching: framework of experimental and control groups

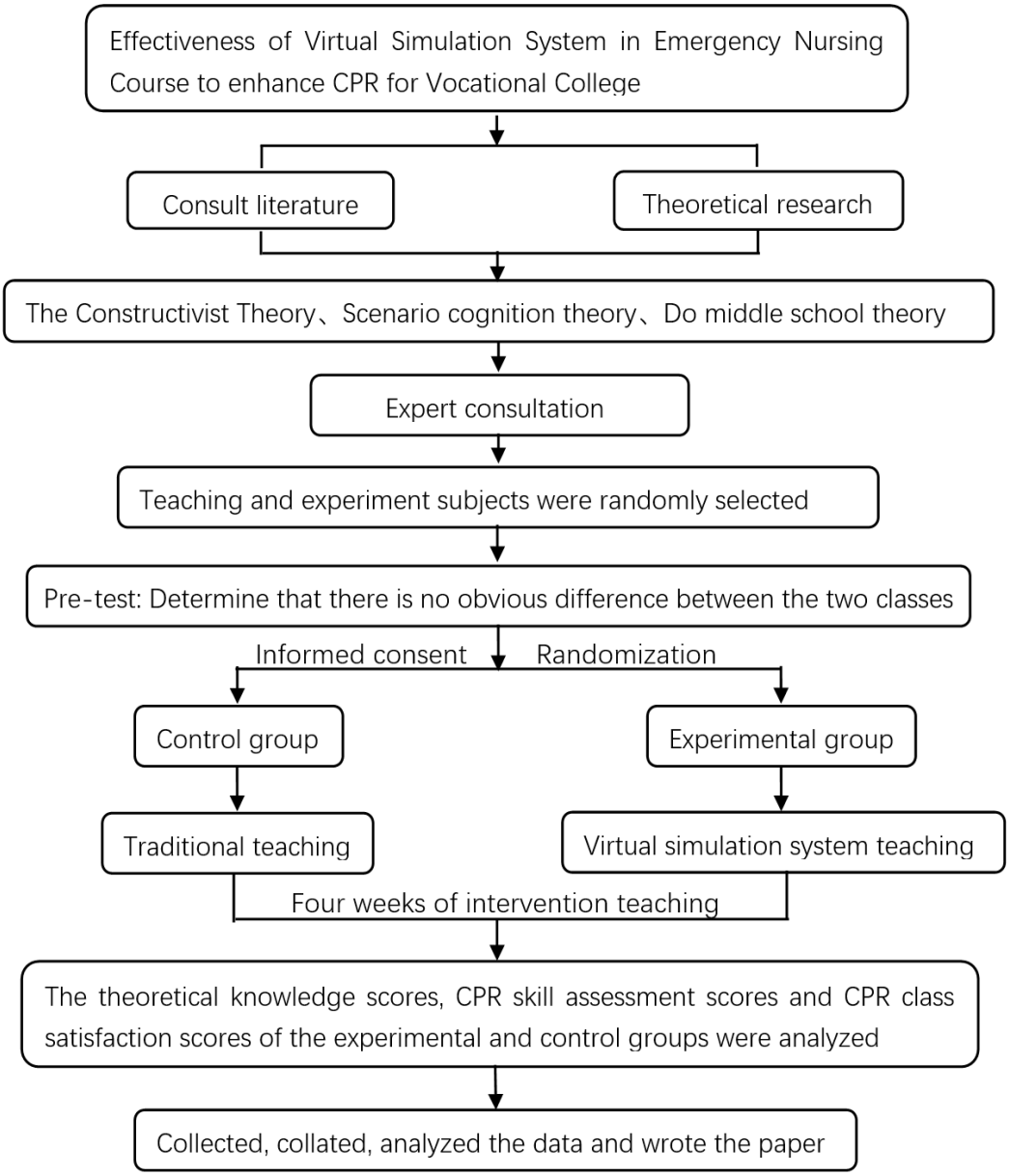


Figure 1 Research technology roadmap

CHAPTER III
RESEARCH METHODS

3.1 Research Designs

A cluster randomized controlled trial was used to randomly select two classes with a total of 100 students from the 750 students in 14 classes of grade 2022 in Sichuan Health Rehabilitation Vocational College, where I worked. Students in both classes had never been exposed to a virtual simulation system and were then randomly assigned to an experimental or control group.

Firstly, a pre-test was conducted on these two (pre-test refers to the test before teaching). By analyzing the data generated from the pre-test, teachers can fully understand students' cognitive status, accurately understand their overall situation, and better analyze the two classes. Secondly, after clarifying the research objectives (specific, clear research objectives can guide subsequent experiments), two classes will be taught according to the clear teaching objectives, and post tests will be conducted simultaneously. Thirdly, a cardiopulmonary resuscitation skill test will be conducted for both classes, and students' scores will be strictly evaluated according to the cardiopulmonary resuscitation scoring table, which can reflect their skill mastery and comprehensive quality. Fourthly, conduct a satisfaction questionnaire survey on cardiopulmonary resuscitation classes. The results of classroom satisfaction can reflect the quality of teaching, student participation, learning interest, etc. Finally, based on the above aspects, compare the teaching effectiveness of the experimental group (virtual simulation system teaching method) with the control group (traditional teaching method).

Specifically, the author of this chapter designed a survey on the application of virtual simulation system in cardiopulmonary resuscitation, mainly conducting pre-test, post test, skill assessment, and classroom effectiveness questionnaire survey. In order to understand individual differences and confirm that there is not much difference between the two classes, a pre-test of the participants' learning ability is conducted before conducting the experiment to ensure the accuracy and effectiveness of the experiment. The questionnaire survey method includes general information survey forms, course content evaluation forms (items), course method evaluation forms (items), etc. In order to ensure the authenticity and reliability of the results, anonymous methods are used. Finally, the scores are statistically analyzed to explore whether virtual simulation experiment teaching has a positive impact on students' learning interest, experimental learning ability, and immediate learning performance in the discipline of emergency nursing, and to analyze the effectiveness of virtual simulation experiment application in emergency nursing experimental teaching. Finally, the survey results were discussed.

The specific implementation plan is as follows: 3.1.1 Determine the teaching objectives as follows:

The first teaching objective is to master the basic concepts of cardiac arrest, cardiopulmonary resuscitation, basic life support, advanced life support, and extended life support, as well as the clinical manifestations of cardiac arrest and the skills and operations of cardiopulmonary resuscitation.

The second teaching objective is to become familiar with the causes and types of cardiac arrest.

The third teaching objective is to understand the latest developments in cardiac arrest and cardiopulmonary resuscitation.

The fourth teaching objective: to be able to timely detect the manifestations of cardiac arrest and proficiently implement cardiopulmonary resuscitation; Master the operational process of basic life support and the indicators of effective recovery;

The fifth teaching objective is to establish the first aid awareness and teamwork awareness of "time is life", and the humanitarian spirit of saving lives and helping the injured.

3.1.2 Develop teaching methods that are suitable for two classes based on teaching objectives:

3.1.2.1 Experimental group (traditional teaching method plus virtual simulation teaching method), specifically: after the teacher explains and demonstrates, use virtual simulation experiments to create various real scene simulations using virtual simulation platforms, combining 3D modeling, animation simulation, human-computer interaction, VR projection, etc., and can provide tasks and challenges similar to actual clinical practice. Students can participate in virtual simulation experiments through ports such as mobile phones, tablets, and computers, and teachers can view students' practice progress in real time to obtain timely feedback. Then students engage in role-playing based on virtual scenes, such as nurses, doctors, patients, etc., in virtual simulation experiments. Through role-playing, students can simulate real clinical scenarios and exercise their emergency response, communication, and teamwork skills. Finally, students' practical operation exercises are not only within virtual simulation experiments, but also require practical operation exercises. Teachers will provide relevant equipment and

materials, such as CPR simulators, gauze, flashlights, etc. And guide students in the operation training of cardiopulmonary resuscitation skills in a cyclic manner. In the last 10 minutes of the class, please have one student demonstrate the operation and everyone participate in commenting and correcting errors.

3.1.2.2 The control group adopts traditional teaching methods: specifically, after the teacher explains and demonstrates, they practice in groups, the teacher inspects and guides error correction, and finally consolidates the new lesson (classmates demonstrate again, everyone corrects) and summarizes

3.1.3 Teaching evaluation method: In order to objectively evaluate students' learning effectiveness and the degree of achieving teaching goals, I plan to use the following evaluation method:

1) Theoretical testing, including pre-test and post test. During the evaluation process, we will organize two groups of students to participate in closed book paper exams simultaneously. This exam includes the same test paper, with a total of 100 points and a duration of 90 minutes. Pre -test design (See Appendix 4): The exam content is closely related to the teaching objectives and can better reflect students' knowledge level. Post test design (See Appendix 5): Post test design focuses more on examining students' understanding and application of knowledge, not only observing their learning outcomes, but also paying attention to their learning process and methods. In summary, both pre-test and post test questions were selected from standardized test questions in the school's question bank over the years, with a total of 53 questions and five types of questions, totaling 100 points. After rigorous discussions

among five experts from the school, it was unanimously agreed that the knowledge points covered a wide range and met the testing requirements.

2）Practical operation skills assessment (See Appendix 6): Students need to undergo a practical operation skills assessment during the fourth class, and their scores will be strictly evaluated according to the cardiopulmonary resuscitation scoring table. Based on their operation skills and safety awareness, corresponding evaluations and grades will be given. Our hospital's cardiopulmonary resuscitation assessment scoring table is strictly formulated in accordance with the national cardiopulmonary resuscitation assessment guidelines. Subject teachers periodically update and improve according to the AHA cardiopulmonary resuscitation guidelines, with a maximum score of 100 points. Five experts unanimously agree that it can effectively evaluate students' comprehensive qualities such as mastery of skills and emergency response abilities.

3）Learning Feedback Questionnaire (See Appendix 7) : Design a learning survey feedback questionnaire on classroom satisfaction with cardiopulmonary resuscitation, using a 5-point linker scale design, with 1=strongly disagree, 2=disagree, 3=average, 4=agree, 5=strongly agree. The higher the score, the better the response effect. Initially, 25 questions were drafted and 5 experts from the nursing school were invited to score the research questions and options using Objective Consistency (IOC) developed by Povinelli and Hambleton (1976). After discussion, screening, and modification by the five experts from the school, 20 questions with high rationality, comprehensiveness, and diversity were retained for evaluation, mainly including satisfaction evaluation of teaching projects (including teachers, teaching methods,

teaching scenarios, student interests, comprehensive qualities, etc.) and improvement suggestions.

4) Teaching Plan Arrangement In order to ensure the smooth progress of the teaching project, I have formulated the following teaching plan arrangement: Teaching Time Arrangement: The project has a total of 8 class hours, each class hour is 40 minutes, the first class is 2 class hours, and the theoretical class. The second class of 2 hours is mainly for teachers to demonstrate and students to practice. The third class lasts for 2 hours, mainly for students to practice and for teachers to inspect and guide. The fourth class lasts for 2 hours, and skill assessment and satisfaction questionnaire survey will be conducted.

3.1.5. Preparation of Teaching Resources In order to support the development of teaching projects, the following teaching resources need to be prepared: 1）Virtual Simulation System Platform: A platform suitable for virtual simulation experiments in emergency nursing has been selected, which contains rich emergency knowledge, highly simulated scenarios, and challenging tasks. 2）Practical operation equipment and materials: Provided the necessary equipment and materials for basic skills such as cardiopulmonary resuscitation simulators, gauze, respiratory membranes, etc.3）Case analysis data: Collect information on the clinical manifestations, diagnosis, and treatment plans of some common diseases for students to discuss, analyze, and role play in groups.

During the teaching process, both classes use the same textbooks, class schedule, learning tasks, and testing tools. All teaching practices are taught by the author, ensuring that the number of groups and members in each class is consistent, and that the teaching process, teaching style,

blackboard writing, and PPT are basically consistent, with maximum control over irrelevant variables in educational practice experiments.

3.2 Population

The visiting population of this study was the second-year nursing university student of Sichuan Health and Rehabilitation Vocational College, a junior medical college in Zigong City, Sichuan Province, China. The grade has 15 classes with 50 people each, for a total of 750 people. Participated in the experiment in total: 100 students.

3.3 Sampling Designs

The survey subjects of the study were all selected from the author's school (Sichuan Health and Rehabilitation Vocational College), and two parallel classes in the second year of university were randomly selected, and no students in the class had learned (been exposed to) virtual simulation teaching related learning. 50 students from Class 1 will serve as the control group, and 50 students from Class 2 will serve as the experimental group. In the application of virtual simulation systems, the experimental group receives virtual assisted teaching, while the control group receives routine teaching. The recruited participants include two groups. The researchers approached each group of students. We provided oral and written explanations to two groups of people regarding the purpose of this study. Students were informed that participation is voluntary and they can choose not to participate or withdraw from the study at any time. Finally, a questionnaire survey will be conducted on a class by class basis, with the testing environment being the daily life and learning environment of the participants. The impact on the participants

can be ignored, and the survey time will be controlled within 5 minutes. The content of each survey questionnaire is consistent, using a unified scoring standard. The author sends the questionnaire to each student, allowing them to freely choose the answers they want. No one else can interfere, and communication between students is also prohibited to ensure that each questionnaire reflects the student's personal attitude. After all students complete their answers, the author collects the questionnaire.

3.4 Instrument

3.4.1 Teaching Process Design

This study uses two teaching methods, namely, a virtual simulation system and a traditional teaching method.

(On the premise of controlling other teaching conditions, the teaching situation of the experimental class and the control class is compared.)

Teaching process design of experimental group virtual simulation system (method 1) and traditional teaching process design of control group (method 2), summarizing the respective procedures, As shown in the Table 1:

Table 1 Teaching process design of experimental group virtual simulation system and traditional teaching process design of control group

Virtual simulation system teaching process design (Experimental Group) (Method 1)	**Traditional teaching process design (Control Group) (Method 2)**
1. According to the teaching content of the course, teachers need to be prepared before class, select different virtual scenes, and through different virtual systems, teachers should operate and display, and students can learn knowledge comprehensively.	1. The teacher demonstrated and the students watched the study.
2. Students 'independent practice and feedback: Students are randomly formed into a study group of 5-6 students to conduct virtual simulation project practice, and the system feedback students' operation in real time to help students correct in time.	2. Students will practice in groups, and teachers will inspect and guide them.
3. Teachers inspect and guide students, and check students 'exercises (grades, duration, error points, etc.) through the virtual simulation system, and conduct targeted correction exercises to improve students' practical operation ability.	3. Select one student for operation, and the rest of the students watch and comment on error correction, and teachers comment.
4. Group discussion and sharing, sharing of successful cases and lessons of failures.(The virtual simulation system makes full use of information technology to promote students to find problems, analyze problems and solve problems, and give full play to their subjective initiative under the guidance of virtual cases)	4. Assign your homework after class。
5. Finally, we need to evaluate the learning results of this class based on the report of the virtual simulation system. The content of evaluation generally includes: process evaluation of virtual simulation system, teachers 'evaluation of students, students' self-evaluation and mutual evaluation.	
6. Assign your homework after class。	

3.4.2 Pre-test: Before the experimental research begins, in order to understand the initial situation of the two groups of students (experimental group and control group) and whether they meet the

experimental research design, a test paper is developed based on the teaching objectives and content. There are five types of test questions, including fill in the blank questions, multiple-choice questions, noun explanation questions, simple questions, case analysis questions, with a wide coverage of recognition points and reasonable difficulty allocation, which can comprehensively and accurately reflect students' mastery of the knowledge field.

3.4.3 Post-test: It mainly evaluates the learning situation of students after teaching experiments. In order to test whether they have achieved my expected goals, the content of the post test paper closely follows the teaching objectives and experimental purposes. There are a total of 5 types of questions in the same test, including fill in the blank questions, multiple-choice questions, word explanation questions, simple questions, and case analysis questions. However, the difficulty of the post test questions is higher than that of the pre-test, which makes it easier to evaluate the overall situation of the two groups of students.

3.4.4 CPR Skill assessment: Experimental operation skill assessment emphasizes the combination of theory and practice. Through assessment, students can be guided to apply theoretical knowledge to practical operations, deepen their understanding and mastery of theoretical knowledge, and cultivate their experimental operation skills and scientific literacy. In order to comprehensively evaluate students' mastery in knowledge understanding, experimental operation, instrument use, and other aspects. I am assessed through the 'Assessment Score for Cardiopulmonary Resuscitation Skills', which is developed based on the national emergency response assessment in 2023. Our teaching and research department has compiled this score based on the actual situation

of our hospital and updated and improved it according to the 2024 AHA Cardiopulmonary Resuscitation Guidelines, with a maximum score of 100 points. This can comprehensively understand whether students have mastered the basic skills and methods of the experiment, and whether they have combined theoretical knowledge with practical operations, so as to better apply it to work and daily life.

3.4.5 Satisfaction Survey Questionnaire for Cardiopulmonary Resuscitation Classroom: Through the satisfaction survey questionnaire for students in the cardiopulmonary resuscitation classroom, we can understand their overall feelings and feedback on the quality of classroom teaching, so that teachers can improve teaching methods and content based on this, and enhance teaching quality. This questionnaire is mainly distributed through Wenjuanxing website, highlighting students' subjectivity, with a moderate number of questions and a reasonable structure, This can provide a better understanding of the overall satisfaction of the experimental group students with the virtual simulation system class, so as to promote the transformation of teachers' teaching methods.

3.5 Instrument structure and quality

1. Invite 5 experts from the School of Nursing to use the Objective Consistency (IOC) developed by Rovinelli and Hambleton (1976) to score the questions and options of the satisfaction questionnaire survey on cardiopulmonary resuscitation classrooms, as well as the pre-test, post test, and cardiopulmonary resuscitation skill assessment scoring table.

There are 5 experts, 4 from the school of nursing and 1 from the hospital clinical nursing. Expert standard: have professional knowledge and experience in the fields of educational research, nursing teaching, clinical nursing, psychological education, teaching methods, and other fields, and have relevant medical professional skill level certificates and clinical nursing work experience. Participate in the content review and evaluation of the questionnaire, and make suggestions for modifying the questionnaire. Here are five experts in the field of nursing education and clinical nursing work:

1.1) Pan Yan: A full-time teacher, and associate professor of Sichuan Vocational College of Health and Rehabilitation, serving as the director of the teaching and Research Section of Surgery and First Aid. His main research direction is surgical clinical nursing, and he has many years of clinical nursing experience and remarkable research results.

1.2) Huang Yongxian: Deputy Director nurse of Zigong First People's Hospital, and also the director of the Nursing Training Center of Sichuan Health and Rehabilitation Vocational College. His main research interests include emergency nursing, clinical nursing, and nursing education, and he has rich experience in clinical nursing and teaching.

1.3) CAI Li: Full-time teacher and associate professor of The School of Nursing, Sichuan Health and Rehabilitation Vocational College. His main research interests include infectious disease nursing and nursing education, with rich clinical nursing experience and educational background.

1.4) Zheng Guoyan: A full-time teacher and associate professor of Sichuan Health and Rehabilitation Vocational College. Her research

interests cover chronic disease specialty nursing, nursing education, and clinical nursing. She is a senior expert in nursing education.

1.5) Wang Huadong: Sichuan health rehabilitation vocational college, nursing college full-time teacher, associate professor, and national secondary psychological consultant, he has rich research experience in the field of psychology and teaching experience, research direction covers mental health education, development, and education psychology, nursing education, nursing ethics courses, especially good at combining psychology and teaching, provide teachers and students with mental health guidance and support, for high-quality teaching power.

3.5.1 IOC

It was submitted to 5 experts in the field to measure and screen the effectiveness of content based on the Project Objective Consistency Index (IOC) developed by Rovinelli and Hambleton (1976) to achieve effectiveness. The validity of the scoring criteria is determined using the following formula (IOC): , where IOC represents the acceptance index, ∑ R represents the sum of experts, and N equals the number of experts. If the average value obtained is within the range of 0.50 to 1.00, it indicates that the test paper is considered valid.

3.5.2 IOC Result

3.5.2.1There were 25 questions in the preliminary proposed student satisfaction questionnaire. According to the IOC results of CPR class student satisfaction survey (see Appendix 7), after discussion and modification by 5 experts in our school, questions 1,6,17,18 and 20 were deleted, and 20 multiple-choice questions were retained. The student satisfaction questionnaire in CPR class was finally determined, as shown in Supplementary Table 7. Overall, the questionnaire has a moderate

number of questions, a rich content and a reasonable structure. A pre-survey was conducted before the formal investigation and the confidence was tested with the clonal Bach coefficient (Cronbach's Alpha). The questionnaire was designed using a 5 Linkert scale. A total of 20 questions were included. We conclude that Krenbach α = 0.869 has a coefficient between 0.766 and 0.953, indicating that the questionnaire has a reasonable structure, highly stable, and excellent reliability can be used for formal data collection.

3.5.2.2 According to the pre-test and post test investigation of IOC results (see Appendix4 and 5 for details). The pre-test and post test questions are selected from standardized test questions in the school's question bank over the years. After strict discussions among five experts in the school, it is unanimously agreed that the knowledge points cover a wide range and can comprehensively and objectively evaluate students' knowledge mastery, thinking ability, and application ability. It can also effectively evaluate students' mastery of knowledge, understanding ability, and ability to analyze and solve problems.

3.5.2.3 According to the IOC results of the cardiopulmonary resuscitation operation skill assessment standard (see Appendix6 for details), this scoring standard is formulated based on the national emergency response assessment in 2023. Our teaching and research department has compiled this scoring standard in combination with the actual situation of our hospital, and updated and improved it according to the 2024 AHA cardiopulmonary resuscitation guidelines, with a maximum score of 100 points. The five experts unanimously agree that it can effectively evaluate students' comprehensive qualities such as mastery of skills and emergency response abilities.

3.5.3Validity and Reliability

This study used objective consistency (IOC) developed by Rovinelli and Hambleton (1976) to create a questionnaire through literature review. Firstly, based on literature databases such as CNKI, Wanfang, and Vep, the system searches for literature related to the theme of "Application of Virtual Simulation Systems in Emergency Nursing" from 2013 to 2023. Through literature review and analysis, a preliminary student satisfaction survey questionnaire has been developed for this topic. In order to ensure the accuracy and validity of the relevant data and the reliability of the questionnaire used, a pre-survey was conducted, and Cronbach's alpha=0.869 was obtained, indicating that the questionnaire structure is reasonable, highly stable, and has excellent reliability, which can be used for formal data collection.

In the first stage of the course, the course plan and study test (pretest) are made according to the teaching objectives. In the second stage of implementation, the teaching test is carried out after the learning process to timely grasp the students' learning situation. The collection and analysis of classroom teaching effect data were described before and after the third stage of implementation. For all of the data collected and analyzed in stage 4, the researchers summarized and concluded. To ensure the accuracy and validity of the relevant data, the obtained data were analyzed and processed using Excel and SPSS software. The purpose is to understand the students' theoretical knowledge, operational skills, and classroom satisfaction with the subject of emergency nursing.

This study collected data through methods such as student classroom satisfaction questionnaire survey, pre-test, post test, skill assessment. All data complement and confirm each other to ensure the

authenticity and comprehensiveness of the collected data. Meanwhile, I will use SPSS data analysis software to process the data in the later stage. In addition, I will also use existing research results to cite and discuss the findings under investigation, which is beneficial for maintaining the authenticity and validity of the data. However, this study takes vocational nursing colleges as a case study, and its breadth also requires more in-depth research. Therefore, it should be noted that there is relatively little research and curriculum design on virtual simulation teaching in China, and there is a lack of experience. In the teaching process, it is necessary to fully respect the subject status of students, understand the importance of practical operations in learning, pay attention to the clinical practice awareness of virtual integration, and improve clinical practice ability and adaptability.

3.6 Data Analysis

First, researchers submitted an application for ethical review to Mahasarakham University before starting data collection. Application materials usually include a research plan, informed consent form template, participant recruitment information, etc. These materials should elaborate on the research purpose, methods, expected risks, and protective measures to ensure that the rights and interests of participants are fully protected.

Then, experts from different fields from Mahasarakham University will carefully review the submitted application to ensure the scientificity, rationality, and ethics of the research and pay special attention to the potential risks of the research to participants, the adequacy of informed consent, data security, and confidentiality, etc.

Finally, the author has obtained the certificate of the ethics committee of Mahasarakham University. (See Appendix 1) Of course, after obtaining the certificate from the ethics committee, researchers should strictly abide by the ethical guidelines and principles for data collection and analysis. This includes ensuring the informed consent of participants, minimizing potential risks, and protecting data security and privacy. In short, the author will protect the rights and interests of the participants, improve the scientificity and credibility of the research, and lay a solid foundation for the smooth publication of the paper.

3.6.1 Questionnaire collection

3.6.2 Pre survey:

A questionnaire was randomly selected from one class of students in the same grade and major. A total of 42 questionnaires were collected, and 7 invalid questionnaires (out of 10) were excluded. The remaining 35 qualified questionnaires were analyzed for reliability validity using SPSS software. The alpha value of Cronbach's alpha is 0.869, with coefficients ranging from 0.766 to 0.953, indicating that the questionnaire structure is reasonable, highly stable, and can be used for formal data collection.

3.6.3 Questionnaire distribution and recovery:

Explain the purpose and meaning of the research to the students again. In order to ensure the authenticity of the content of each questionnaire, the QR code of the questionnaire is sent to the students' class group, so that they can freely choose the answers they want, others cannot interfere, and communication between students is prohibited, so as to ensure that each questionnaire can reflect the personal attitude of the students. After the questionnaire is completed, students can raise their hand and check whether it is submitted.

3.6.4 After the collection of questionnaires

I will check the questionnaires, eliminate the missing questionnaire and the questionnaires with the same answers to each option, and register and sort the questionnaires that meet the requirements.

3.6.5 A test of theoretical knowledge

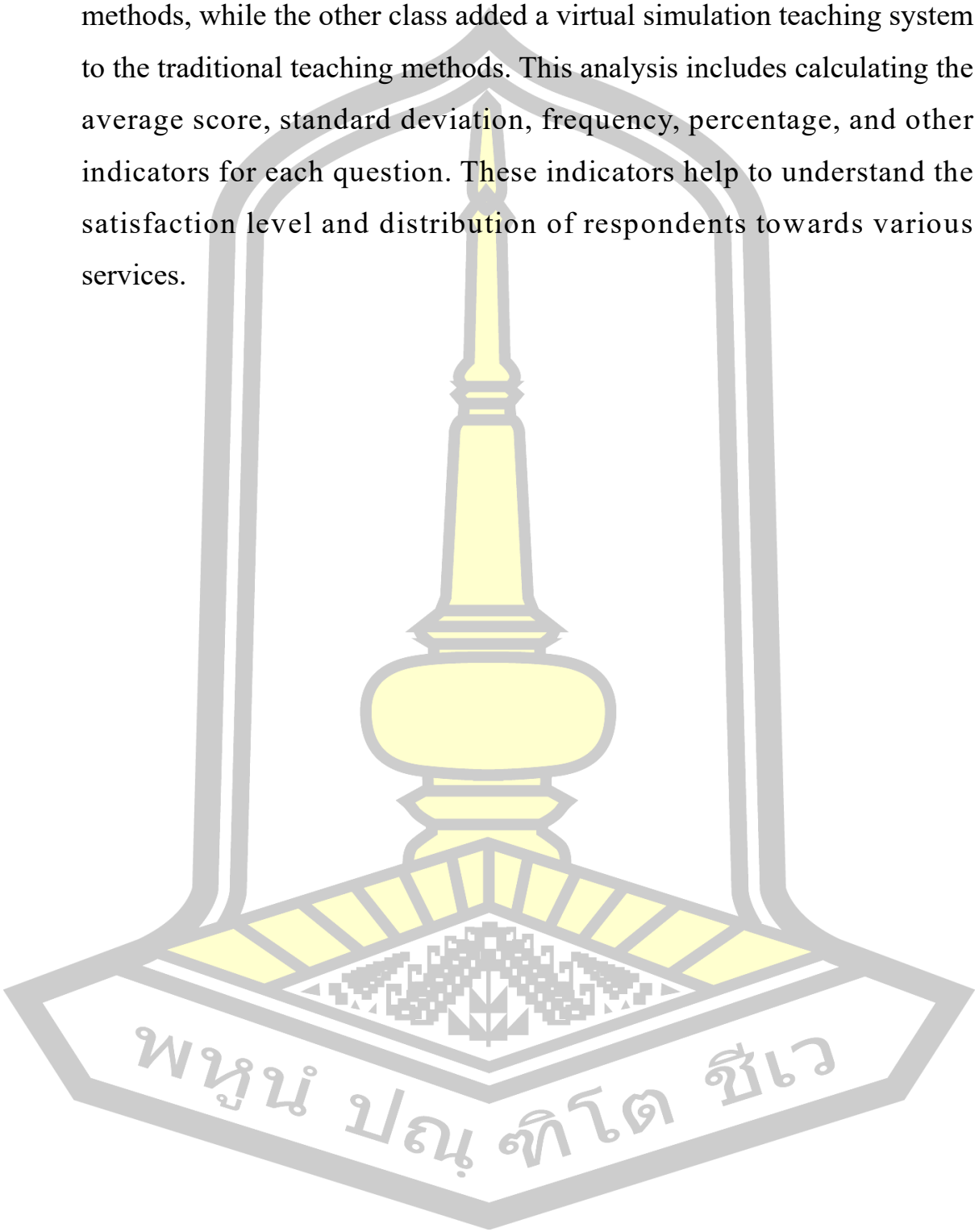
In order to evaluate students' mastery of the theoretical knowledge of cardiopulmonary resuscitation in this chapter, we arranged for the assessment to be conducted one week after the completion of the control course and experimental course. In the evaluation process, we organized two groups of students to participate in a closed book paper exam at the same time. This exam included the same paper, which was extracted from the school's question bank over the years and modified by experts. Therefore, the paper had moderate difficulty and effective differentiation, suitable for evaluating students' mastery of theoretical knowledge. The exam paper has a total of 100 points and lasts for 90 minutes.

3.6.6 Practical skills assessment, with 100 points. With the CPR standard scoring table, the operation skill level and comprehensive quality are strictly assessed.

3.6.7 Data analysis: SPSS 22.0 was used for statistical analysis of the data.

3.6.8 1 Descriptive analysis: Quantitative data that conforms or approximates a normal distribution in the study are represented by $x \pm s$, quantitative data that does not conform to a normal distribution are represented by [M (P2s, P7s)], and qualitative data are represented by frequency and composition ratio. Quantitative data analysis was conducted by using single sample t-tests to analyze the theoretical and

skill scores of students in two classes: one class used traditional teaching methods, while the other class added a virtual simulation teaching system to the traditional teaching methods. This analysis includes calculating the average score, standard deviation, frequency, percentage, and other indicators for each question. These indicators help to understand the satisfaction level and distribution of respondents towards various services.



CHAPTER IV
DATA ANALYSIS RESULTS

4.1 Comparison of the general data between the two groups

There were 50 students in the experimental group, including 13 boys and 37 girls, with average age: 20.24.50 students in the control group, including 14 boys and 36 girls, with average age: 20.3. There was no obvious difference between the two groups, shown in Table l

Table 2 Comparison of the general data between the two study groups of students

Group	N	Average age	Gender case (%) Man	Gender case (%) Woman
Experimental Group (n=50)	50	20.24	13 (26%)	37 (74%)
Control Group(n=50)	50	20.3	14 (28%)	36 (72%)

4.2 Comparison of the theoretical knowledge between the two groups

By comparing the knowledge scores of the virtual simulation system (experimental group) and the traditional teaching method (control group) after learning, a single sample t-test was used to compare the results. Conclusion: There was no significant difference in pre-test scores between the two groups ($t=0.583$, $p=0.561>0.05$). The average post test score of the experimental group was 88.68, significantly higher than the control group's score of 75.24. This indicates that after the experiment, the test scores of the subjects in the experimental group have significantly improved, indicating the effectiveness of the experiment. There is a

significant difference in the post test scores between the two groups of students (t=0.521, p=0.001<0.05).

Table 3 Comparison of scores before and after testing theoretical knowledge

Group	N	Pre-Test		Post-Test	
		Mean	Standard Deviation (SD)	Mean	Standard Deviation (SD)
Experimental Group (n=50)	50	73.7	5.55	88.68	4.88
Control Group(n=50)	50	72.98	6.74	75.24	4.40
T -value		-0.583		0.521	
P -value		0.561		0.001	

Note： The p-value of the experimental group post scores was less than 0.05, indicating that the difference was statistically significant.

4.3 Comparison of the operational skills of the two groups:

Assessed by the same teacher. According to Table 3, the skill assessment of the experimental group was 85.1, the control group was 81.52, and the experimental group was better than that of the control group (t= -4.045, p=0.001 <0.05), indicating the significant difference between the mean value of the two groups.

Table 4 Comparison of the operational assessment scores in the two groups

Group	N	Mean	standard deviation (SD)
Experimental Group (n=50)	50	85.10	4.39
Control Group(n=50)	50	81.52	4.45
T-value			-4.045
P -value			0.001

Note 3: *p-value < .05 (reject null hypothesis)

4.4 Comparison of CPR teaching satisfaction scores in the two groups

4.4.1 table 4 by calculating the experimental group and control group satisfaction mean, understand the two groups of CPR classroom satisfaction level has certain differences, (excluding topic 7, the rest of the topic average are higher than the control group) experimental group students in teaching design, curriculum classroom environment, extracurricular learning enthusiasm (learning initiative), comprehensive quality and self recognition are higher than the control group, It shows that the students in the experimental group have a high acceptance of the virtual simulation system and a good teaching effect. There were some significant differences between the experimental group and the control groups.

Table 5 Teaching satisfaction of the students in the two groups

Title		Experimental Group				Control Group			
	Option	Frequency	Mean	(SD)	Variance	Frequency	Mean	(SD)	Variance
Teacher 1	Very disagree	0	4.76	0.476	0.227	0	4.20	0.495	0.245
	disagree	0				0			
	neutrality	1				2			
	agree	10				36			
	Strongly agree	39				12			
Teacher 2	Very disagree	0	4.54	0.762	0.580	0	4.36	0.851	0.725
	disagree	1				1			
	neutrality	2				6			
	agree	22				23			
	Strongly agree	25				20			
Teacher 3	Very disagree	0	4.54	0.676	0.458	0	4.34	0.798	0.637
	disagree	0				0			
	neutrality	5				10			
	agree	13				13			
	Strongly agree	32				27			
Teacher 4	Very disagree	0	4.40	0.571	0.327	0	4.26	0.664	0.441
	disagree	0				0			
	neutrality	2				6			
	agree	26				25			
	Strongly agree	22				19			
Teacher 5	Very disagree	0	4.12	0.799	0.638	0	3.90	0.614	0.378
	disagree	0				0			
	neutrality	13				12			
	agree	18				31			
	Strongly agree	19				7			
Teacher 6	Very disagree	0	4.34	0.658	0.433	0	3.76	0.687	0.472
	disagree	0				0			
	neutrality	5				19			
	agree	23				24			
	Strongly agree	22				7			
Curriculum design 1	Very disagree	0	4.26	0.487	0.237	0	4.28	0.454	0.206
	disagree	0				0			
	neutrality	1				36			
	agree	35				14			
	Strongly agree	14				50			

Table 5 (Continued)

Title	Option	Experimental Group				Control Group			
		Frequency	Mean	(SD)	Variance	Frequency	Mean	(SD)	Variance
Curriculum design 2	Very disagree	0	4.30	0.463	0.214	0	4.28	0.454	0.206
	disagree	0				0			
	neutrality	0				0			
	agree	35				36			
	Strongly agree	15				14			
Curriculum design 3	Very disagree	0	4.54	0.542	0.294	0	4.04	0.699	0.488
	disagree	0				0			
	neutrality	1				11			
	agree	21				26			
	Strongly agree	28				13			
Extracurricular learning enthusiasm. 1	Very disagree	0	4.52	0.580	0.336	0	4.46	0.613	0.376
	disagree	0				0			
	neutrality	2				3			
	agree	20				21			
	Strongly agree	28				26			
Extracurricular learning enthusiasm. 2	Very disagree	0	4.04	0.669	0.447	0	3.92	0.695	0.483
	disagree	0				0			
	neutrality	10				14			
	agree	28				26			
	Strongly agree	12				10			
Comprehensive quality 1	Very disagree	0	4.12	0.659	0.434	0	4.04	0.699	0.488
	disagree	0				0			
	neutrality	8				11			
	agree	28				26			
	Strongly agree	14				13			
Comprehensive quality 2	Very disagree	0	4.44	0.705	0.496	0	4.26	0.751	0.564
	disagree	0				0			
	neutrality	6				9			
	agree	16				19			
	Strongly agree	28				22			
Classroom Facility 1	Very disagree	0	4.48	0.614	0.377	0	4.14	0.700	0.490
	disagree	0				0			
	neutrality	3				9			
	agree	20				25			
	Strongly agree	27				16			

Table 5 (Continued)

Title	Option	Experimental Group				Control Group			
		Frequency	Mean	(SD)	Variance	Frequency	Mean	(SD)	Variance
Classroom Facility 2	Very disagree	0				1			
	disagree	0				0			
	neutrality	1	4.38	0.530	0.281	8	4.04	0.699	0.488
	agree	29				29			
	Strongly agree	20				12			
Extracurricular learning enthusiasm 3	Very disagree	0				0			
	disagree	0				0			
	neutrality	2	4.36	0.563	0.317	8	4.00	0.571	0.327
	agree	28				34			
	Strongly agree	20				8			
Comprehensive quality 3	Very disagree	0				0			
	disagree	0				0			
	neutrality	2	4.58	0.575	0.330	6	4.40	0.700	0.490
	agree	17				18			
	Strongly agree	31				26			
Comprehensive quality 4	Very disagree	0				0			
	disagree	0				1			
	neutrality	2	4.56	0.577	0.333	16	3.80	0.728	0.531
	agree	18				25			
	Strongly agree	30				8			
Comprehensive quality 5	Very disagree	0				0			
	disagree	0				0			
	neutrality	1	4.62	0.530	0.281	6	4.36	0.693	0.480
	agree	17				20			
	Strongly agree	32				24			
Curriculum design 4	Very disagree	0				0			
	disagree	0				0			
	neutrality	3	4.46	0.613	0.376	5	4.12	0.558	0.312
	agree	21				34			
	Strongly agree	26				11			

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CHAPTER V
SUMMARY, DISCUSSION AND RECOMMENDATION

The purpose of this study is to compare the impact of virtual simulation system teaching and traditional teaching on emergency nursing teaching at Sichuan Health Rehabilitation Vocational College in China. The research steps and results are as follows.

5.1 Summary of result

5.1.1 Compared with traditional teaching methods, the application of a virtual simulation system in the chapter on cardiopulmonary resuscitation can help improve students' theoretical grades, enable them to better grasp knowledge, and enhance learning outcomes. Before the teaching experiment, there was no significant difference in pre-test scores between the experimental group and the control group. After teaching based on a virtual simulation system in the experimental class, the average score of the experimental group was higher than that of the control group, and there was a significant statistical significance. So objectively speaking, compared with traditional cardiopulmonary resuscitation experimental teaching, virtual simulation experiments can more effectively help teachers achieve teaching goals. The atmosphere in the classroom is significantly better, students' attention is more focused, students answer questions more actively, and classroom participation is higher. Through the test of theoretical knowledge, it is proved that the teaching method of the experimental group significantly improves the students' theoretical knowledge.

5.1.2 Compared with traditional teaching methods, the application of a virtual simulation system in the chapter on cardiopulmonary resuscitation can help improve students' skill scores. In terms of skill assessment scores, the experimental group had an average score of 85.1, while the control group had an average score of 81.52. The experimental group had better skill scores than the control group ($t=-4.045$, $p=0.001<0.05$), indicating a significant difference between the two groups. Moreover, in the skill operation practice class, the author found that students in the class using virtual simulation experiment teaching were more diligent in their practice, had longer concentrated practice time for skills, and had closer group cooperation and cooperation, which led to a higher emphasis on the entire class.

5.1.3 Application of virtual simulation system in the chapter on cardiopulmonary resuscitation compared with traditional teaching methods: Through the analysis, it was found that the average satisfaction level of the classroom satisfaction questionnaire in the experimental group was significantly higher than that of the control group, and it was found that the satisfaction level of the two groups, especially in the teaching methods, was significantly different. This indicates that after the experiment, the satisfaction of the experimental class participants with teaching significantly improved. During the teaching process, students actively thought and discussed, which stimulated their learning interest and improved their collaborative spirit. Students have a high acceptance of virtual simulation experiments, and they believe that this learning form is helpful for their emergency nursing learning. They hope to apply it to more experimental learning in the future.

In the process of teaching practice, students in the control group showed a lack of interest in learning in the classroom, were not proactive enough in group discussions, and had a lower level of participation in skill exercises. In my satisfaction survey on the cardiopulmonary resuscitation classroom questionnaire, I found through frequency analysis that the control group students (traditional teaching methods) showed a desire for overall curriculum improvement, especially in terms of teaching method design, course content, cutting-edge and innovative teaching methods, as well as skills and knowledge mastery, which all need improvement. This is also why the theoretical and skill scores of the control group students were lower than those of the experimental group, I believe that in future experimental teaching, teachers can consider integrating experimental teaching with virtual simulation system experiments to create a hybrid teaching model tailored to their class. This model combines Virtual simulation system with traditional teaching methods to enhance student learning.

5.2 Discussion of result

Due to the time, the teaching time of each class is very short, so these data may have some contingency. However, I have found that by combining BOPS with virtual simulation technology in the simulation training of neonatal asphyxia resuscitation, such as Tan Hui et al.'s research, it has been shown that this teaching method can help improve students' theoretical knowledge and skill operation level This teaching method focuses students on the classroom and stimulates their interest in learning, allowing them to fully immerse themselves in the teaching environment and deepen their memory of theoretical knowledge. (Tan,

Hu, Li, Wu, & Zhou, 2022). According to Udin et al. (2020), virtual simulations have lots to offer compared to the actual conduct of experiments such as greater accessibility, low cost, time-saving, safe environments to chemical hazards and other dangers, flexibility, and self-paced learning. (Alam, Ullah, & Ali, 2017) A virtual chemistry framework for tailoring textbooks in chemistry education was developed by Alam et al. This framework is used to quantitatively measure student learning skills through fuzzy logic-based methods and use them as an adaptation criterion to change the content of the virtual learning environment. The system displays customized textbooks in the form of courses for students to improve their theoretical learning. Similarly, they proposed the idea of level transition within 3D-VLEs to learn the basic chemistry concepts. When students switch horizontally, they remain in the same learning module and learn more about the concepts in it. They stayed more in the module and received more examples and learning materials according to their learning style, which motivated their learning. (Ghanbarzadeh, & Ghapanchi, 2019) To address the lack of equipment in the lab, Cengiz (Yang, Sun, & Zhang ,2015). has developed a 2D Virtual Chemistry Laboratory (2 DVCL) for high school students to learn chemistry. The evaluation showed that the virtual labs had a positive impact on the students' learning. Li He and colleagues utilized blended virtual simulation experiments in emergency medical skills education. This approach not only markedly enhanced students' understanding of theoretical concepts and operational skills, boosted their overall capabilities, and fostered self-directed learning but also elevated their satisfaction with learning emergency medical skills. (Li et al., 2021). The research and practice of obstetrics and gynecology practical teaching

based on virtual simulation technology by Li Xiao et al. found that virtual simulation teaching systems can improve students' learning interest, exercise their self-learning ability and communication abilities, and enhance the accuracy and proficiency of clinical operation skills. (Li et al., 2022).

Addressing the issues in our school's traditional experimental teaching mode that limit student interest, theoretical knowledge, and operational skills, this paper, in line with Ministry of Education policies and documents, centers on integrating virtual simulation systems with traditional experimental teaching. Drawing from international and domestic literature, it is underpinned by constructivist theory, situated cognition theory, and the theory of learning through practice. This study has demonstrated its certain feasibility and developmental significance:

First, implementing a virtual simulation system for experimental teaching in emergency nursing is a viable teaching approach. It can reshape the traditional experimental teaching mindset among teachers to an extent, making experimental teaching methods more diverse, thus enhancing students' interest in learning, and improving their theoretical knowledge, operational skills, and overall classroom satisfaction. During the survey of students' classroom satisfaction, it was discovered that traditional experimental teaching methods have several unavoidable issues. The traditional teaching approach primarily involves theoretical lectures accompanied by images and video demonstrations, followed by limited operational practice time. While students can grasp the fundamental theories, they lack hands-on operational experience. Additionally, the availability of laboratory models and equipment is insufficient to accommodate students' practice needs, and there is

inadequate guidance from 1-2 teachers to 50 students during skill practice exercises. Consequently, medical education has increasingly incorporated virtual simulation teaching systems in recent years. The essence of virtual simulation teaching systems lies in utilizing various simulation models to replace real clinical scenarios for teaching, accurately replicating authentic emergency situations, enhancing interactions between students and simulators, and immersing students in CPR scenarios, thus aiding in the mastery of emergency skills. This approach offers the benefits of repeatability, non-invasiveness, and freedom from time and location constraints, aligning well with daily life and clinical realities. It forms a valuable bridge between theory and clinical practice, assisting students in enhancing their clinical operational skills. It stands as a crucial educational method in emergency nursing.

Second, after teaching practice, the following conclusion was drawn through statistical analysis of the collected data: virtual simulation systems can improve students' theoretical knowledge. Through statistical analysis of the academic performance scores of the pre-test experimental group and the control group, the results showed that there was not much difference in theoretical scores among students in each class; After the implementation of teaching, there was a significant difference in theoretical scores between the experimental group and the control group through post testing, indicating that the difference in theoretical scores was due to the different independent variables (teaching methods).Emergency nursing teaching based on a virtual simulation system - cardiopulmonary resuscitation experimental teaching, can help students better grasp the relevant knowledge of the experiment, and improve their learning effectiveness and real-time evaluation scores. The

practical characteristics of virtual simulation system experiments can help students better understand the experimental process, and detailed steps, and conduct experimental operations, thereby enhancing their experimental operation ability.

Third, Through statistical analysis of the overall classroom satisfaction of the experimental group and the control group in two teaching practices, the results show that the average satisfaction of the experimental group students is higher than that of the control group in terms of teaching design, curriculum classroom environment, extracurricular learning enthusiasm (learning initiative), comprehensive quality, and self-awareness. Therefore, it can be concluded that conducting virtual simulation experiments can help students improve their classroom interest and teaching design, and enhance their overall classroom satisfaction. In summary, virtual simulation systems are a way to improve first aid theoretical knowledge and skill operations. The implementation of teaching in our school has significantly improved the learning enthusiasm of our students and greatly enhanced their theoretical knowledge and skill operation level. I think it is worth further promoting and applying.

5.3 Suggestion

As a new discipline combining emergency medicine and nursing, the importance of emergency nursing is reflected in many aspects. Such as solid theoretical knowledge, skilled skills, keen observation ability, good emergency response ability communication and coordination ability, etc. And cardiopulmonary resuscitation is an important skill of clinical first aid, which is highly technical. Medical students not only need to

master the theoretical knowledge of cardiopulmonary resuscitation but also need to correctly master its practical operation techniques and skills. Any improper operation may lead to the failure of the operation. Due to the lack of clinical practice of CPR, the complexity and variability of clinical conditions, and the lack of psychological and social attributes of the virtual simulation system and its simulators, it can not be completely equivalent to real patients and can not completely replace the real clinical practice training, so it still needs to be continuously explored and improved in the future teaching process.

Secondly, the implementation of a virtual simulation experiment is also subject to many restrictions. For example, the virtual simulation experiment can not change too much according to the needs of students, and when the virtual simulation experiment is carried out on the Internet, it will be interfered with by the network state, resulting in the decline of learning efficiency. The cost of virtual system construction is expensive, and it also needs to be updated in time at a later stage.

Thirdly, due to the fact that I only selected 2 classes with a total of 100 students in the experimental design and execution process. The relatively small number of experimental participants may have a certain impact on the accuracy and reliability of the experimental results. It may increase the variability and uncertainty of experimental results, thereby affecting the interpretation of experimental data and the reliability of conclusions. Therefore, it is suggested that in subsequent experiments, the number of classes or participants can be increased to improve the accuracy and credibility of the experimental results. To make the experimental results closer to the actual overall situation, which is more

conducive to the improvement of emergency nursing teaching and the enhancement of teaching quality.

Finally, in order to make the virtual simulation technology better integrated into the emergency nursing classroom, I hope that more front-line teachers can recognize the role of the new education mode in the new era, and truly understand and correctly use the virtual simulation system experiment. I think all teachers can participate in the school-enterprise cooperation with the virtual simulation system development company. Teachers in our school can write scripts to create simulation scenes that are more realistic and close to clinical and can better solve practical problems, so as to develop virtual simulation system teaching that is more in line with their own schools and students' learning conditions. Through in-depth research on the experimental teaching of virtual simulation systems, every student can obtain a better learning effect in class.

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APPENDIX

Appendix 1

Mahasarakham University Ethics Committee For Research Involving Human Subjects Certificate of Approval

MAHASARAKHAM UNIVERSITY ETHICS COMMITTEE FOR
RESEARCH INVOLVING HUMAN SUBJECTS

Certificate of Approval

Approval number: 312-170/2024

Title : Effectiveness of Virtual Simulation System in Emergency Nursing Course to enhance First Aid Skill for Vocational College.

Principal Investigator : Xuemei Ni
Responsible Department : Faculty of Education
Research site : Sichuan Vocational College of Health and Rehabilitation, China

Review Method : Expedited Review

Date of Manufacture : 23 May 2024 **expire :** 22 May 2025

This research application has been reviewed and approved by the Ethics Committee for Research Involving Human Subjects, Mahasarakham University, Thailand. Approval is dependent on local ethical approval having been received. Any subsequent changes to the consent form must be re-submitted to the Committee.

Ratree S.
(Assistant Professor Ratree Sawangjit)
Chairman

Approval is granted subject to the following conditions: (see back of this Certificate)

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Appendix 2

Teaching plan design of experimental group (virtual simulation system)

	first aid	**Teaching date**	2024.5.27
Professional Class	Grade 22 College Nursing Class 6	**Place**	3-B411
Teacher	Xuemei Ni	**Director of Teaching and Research Section**	Yan Pan
Teaching hours	2 class hours	**Course type**	Practical courses
Teaching Title	Practice 2: Cardiopulmonary Resuscitation (1)		
Teaching objectives	1. Master the operational process of basic life support and effective indicators for recovery; 2. Able to correctly evaluate patients, assess their condition, promptly detect cardiac arrest, and proficiently perform cardiopulmonary resuscitation; 3. Establish a sense of first aid and team cooperation that "time is life", and have a sense of love for injury and safety regulations in operation.		
Learning situation Analysis	Virtual simulation learning tasks have been assigned before class, and students have comprehensively reviewed the theoretical knowledge of cardiac arrest and cardiopulmonary resuscitation through a game like approach. Through continuous experimentation in virtual simulation software, they have gained an understanding of the operational process of cardiopulmonary resuscitation, which has greatly stimulated their desire to overcome challenges. They also have practical experience in clinical internships, possessing certain basic professional knowledge and skills. So this is a practical training class that the students really enjoyed. Everyone actively participated in the practice, hoping to pass the level within the time specified by the virtual simulation system and successfully rescue the patient. Therefore, only a few students lacked learning enthusiasm, were shy, lacked confidence, and had poor first aid awareness.		
Key points	The operational process of cardiopulmonary resuscitation and the indicators of effective resuscitation.		
Difficulties	The operation methods of chest compressions and artificial respiration.		
Reference Information	1. Luo Xianwu, Wang Ran. Guidelines for the National Nurse Practicing Qualification Examination in 2021 [M]. Beijing: People's Health Publishing House, 2020 2. Xu Hong. Emergency and Critical Care Nursing [M]. Beijing: People's Health Publishing House, 2016 3. Zhang Bo, Gui Li. Emergency and Critical Care Nursing [M]. Beijing: People's Health Publishing House, 2017 4. Guo Maohua, Wang Hui. Emergency and Critical Care Nursing [M]. Beijing: People's Health Publishing House, 2019		
Teaching Method	Self exploration method, teaching method, demonstration method, role-playing method, situational teaching method, practice method, etc		
Teaching process and time allocation	content		Time

	[Organizing teaching] Counting the number of people, maintaining classroom discipline, and greeting teachers and students	2 minutes
	[Review old lesson] Ask students to review the knowledge from the previous lesson	5 minutes
	[Introduction of New Course] Present case studies to students and ask thought-provoking questions to introduce the new course	1 minute
	[Teaching New Course] Before class, explain the teaching objectives. For specific content of the new course, please refer to the classroom teaching schedule	64 minutes
	[Consolidation and Summary] Summarize the key and difficult points through learning exercises to test and consolidate teaching effectiveness	6 minutes
	[Assignment] Each student is required to complete the assignment independently	1 minute Mobile for 1 minute
Teaching Reflection		

Practice 2: Cardiopulmonary Resuscitation (1)

Organizational teaching (2 minutes): attendance, dress code inspection, emphasis on discipline and practical training safety

二、Review of old lesson (5 minutes): Question: 1. Concept and clinical manifestations of cardiac arrest? 2. What is the operational process for basic life support? What are the indicators of successful recovery?

三、Import new lesson (1 minute)：Show students the knowledge points with high frequency of errors in their clearance in the virtual simulation system, and propose thinking questions to introduce new lessons

四、Teaching a new lesson (64 minutes):

1. Elaborate teaching objectives and assign classroom tasks

2. Teacher demonstration: Operation method and precautions of bare handed cardiopulmonary resuscitation (organize students to carefully watch and record)

Preparation: Material preparation, operator preparation

Purpose: To use artificial methods to quickly establish effective circulation and respiration in patients, restore necessary blood oxygen supply, and save their lives

Implementation: Assess the environment - assess consciousness, breathing, and pulse (tap and shout loudly - determine carotid artery and breathing) - initiate emergency response procedures - record the start time

of rescue - place the body position - perform chest compressions (confirm the correct compression site (double breast line method) - overlap hands and clasp ten fingers, with the forearm perpendicular to the patient's sternum and the elbow joint extended - press vertically downward, with even pressure causing the sternum to sink 5cm-6cm -, then quickly relax, Pressing and relaxing for the same duration, with the palm base not leaving the chest wall during relaxation) - Open the airway (check for cervical spine damage - remove foreign objects, dentures and secretions in the oral and nasal cavity - unobstructed airway) - Artificial respiration - Observe the patient's chest undulation -5 cycles of re examination - Organize, wash hands, and record

3. Q&A and Q&A: Understand the feelings of students after watching, answer the questions raised by students, emphasize the key and difficult points again, and emphasize the accuracy of operation and first aid awareness in key links

4.Student Practice: 5-6 students/group, students open the virtual simulation system to simulate scenes inside and outside the hospital for practice and operation, emphasizing the differences between inside and outside the hospital and the precautions and steps for pulmonary resuscitation in various scenarios. The teacher's inspection and guidance (group cooperation, students can correct each other according to the virtual system prompts to improve practice efficiency)

5.Open the virtual system: When grouping students to practice, play a simulated scene (immersion), ensure that students' phones are connected to the teaching virtual simulation system, practice compressing frequency according to the system's audio prompts, and check for errors at any time. They should correct themselves in a timely manner and improve the quality of teaching.

6. Student feedback: Select a comprehensive simulation scenario (such as the fire scene) in the virtual simulation system, and ask a student to show it:The operating method of unarmed cardiopulmonary resuscitation, student correction, teacher feedback (emphasizing key and difficult points)，Exercise the emergency ability of the whole class and evaluate the knowledge mastery of the students.五、 Consolidate the new lesson

and summarize (6 minutes) (The teacher asks questions while summarizing, guiding students to answer and deepen their memory)

Summarize the practice situation and common problems of students, and emphasize once again the basic operating steps and precautions of unarmed cardiopulmonary resuscitation

六、 Assign homework (1 minute)

1. Utilize fragmented time (such as breaks, self-study, etc.) to complete cardiopulmonary resuscitation again in a virtual simulation system, and complete the process (within 5 minutes, all steps are error free)， The virtual simulation system for real-name registration, each student to press the frequency, the depth must reach more than 95%.

2. After the virtual simulation system is approved, use self-study classes and open hours in the training room to practice the operation method of unarmed cardiopulmonary resuscitation.七、Random time(1 minute)

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Course Name	first aid	Teaching date	2024.5.27

Appendix 3

Teaching plan design of the control group

(traditional teaching method)

Professional Class	Grade 22 College Nursing Class 5	**Place**	3-B411
Teacher	Xuemei Ni	**Director of Teaching and Research Section**	Yan Pan
Teaching hours	2 class hours	**Course type**	Practical courses
Teaching Title	Practice 2: Cardiopulmonary Resuscitation (1)		
Teaching objectives	1. Master the operational process of basic life support and effective indicators for recovery; 2. Able to correctly evaluate patients, assess their condition, promptly detect cardiac arrest, and proficiently perform cardiopulmonary resuscitation; 3. Possess first aid awareness, injury awareness, and teamwork skills.		
Learning situation Analysis	The students in this class have already learned the theoretical knowledge of cardiac arrest and cardiopulmonary resuscitation, watched relevant videos of cardiopulmonary resuscitation, and have practical experience in clinical internships, possessing certain basic professional knowledge and skills. This is a practical training class that students enjoy, but there are still some students who have a certain degree of fear of difficulties, lack enthusiasm for learning, have a poor sense of group cooperation, are shy, lack confidence, and lack awareness of first aid.		
Key points	The operational process of cardiopulmonary resuscitation and the indicators of effective resuscitation.		
Difficulties	The operation methods of chest compressions and artificial respiration.		
Reference Information	1. Luo Xianwu, Wang Ran. Guidelines for the National Nurse Practicing Qualification Examination in 2021 [M]. Beijing: People's Health Publishing House, 2020 2. Xu Hong. Emergency and Critical Care Nursing [M]. Beijing: People's Health Publishing House, 2016 3. Zhang Bo, Gui Li. Emergency and Critical Care Nursing [M]. Beijing: People's Health Publishing House, 2017 4. Guo Maohua, Wang Hui. Emergency and Critical Care Nursing [M]. Beijing: People's Health Publishing House, 2019		
Teaching Method	Teaching method, demonstration method, questioning method, and practice method.		
Teaching process and time allocation	content		Time
	[Organizing teaching] Counting the number of people, maintaining classroom discipline, and greeting teachers and students [Review old lesson] Ask students to review the knowledge from the previous lesson [Introduction of New Course] Present case studies to students and ask thought-provoking questions to introduce the new course [Teaching New Course] Before class, explain the teaching objectives. For specific content of the new course, please refer to the classroom teaching schedule [Consolidation and Summary] Summarize the key and difficult points through learning exercises to test and consolidate teaching effectiveness [Assignment] Each student is required to complete the assignment independently		2 minutes 5 minutes 1 minute 64 minutes 6 minutes 1 minute Mobile for 1 minute
Teaching Reflection			

Practice 2: Cardiopulmonary Resuscitation (1)

Organizational teaching (2 minutes): attendance, dress code inspection, emphasis on discipline and practical training safety

二、Review of old lesson (5 minutes): Question: 1. Concept and clinical manifestations of cardiac arrest? 2. What is the operational process for basic life support? What are the indicators of successful recovery?

三、Import new lesson (1 minute):Introduction of new lesson (1 minute): Present case studies to students and ask thought-provoking questions to introduce the new lesson

四、Teaching a new lesson (64 minutes):

1. Elaborate teaching objectives and assign classroom tasks

2. Teacher demonstration: Operation method and precautions of bare handed cardiopulmonary resuscitation (organize students to carefully watch and record)

Preparation: Material preparation, operator preparation

Purpose: To use artificial methods to quickly establish effective circulation and respiration in patients, restore necessary blood oxygen supply, and save their lives

Implementation: Assess the environment - assess consciousness, breathing, and pulse (tap and shout loudly - determine carotid artery and breathing) - initiate emergency response procedures - record the start time of rescue - place the body position - perform chest compressions (confirm the correct compression site (double breast line method) - overlap hands and clasp ten fingers, with the forearm perpendicular to the patient's sternum and the elbow joint extended - press vertically downward, with even pressure causing the sternum to sink 5cm-6cm -, then quickly relax, Pressing and relaxing for the same duration, with the palm base not leaving the chest wall during relaxation) - Open the airway (check for cervical spine damage - remove foreign objects, dentures and secretions in the oral and nasal cavity - unobstructed airway) - Artificial respiration - Observe the patient's chest undulation -5 cycles of re examination - Organize, wash hands, and record

3. Q&A and Q&A: Understand the feelings of students after watching, answer the questions raised by students, emphasize the key and difficult points again, and emphasize the accuracy of operation and first aid awareness in key links

4. Student exercises: 5-6 students/group practice operations, teacher's supervision and guidance (group cooperation and error correction exercises)

5. Play educational videos: Play video materials of the operation of this lesson during student practice

6. Student feedback: The operating method of unarmed cardiopulmonary resuscitation, student correction, teacher feedback (emphasizing key and difficult points)

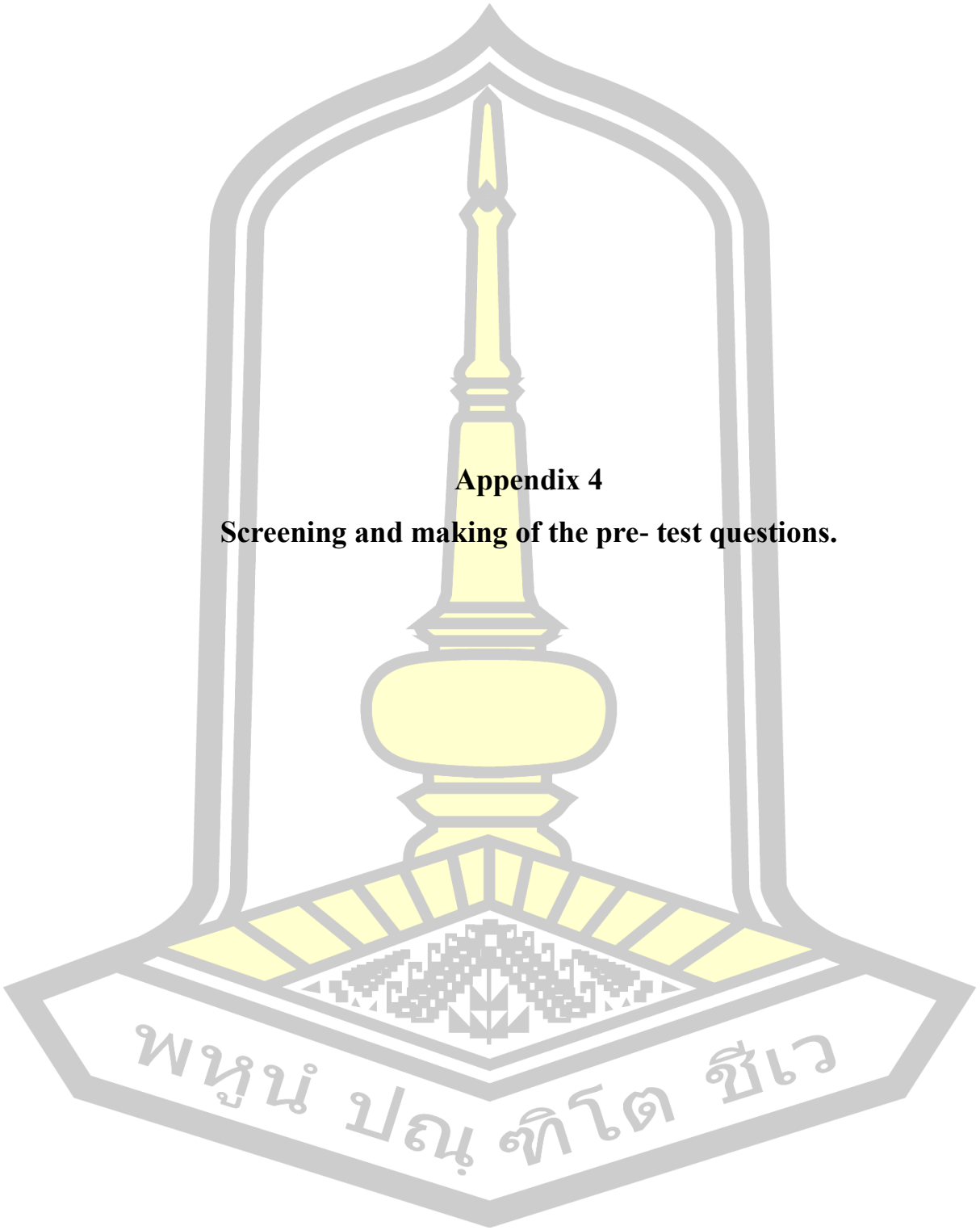
五、 Consolidate the new lesson and summarize (6 minutes) (The teacher asks questions while summarizing, guiding students to answer and deepen their memory)

Summarize the practice situation and common problems of students, and emphasize once again the basic operating steps and precautions of unarmed cardiopulmonary resuscitation

六、 Assign homework (1 minute)

Practice the operation method of unarmed cardiopulmonary resuscitation during the open hours of self-study classes and training rooms

七、Random time(1 minute)



Appendix 4

Screening and making of the pre- test questions.

IOC stands for acceptance index, $\sum R$ stands for expert summation, n stands for number of experts. $\left(IOC = \frac{\sum R}{n}\right)$

The preliminary questionnaire was submitted to five experts in the field to measure and screen the content validity based on the Index of Item - Objective Congruence (IOC) developed by Rovinelli & Hambleton (1976) in order to achieve validity .Considering the consistency (IOC) between the evaluation items and the evaluation criteria, the evaluation criteria are as follows:

Make sure that the evaluation item meets the evaluation criteria and the score is +1;Uncertainty that the evaluation item meets the evaluation criteria and the score is 0 ;When you are sure that the evaluation item does not meet the evaluation criteria, the score is -1 ;Content effectiveness of the Scoring Rubric , use the following formula to determine (IOC):

If the resulting average fell within the range of 0.50 to 1.00, it indicated that the test paper was considered valid.If the resulting average fell within the range of 0.50 to 1.00, it indicated that the test paper was considered valid.

Question type	NO	Topic	Expert's Opinion					∑ R	IOC	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
一、 Fill in the blank questions	1	The position of CPR compression ( ).	+1	+1	+1	+1	+1	5	1	selected
	2	The frequency of CPR compressions is ( ) times/minute, ( ) centimeters.	+1	+1	+1	+1	0	4	0.8	selected
	3	The technique of opening the airway during cardiopulmonary resuscitation( ).	+1	+1	+1	+1	+1	5	1	selected
	4	When conducting CPR, the evaluation cycle time should be greater than ( ) and less than ( ).	0	+1	+1	+1	+1	5	0.8	selected
	5	The tasks of the emergency department include ( ) ( ) ( ) ( ).	+1	+1	+1	+1	+1	5	1	selected
二、 Multiple Choice Question	1	emergency medicine is （ ）	+1	+1	+1	+1	+1	5	1	selected
	2	What is the emergency medical service system	+1	+1	+1	+1	+1	5	1	selected
	3	Main frequent tasks of pre hospital emergency treatment ()	+1	+1	+1	+1	+1	5	1	selected
	4	Which of the following does not belong to the setting of the emergency department	+1	+1	+1	+1	+1	5	1	selected
	5	Which of the following is the correct step for cardiopulmonary resuscitation?	0	+1	0	+1	+1	3	0.6	selected
	6	In the event of a sudden heart attack, the first aid measures that should be taken immediately are:	+1	+1	+1	0	+1	4	0.8	selected
	7	. What is the most likely occurrence for patients with sudden headaches accompanied by loss of consciousness?	+1	+1	+1	+1	+1	5	1	selected
	8	When you discover a comatose patient, which of the following steps should not be taken?	+1	+1	+1	+1	+1	5	1	selected
	9	Which of the following will slow down the body's natural antipyretic response?	+1	+1	+1	+1	+1	5	1	selected

Question type	NO	Topic	Expert's Opinion					∑ R	IOC	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	10	Common causes of sudden death include	+1	+1	0	+1	+1	4	0.8	selected
	11	The most common causes of cardiac arrest	+1	+1	+1	+1	+1	5	1	selected
	12	What is the cause of sudden respiratory arrest	+1	+1	+1	+1	+1	5	1	selected
	13	When treating ventricular fibrillation/avascular ventricular tachycardia, the recommended number of shocks is: ()	+1	+1	+1	+1	+1	5	1	selected
	14	The depth of chest compressions during adult cardiopulmonary resuscitation is: ()	+1	+1	+1	+1	+1	5	1	selected
	15	For infants, medical staff should use the compression breathing ratio for dual person cardiopulmonary resuscitation: ()	+1	+1	+1	+1	+1	5	1	selected
	16	A patient with no pulse activity and a heart rate of 30 has been sent to the emergency room. Tracheal intubation and continuous chest compressions have been administered, and the following should be given: ()	+1	+1	+1	+1	+1	5	1	selected
	17	To ensure high-quality CPR and minimize the interruption time of compression, efforts should be made to keep the chest outside the chest Press interrupt time: ()	+1	+1	+1	+1	+1	5	1	selected
	18	When medical staff perform cardiopulmonary resuscitation, what is the evaluation time for circulation	+1	+1	+1	+1	+1	5	1	selected
	19	19. Which of the following is the most effective treatment for patients undergoing cardiopulmonary resuscitation using	+1	+1	+1	+1	+1	5	1	selected

Question type	NO	Topic	Expert's Opinion					∑ R	I O C	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
		sodium bicarbonate								
	20	The most common causes of ventricular fibrillation are: ()	+1	+1	+1	+1	+1	5	1	selected
	21	How many beats per minute does a normal adult have?	+1	+1	+1	+1	+1	5	1	selected
	22	What is the golden rescue time for patients with sudden respiratory or cardiac arrest?	+1	+1	+1	+1	+1	5	1	selected
	23	When performing unarmed cardiopulmonary resuscitation on site, which option is the patient's placement position?	+1	+1	+1	+1	+1	5	1	selected
	24	If someone is found to have fainted, no carotid pulsation, and no spontaneous breathing, what rescue methods should be taken?	+1	+1	+1	+1	+1	5	1	selected
	25	What is the order of cardiopulmonary resuscitation first?	+1	+1	+1	+1	+1	5	1	selected
	26	What is the position for pressing during cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected
	27	What is the depth of compression for adult cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected
	28	What is the frequency of compressions per minute for adult cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected
	29	What is the frequency of compressions per minute for adult cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected
	30	What is the ratio of compression to blowing during cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected

Question type	NO	Topic	Expert's Opinion					∑ R	I O C	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	31	During cardiopulmonary resuscitation, first responders should: ()	+1	+1	+1	+1	+1	5	1	selected
	32	The most common secondary pathological changes that occur after 32 heart rate resuscitation are:	+1	+1	+1	+1	+1	5	1	selected
	33	When medical staff undergo cardiopulmonary resuscitation, the evaluation of circulation time is:	+1	+1	+1	+1	+1	5	1	selected
	34	When blowing air from mouth to mouth to children, the frequency of blowing air is:	+1	+1	+1	+1	+1	5	1	selected
	35	The correct strategy for defibrillation in patients who witness cardiac arrest is:	+1	+1	+1	+1	+1	5	1	selected
	36	For cases where breathing has stopped but there are still signs of circulation, the frequency of artificial ventilation should be:	+1	+1	+1	+1	+1	5	1	selected
	37	The recommended time for each blow during cardiac arrest in the cardiopulmonary resuscitation guidelines is:	+1	+1	+1	+1	+1	5	1	selected
	38	Before defibrillation, rescue personnel in the emergency medical service system should: A. Precardiac percussion B. Approximately 5 groups (about 2 minutes) of	+1	+1	+1	+1	+1	5	1	selected
	39	The reliable indicators for diagnosing sudden cardiac arrest are:	+1	+1	+1	+1	+1	5	1	selected
	40	The cardiac arrest time refers to:	+1	+1	+1	+1	+1	5	1	selected
三、Explanation of nouns	1	Oligouria:	+1	+1	+1	+1	+1	5	1	selected
	2	Cardiac arrest:	+1	+1	+1	+1	+1	5	1	selected
	3	CPR:	+1	+1	+1	+1	+1	5	1	selected

Question type	NO	Topic	Expert's Opinion					∑ R	IOC	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	4	Shock	+1	+1	+1	+1	+1	5	1	selected
	5	5.Difficulty breathing:	+1	+1	+1	+1	+1	5	1	selected
四、Short answer question	1	1. Describe the categories of ICU service recipients?	+1	+1	+1	+1	+1	5	1	selected
	2	Describe the clinical manifestations of cardiac arrest?	+1	+1	+1	+1	+1	5	1	selected
五、Case study questions	1	How to correctly open the airway?	+1	+1	+1	+1	+1	5	1	selected
	2	Common complications of CPR?	+1	+1	+1	+1	+1	5	1	selected

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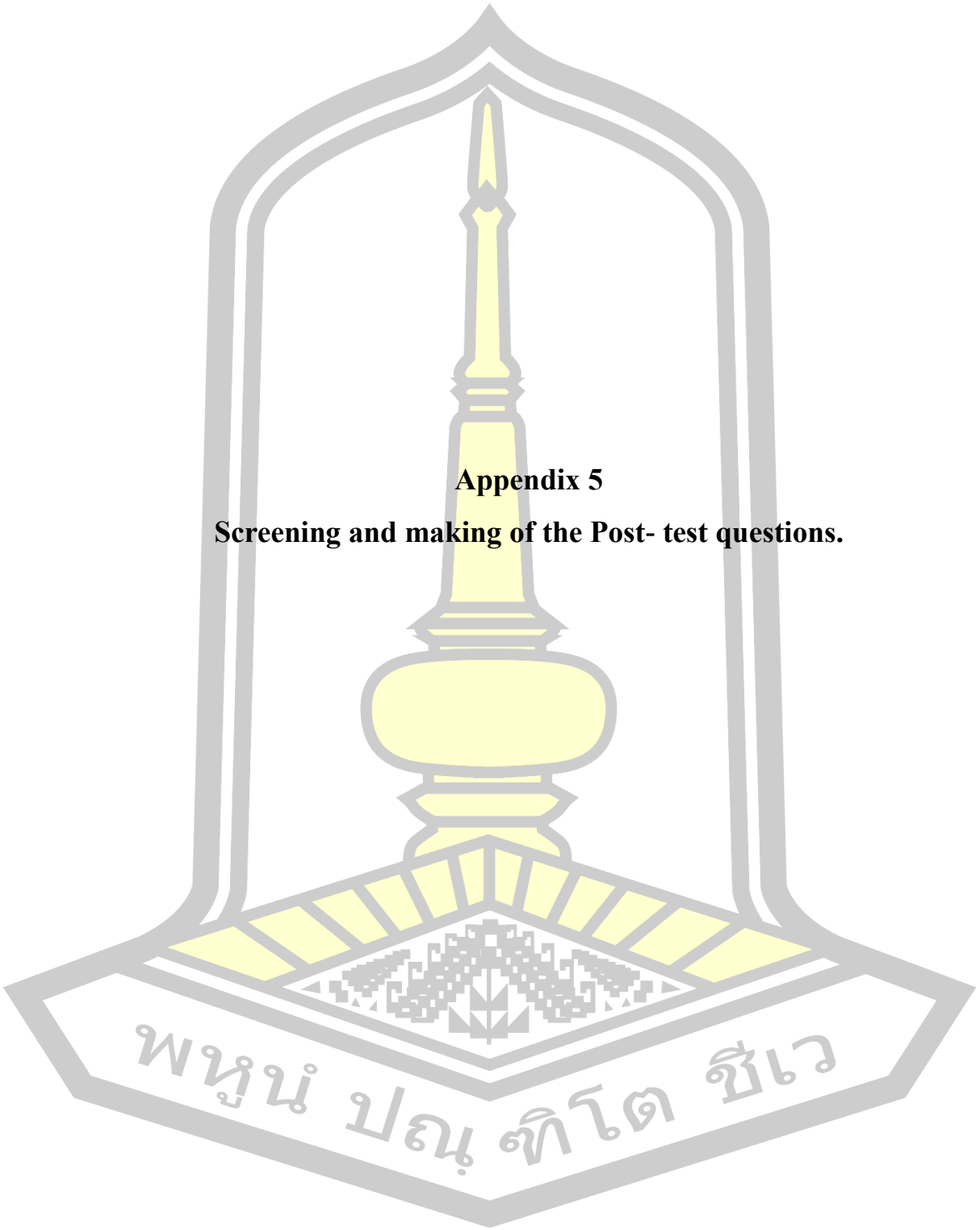

Appendix 5

Screening and making of the Post- test questions.

IOC stands for acceptance index, $\sum R$ stands for expert summation, n stands for number of experts.

The preliminary questionnaire was submitted to five experts in the field to measure and screen the content validity based on the Index of Item - Objective Congruence (IOC) developed by Rovinelli & Hambleton (1976) in order to achieve validity .Considering the consistency (IOC) between the evaluation items and the evaluation criteria, the evaluation criteria are as follows:

Make sure that the evaluation item meets the evaluation criteria and the score is +1;Uncertainty that the evaluation item meets the evaluation criteria and the score is 0 ;When you are sure that the evaluation item does not meet the evaluation criteria, the score is -1 ;Content effectiveness of the Scoring Rubric , use the following formula to determine (IOC):

If the resulting average fell within the range of 0.50 to 1.00, it indicated that the test paper was considered valid.If the resulting average fell within the range of 0.50 to 1.00, it indicated that the test paper was considered valid.

Question type	NO.	Topic	Expert's Opinion					∑R	IOC	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
一、 Fill in the blank questions	1	The indicators for determining cardiac arrest are ( ), ( ), and ( ).	+1	+1	+1	+1	+1	5	1	selected
	2	On site cardiopulmonary resuscitation involves three steps: C, A, and B, which refer to ( ), ( ), and ( ), respectively.	+1	+1	+1	0	+1	5	0.8	selected
	3	The most commonly used technique for open airway in adult cardiopulmonary resuscitation is ( ).	+1	-1	+1	+1	+1	5	0.8	selected
	4	Each blow during cardiac arrest is ( ) ML。	+1	+1	+1	+1	+1	5	1	selected
	5	When performing cardiopulmonary resuscitation, the compression depth is ( ) centimeters and the frequency is ( ) times/minute.	+1	+1	+1	+1	+1	5	1	selected
	1	1. Common causes of sudden death include	+1	+1	+1	+1	+1	5	1	selected
	2	The most common causes	+1	+1	+1	+1	+1	5	1	selected

Question type	NO.	Topic	Expert's Opinion					∑ R	I O C	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
		of cardiac arrest								
	3	What is the cause of sudden respiratory arrest	+1	+1	+1	+1	+1	5	1	selected
	4	The depth of chest compressions during adult cardiopulmonary resuscitation is:	+1	+1	+1	+1	+1	5	1	selected
二、Multiple Choice Question	5	For infants, medical staff should use the compression breathing ratio for dual person cardiopulmonary resuscitation: ()	+1	+1	-1	+1	+1	4	0.8	selected
	6	The most common causes of ventricular fibrillation are: ()	+1	+1	+1	0	+1	4	0.8	selected
	7	How many beats per minute does a normal adult have?	+1	+1	+1	+1	+1	5	1	selected
	8	What is the golden rescue time for patients with sudden respiratory or cardiac arrest?	+1	+1	+1	+1	+1	5	1	selected
	9	Which option is the patient's placement position during on-site unarmed cardiopulmonary resuscitation surgery?	+1	+1	+1	+1	+1	5	1	selected
	10	If someone is found to have	+1	+1	0	+1	+1	4	0.8	selected

Question type	NO.	Topic	Expert's Opinion					∑ R	I O C	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
		fainted, no carotid pulsation, and no spontaneous breathing, what rescue methods should be taken?								
	11	What is the order of cardiopulmonary resuscitation first?	+1	+1	+1	+1	+1	5	1	selected
	12	What is the position for pressing during cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected
	13	What is the depth of compression for adult cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected
	14	What is the frequency of compressions per minute for adult cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected
	15	How many milliliters of tidal fluid are needed each time during artificial respiration?	+1	+1	+1	+1	+1	5	1	selected
	16	A patient with no pulse activity and a heart rate of 30 has been sent to the emergency room. Tracheal intubation and continuous chest	+1	+1	+1	+1	+1	5	1	selected

Question type	NO.	Topic	Expert's Opinion					∑ R	I O C	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
		compressions have been administered, and the following should be given: ()								
	17	To ensure high-quality CPR and minimize the interruption time of compression, efforts should be made to keep the chest outside the chest Press interrupt time: ()	+1	+1	+1	+1	+1	5	1	selected
	18	When medical staff perform cardiopulmonary resuscitation, what is the evaluation time for circulation	+1	+1	+1	+1	+1	5	1	selected
	19	Which of the following is the most effective treatment for patients undergoing cardiopulmonary resuscitation using sodium bicarbonate	+1	+1	+1	+1	+1	5	1	selected
	20	The most common causes of ventricular fibrillation are: ()	+1	+1	+1	+1	+1	5	1	selected
	21	How many beats per minute does a normal adult have?	+1	+1	+1	+1	+1	5	1	selected
	22	What is the golden rescue time for patients	+1	+1	+1	+1	+1	5	1	selected

Question type	NO.	Topic	Expert's Opinion					∑ R	I O C	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
		with sudden respiratory or cardiac arrest?								
	23	When performing unarmed cardiopulmonary resuscitation on site, which option is the patient's placement position?	+1	+1	+1	+1	+1	5	1	selected
	24	If someone is found to have fainted, no carotid pulsation, and no spontaneous breathing, what rescue methods should be taken?	+1	+1	+1	+1	+1	5	1	selected
	25	What is the order of cardiopulmonary resuscitation first?	+1	+1	+1	+1	+1	5	1	selected
	26	What is the position for pressing during cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected
	27	What is the depth of compression for adult cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected
	28	What is the frequency of compressions per minute for adult cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected

Question type	NO.	Topic	Expert's Opinion					∑ R	I O C	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	29	How many milliliters of tidal fluid are needed each time during artificial respiration?	+1	+1	+1	+1	+1	5	1	selected
	30	What is the ratio of compression to blowing during cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected
	31	During cardiopulmonary resuscitation, first responders should: ()	+1	+1	+1	+1	+1	5	1	selected
	32	When treating an infant with airway foreign body infarction on site, the position that the infant should be placed in is: ()	+1	+1	+1	+1	+1	5	1	selected
	33	The location of infant cardiac compressions is: ()	+1	+1	+1	+1	+1	5	1	selected
	34	The indications for defibrillation are: ()	+1	+1	+1	+1	+1	5	1	selected
	35	Ambiguous biphasic wave defibrillator shock energy: ()	+1	+1	+1	+1	+1	5	1	selected
	36	For most adults with sudden non-invasive cardiac arrest,	+1	+1	+1	+1	+1	5	1	selected

Question type	NO.	Topic	Expert's Opinion					∑ R	I O C	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
		what are: ()								
	37	Which of the following is the most effective treatment for patients undergoing cardiopulmonary resuscitation using sodium bicarbonate	+1	+1	+1	+1	+1	5	1	selected
	38	The most common causes of ventricular fibrillation are: ()	+1	+1	+1	+1	+1	5	1	selected
	39	A patient seeking medical attention due to dizziness and fatigue, with an electrocardiogram showing 40 beats per minute and palpable pulse, should be the first choice	+1	+1	+1	+1	+1	5	1	selected
	40	The best method for managing airways in hospitals with sudden cardiac arrest: ()	+1	+1	+1	+1	+1	5	1	selected
三、Explanation of nouns	1	Cardiopulmonary resuscitation:	+1	+1	+1	+1	+1	5	1	selected
	2	Sudden cardiac arrest:	+1	+1	+1	+1	+1	5	1	selected
	3	Electric defibrillation:	+1	+1	+1	+1	+1	5	1	selected

Question type	NO.	Topic	Expert's Opinion					∑ R	IOC	Result
			Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	4	Respiratory arrest:								
	5	. Hypoxia: :	+1	+1	+1	+1	+1	5	1	selected
四、 Short answer question	1	What are the indications for terminating cardiopulmonary resuscitation?	+1	+1	+1	+1	+1	5	1	selected

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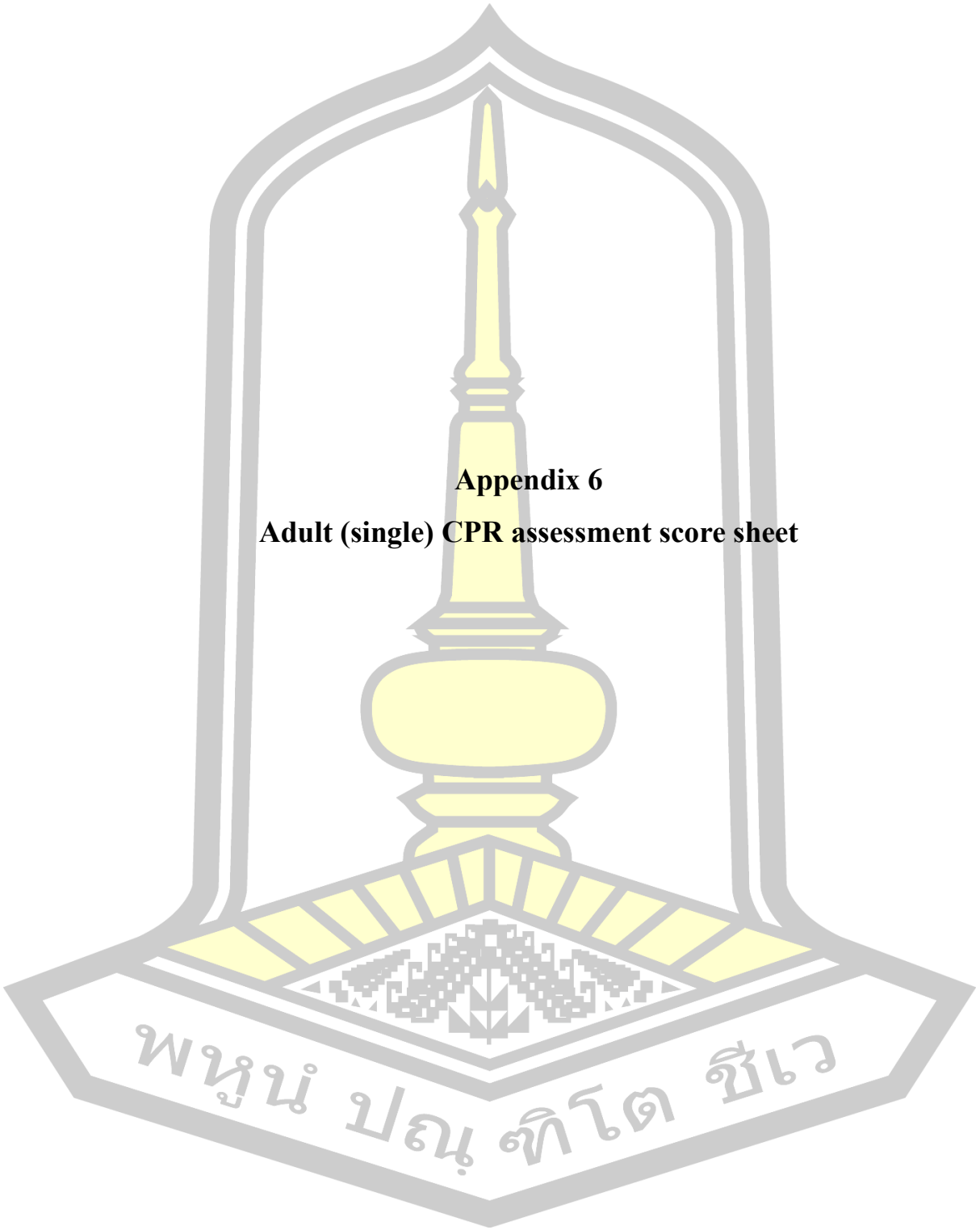


Appendix 6

Adult (single) CPR assessment score sheet

IOC stands for acceptance index, ∑R stands for expert summation, n stands for number of experts.

The preliminary questionnaire was submitted to five experts in the field to measure and screen the content validity based on the Index of Item - Objective Congruence (IOC) developed by Rovinelli & Hambleton (1976) in order to achieve validity .Considering the consistency (IOC) between the evaluation items and the evaluation criteria, the evaluation criteria are as follows:

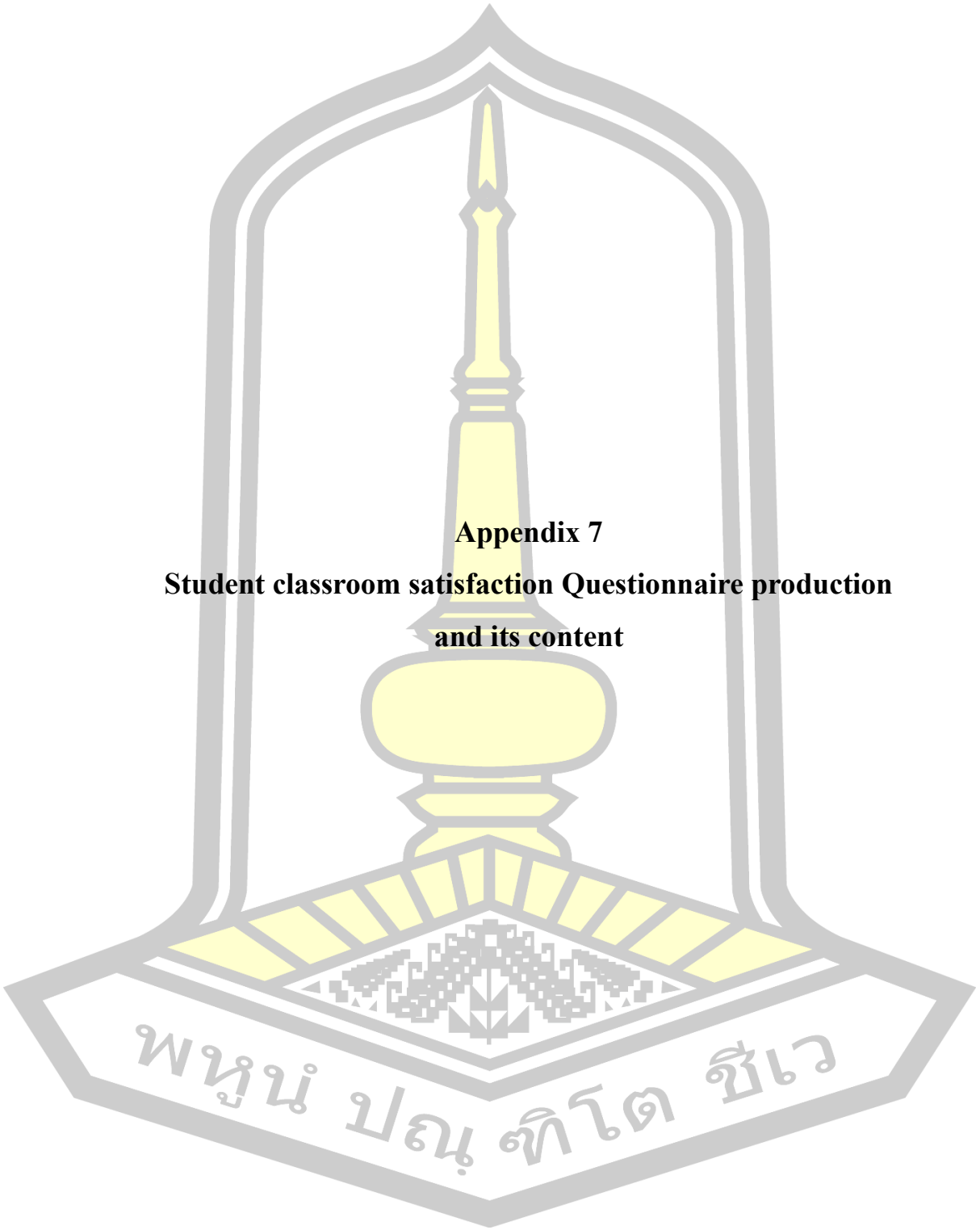
Make sure that the evaluation item meets the evaluation criteria and the score is +1;Uncertainty that the evaluation item meets the evaluation criteria and the score is 0 ;When you are sure that the evaluation item does not meet the evaluation criteria, the score is -1 ;Content effectiveness of the Scoring Rubric , use the following formula to determine (IOC):

If the resulting average fell within the range of 0.50 to 1.00, it indicated that the test paper was considered valid.If the resulting average fell within the range of 0.50 to 1.00, it indicated that the test paper was considered valid.

Question number	**Topic**	**Expert's Opinion**					**∑ R**	**I O C**	**Result**
		Expert 1	**Expert 2**	**Expert 3**	**Expert 4**	**Expert 5**			
1. preparation	Preparation of materials: 2 gauze sheets, 1 tray, 2 bending discs, and a recovery board（4）	+1	+1	+1	+1	+1	5	1	selected
	Operator preparation: Dress neatly and wear a hat（2）	+1	+1	+1	+1	0	4	0.8	selected
2.Purpose (Oral)	Using artificial methods to quickly establish effective circulation and respiration (1 point), restore necessary blood oxygen supply (1 point), and save the patient's life (1 point)（3）	+1	+1	+1	+1	+1	5	1	selected

Question number	Topic	Expert's Opinion					∑ R	I O C	Result
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
3. Assessing the environmen	Observe the surrounding environment to determine safety（1）	0	+1	+1	+1	+1	5	0.8	selected
4.Judging consciousn ess, breathing, and pulse	Pat the patient's shoulders （1）	+1	+1	+1	+1	+1	5	1	selected
	Call separately to both ears, the call sound is loud and effective（1）	+1	+1	+1	+1	+1	5	1	selected
	The method of checking carotid artery pulsation is correct: the time is 5-10 seconds (1 minute), the position is correct (1 minute), and the sliding direction is correct (1 minute); Simultaneously observe the patient's chest undulation (1 point)（4）	+1	+1	+1	+1	+1	5	1	selected
5. Initiate emergency response procedures 9	Call for help, activate emergency response procedures（1）	+1	+1	+1	+1	+1	5	1	selected
	Record the start time of rescue (refer to the table and verbally state the specific time)（1）	+1	+1	+1	+1	+1	5	1	selected
6. Positioning	Pillow removal (1 point), patient in supine position (1 point), placed on a hard surface (2 points), unbuttoned collar, tie (0.5 points), belt (0.5 points)（5）	0	+1	0	+1	+1	3	0.6	selected
7. External chest compression	Confirm the correct pressing position (double breast line method) (2 points), overlap both hands, clasp ten fingers, make the forearm perpendicular to the patient's sternum, and extend both elbow joints (3 points). Use the weight of the upper body to vertically press down, evenly press down to make the sternum sink 5cm-6cm (5 points), then quickly relax to make the chest fully rebound (2 points), press and relax for the same time, and keep the base of the palm on the chest wall when relaxing (2 points)（14）	+1	+1	+1	0	+1	4	0.8	selected
	Effective pressing (only when the green light is on is effective, and each cycle must be completed within 15-18 seconds, with each cycle lasting 0.2 minutes) (30 presses per cycle, with a pressing frequency of 100-120 times per minute）first cycle （6）	+1	+1	+1	+1	+1	5	1	selected
	Second cycle（6）	+1	+1	+1	+1	+1	5	1	selected

Question number	Topic	Expert's Opinion					∑ R	I O C	Result
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	Third cycle （6）	+1	+1	+1	+1	+1	5	1	selected
	Fourth cycle（6）	+1	+1	0	+1	+1	4	0.8	selected
	Fifth cycle （6）								
8.Open airway	Check for cervical spine injury (1 point), head tilted to one side (0.5 points), observe and remove foreign objects, dentures, and secretions in the oral and nasal cavity (0.5 points)	+1	+1	+1	+1	+1	5	1	selected
	Head up chin lifting method: lift the chin with one hand (0.5 points) and press the forehead with the other hand (0.5 points), effectively opening the airway (2 points).	+1	+1	+1	+1	+1	5	1	selected
9. artificial respiration	Effective artificial respiration (1.5 minutes per session) (blowing twice is a cycle. Inhale calmly, blowing for more than 1 second)（first cycle—Fifth cycle， 15）	+1	+1	+1	+1	+1	5	1	selected
10. Re-inspection 20	Has this learning method effectively enhanced my clinical emergency response ability??	+1	+1	+1	+1	+1	5	1	selected
	Judging whether the pulsation of the large artery has recovered (touching the carotid artery)	+1	+1	+1	+1	+1	5	1	selected
	Judging whether breathing has recovered (observing chest undulations)	+1	+1	+1	+1	+1	5	1	selected
	Recheck time 5-10 seconds	+1	+1	+1	+1	+1	5	1	selected
	Record the end time of rescue (refer to the table and verbally state the specific time)	+1	+1	+1	+1	+1	5	1	selected
11.Quality assessment	Correct and proficient operation methods, with coherent movements (2 points); Order not reversed (1 point); Act quickly, remain calm and orderly. From the assessment of the environment to the completion of the retest after 5 cycles, it shall not exceed 3 minutes (3 points) (1 point deducted for every 10 seconds); Pay attention to protecting patient privacy (1 point); Having a sense of love and injury (1 point)。	+1	+1	+1	+1	+1	5	1	selected



Appendix 7

Student classroom satisfaction Questionnaire production and its content

IOC stands for acceptance index, ∑R stands for expert summation, n stands for number of experts.

The preliminary questionnaire was submitted to five experts in the field to measure and screen the content validity based on the Index of Item - Objective Congruence (IOC) developed by Rovinelli & Hambleton (1976) in order to achieve validity .Considering the consistency (IOC) between the evaluation items and the evaluation criteria, the evaluation criteria are as follows:

Make sure that the evaluation item meets the evaluation criteria and the score is +1;Uncertainty that the evaluation item meets the evaluation criteria and the score is 0 ;When you are sure that the evaluation item does not meet the evaluation criteria, the score is -1 ;

Content effectiveness of the Scoring Rubric , use the following formula to determine (IOC): If the resulting average fell within the range of 0.50 to 1.00, it indicated that the test paper was considered valid.

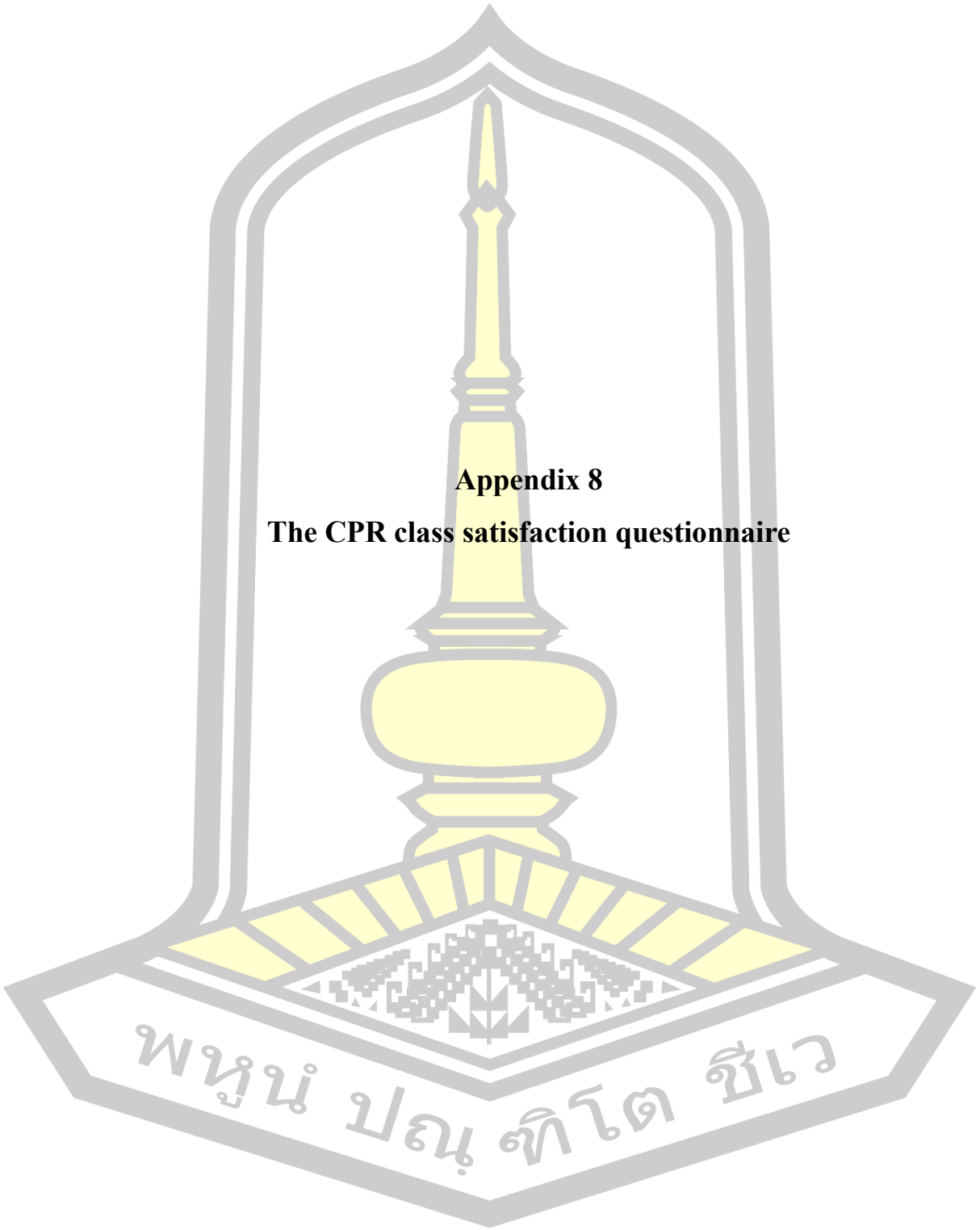
IOC Student classroom satisfaction survey results

Question number	Topic	Expert's Opinion					ΣR	IOC	Result
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
1	Are you satisfied with the teacher's teaching style and professional attitude in class?	-1	+1	-1	-1	-1	1	0.2	deselection
2	Is the teacher appropriate and relevant to the selected textbook and course, with appropriate difficulty level?	+1	+1	+1	+1	+1	5	1	selected
3	Is the teaching method of this course effective and helpful to students, making it easier to understand CPR knowledge?	+1	+1	+1	+1	0	4	0.8	selected

Question number	Topic	Expert's Opinion					Σ R	I O C	Result
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
4	Is the teaching objectives clear, the content rich, the logic rigorous, the priorities clear, and easy to grasp?	+1	+1	+1	+1	+1	5	1	selected
5	Is the teacher's content clearly listed and explained during the lecture?	0	+1	+1	+1	+1	5	0.8	selected
6	Is the course content very practical value?	-1	+1	+1	-1	-1	1	0.4	deselection
7	Is the teaching method of the teacher cutting-edge and innovative?	+1	+1	+1	+1	+1	5	1	selected
8	Is the classroom atmosphere of the teaching teacher lively, interesting, and interactive, with high student participation enthusiasm?	+1	+1	+1	+1	+1	5	1	selected
9	Is the course content designed reasonably and can it help you master the key and difficult knowledge of commonly used cardiopulmonary resuscitation techniques?	+1	+1	+1	+1	+1	5	1	selected
10	I am satisfied with the duration of the emergency nursing course offered by my department and am able to grasp the knowledge of this chapter very well.	+1	+1	+1	+1	+1	5	1	selected
11	The knowledge involved in the course can help me enter clinical practice faster in the future, with high practicality, and there is a close relationship between becoming an excellent nurse?	+1	+1	+1	+1	+1	5	1	selected
12	Have you self-taught the theory and skills of cardiopulmonary resuscitation in the past month?	0	+1	0	+1	+1	3	0.6	selected
13	Outside the hospital, if you encounter a patient with cardiac arrest, will you provide medical assistance	+1	+1	+1	0	+1	4	0.8	selected
14	How effective was the collaboration among team members during the	+1	+1	+1	+1	+1	5	1	selected

Question number	Topic	Expert's Opinion					Σ R	I O C	Result
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	course practice session?you be brave enough to provide assistance and assess your ability or confidence to perform rescue operations?								
15	Through this learning experience, my level of cardiopulmonary resuscitation has greatly improved, and I am capable of rescue alone?	+1	+1	+1	+1	+1	5	1	selected
16	The classroom environment is very conducive to learning. Can the facilities, equipment, models, and venues meet the teaching requirements?	+1	+1	+1	+1	+1	5	1	selected
17	Is teachers' teaching time allocated appropriate?	-1	1	1	-1	-1	2	0.4	deselection
18	Does the teacher have logical and coherent teaching process?	1	-1	-1	1	-1	2	0.4	deselection
19	Is there sufficient time for classroom practice?	+1	+1	0	+1	+1	4	0.8	selected
20	Has the content of this lecture been helpful and inspiring to you?	-1	-1	-1	-1	-1	0	0	deselection
21	This learning method has greatly stimulated my interest in learning, improved my initiative and independence in learning?	+1	+1	+1	+1	+1	5	1	selected
22	Can this learning method effectively exercise my critical thinking ability and independent analysis, judgment, and processing ability?	+1	+1	+1	+1	+1	5	1	selected
23	Can this learning method cultivate my teamwork spirit?	+1	+1	+1	+1	+1	5	1	selected
24	Has this learning method effectively enhanced my clinical emergency response ability??	+1	+1	+1	+1	+1	5	1	selected
25	Overall,are you satisfied with the entire course design and process?	+1	+1	+1	+1	+1	5	1	selected

IOC Student classroom satisfaction survey results



Appendix 8

The CPR class satisfaction questionnaire

Part one:

Interview Questions for the teachers

Chapter 4 of Emergency Nursing - Satisfaction Survey of Middle School Students in Cardiopulmonary Cerebral Resuscitation Course

Dear classmates, this questionnaire is to understand the learning experience and effectiveness of Chapter 4- Cardiopulmonary Cerebral Resuscitation in the emergency nursing course I teach, in order to gain a deeper understanding of the students, develop more suitable learning methods, and improve the teaching quality of this subject. This study was conducted at Sichuan Health and Rehabilitation Vocational College in Sichuan Province, China.

I really hope you can share your experience and suggestions in the classroom. This survey does not need to be signed, and I hope you can answer truthfully. Filling out the questionnaire takes 15-20 minutes. I assure you that your answer will be completely anonymous and will only be used for this academic research. Thank you for participating in my investigation! Your opinions and suggestions are very important for the improvement and enhancement of my course. If you have any other questions or opinions, please feel free to contact me at any time.

Researcher: Xuemei Ni

Supervisor: Asst.Prof.Dr. Kanyarat Sonsupap

For correspondence:

E-mail: 1272653486@qq.com

Phone: +86 13558916132

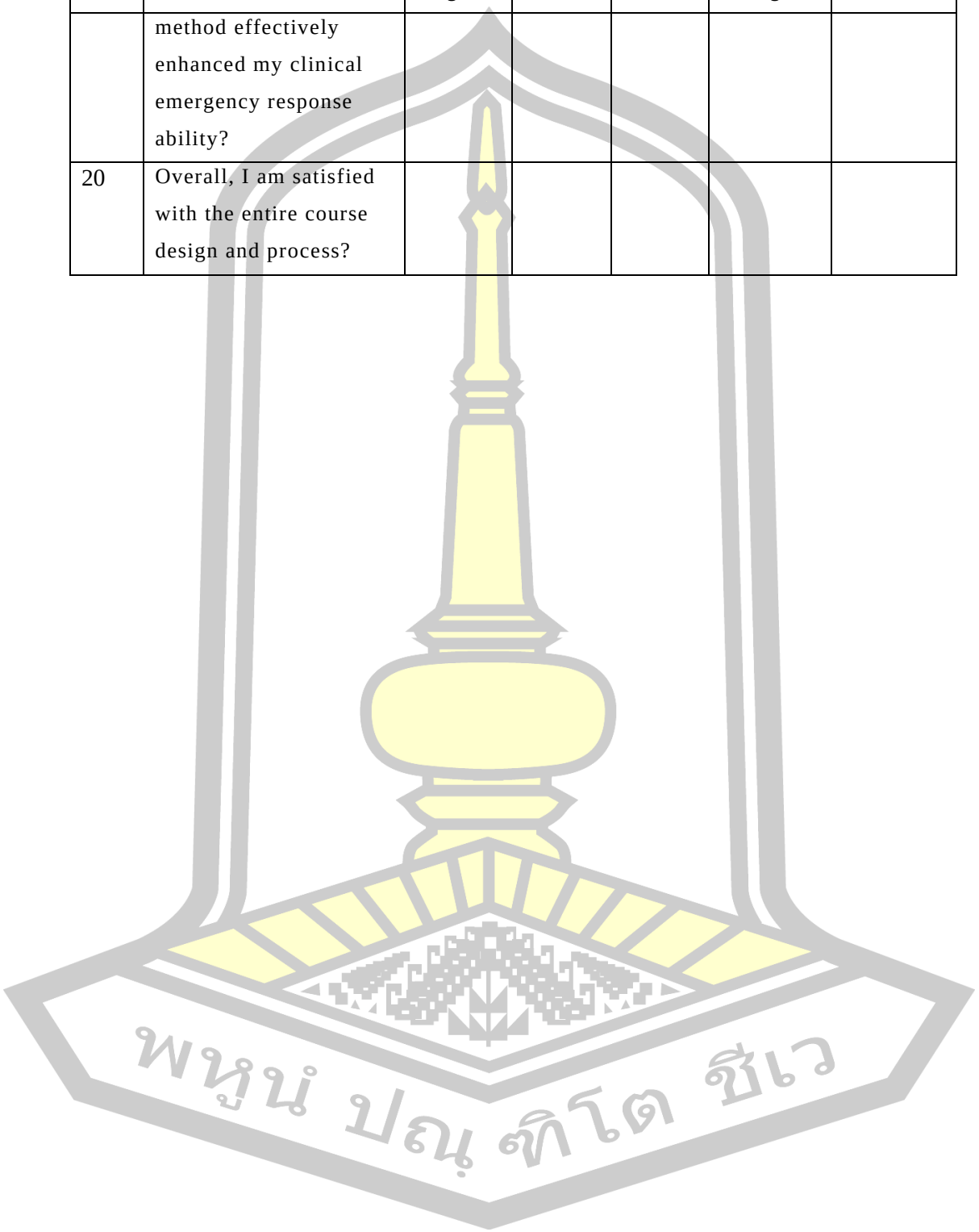
Part two of the questionnaire

No.	The Question	Strongly Agree	Agree	Disagree	Strongly Disagree	No Opinion
1	Is the teacher appropriate and relevant to the selected textbook and course, with appropriate difficulty level?					
2	Is the course content designed reasonably and can it help you master the key and difficult knowledge of commonly used cardiopulmonary resuscitation techniques?					
3	Is the teaching method of this course effective and helpful to students, making it easier to understand CPR knowledge?					
4	Is the teaching objectives clear, the content rich, the logic rigorous, the priorities clear, and easy to grasp?					
5	Is the teacher's content clearly listed and explained during the lecture?					
6	Is the teaching method of the teacher cutting-edge and innovative?					

No.	The Question	Strongly Agree	Agree	Disagree	Strongly Disagree	No Opinion
7	Is the classroom atmosphere of the teaching teacher lively, interesting, and interactive, with high student participation enthusiasm?					
8	Have you self-taught the theory and skills of cardiopulmonary resuscitation in the past month?					
9	Outside the hospital, if you encounter a patient with cardiac arrest, will you provide medical assistance					
10	How effective was the collaboration among team members during the course practice session?					
11	Through this learning experience, my level of cardiopulmonary resuscitation has greatly improved, and I am capable of rescue alone?					
12	I am satisfied with the duration of the emergency nursing course offered by my department and am able to grasp the knowledge of this chapter very					

No.	The Question	Strongly Agree	Agree	Disagree	Strongly Disagree	No Opinion
	well.					
13	The knowledge involved in the course can help me enter clinical practice faster in the future, with high practicality, and there is a close relationship between becoming an excellent nurse?					
14	The classroom environment is very conducive to learning. Can the facilities, equipment, models, and venues meet the teaching requirements?					
15	Is there sufficient time for classroom practice?					
16	This learning method has greatly stimulated my interest in learning, improved my initiative and independence in learning?					
17	Can this learning method effectively exercise my critical thinking ability and independent analysis, judgment, and processing ability?					
18	Can this learning method cultivate my teamwork spirit?					
19	Has this learning					

No.	The Question	Strongly Agree	Agree	Disagree	Strongly Disagree	No Opinion
	method effectively enhanced my clinical emergency response ability?					
20	Overall, I am satisfied with the entire course design and process?					



Appendix 9

Research Support Request Form Si Chuan Vocational College of Health and Rehabilitation

Request for research and experiment on the school - based

Virtual simulation system teaching model

Dear Faculty of Nursing（SiChuan Vocational College of Health and Rehabilitation）：

With the development of society, people's demand for health is increasing, and the implementation of the current national big health strategy puts forward new requirements for the goal of medical education .In order to better improve students' theoretical knowledge, operational skills, and overall classroom satisfaction.Xuemei Ni(PASSPORT :EJ2714523) ,I am studying the application of virtual simulation system experiment in the subject of acute critical care, which requires the support and help of your school in the process of curriculum development and course experiment.

Please approve the above request .

Master: Xue mei Ni

Mahasarakham University

24 Day 3 Month 2022 Year

BIOGRAPHY

NAME	Xuemei Ni
DATE OF BIRTH	October 25, 1990
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