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Reform Thinking of Medical Education on the Use of Online Learning Platform in Comprehensive Universities

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Abstract:

With the rapid development of information technology, medical education has ushered in the era of digitalization and intelligence. However, it seems that comprehensive universities do not integrate the advantages of computers into their medical education, which leads to many problems in the medical education. For these problems, this paper first conducted questionnaires with 285 clinical medicine students and interviewed 9 medicine teachers from two comprehensive universities to better understand the present situation of medical education. This paper proposes the teaching mode of "organ system as the main line, disease as the center, clinical thinking path as the guide" on the use of online learning platform and augmented reality (AR)/virtual reality (VR) technology. Meanwhile, the research gives advice to use the professional advantages of informatization and digitalization of online learning platform in comprehensive universities to expand teachers' interdisciplinary and cross-professional knowledge system. In this way, the quality of medical education in comprehensive universities can be significantly improved.

Keywords: online learning platform, informatization technology, digitalization technology, medical education, integrate educational reform, comprehensive university

INTRODUCTION

In recent years, with the aging of the population and the increase of complex diseases, the demand for medical talents and the requirements for professional skills have increased significantly [1-3]. The reality is that many medical graduates, especially those who have graduated from comprehensive universities, do not meet this requirement, which is mainly related to the shortage of medical teaching resources in comprehensive universities.

As of 2021, there are 420 medical colleges and universities in China, of which 42.1% are comprehensive universities [4]. However, compared with professional schools, the overall professional quality of medical students cultivated by comprehensive universities needs to be improved. How to improve the professional quality of medical students should start from the teaching and learning of basic medicine and clinical medicine. Basic medicine and clinical medicine, as the "two wings" of medical education, play a crucial role in cultivating medical talents [5]. The main objectives of basic medical education and clinical medical education are to cultivate students' basic theories, laboratory skills, and clinical practice experience [6, 7].

In China, the development of basic medical education and clinical medical education in comprehensive universities has become mature, mainly reflected in the curriculum settings, teaching methods, textbook systems and clinical internships [8]. Medical colleges of comprehensive universities have established relatively complete teaching systems and formed more standardized teaching management mechanisms. However, due to insufficient educational resources, many students have limited opportunities for clinical internships. Moreover, traditional basic medical education and clinical medical education need to adapt to the modernization of medical services [9].

Compared with medical schools, comprehensive universities have the advantage of better integrating science and engineering into medicine. In particular, the wide application of computer technology such as augmented reality (AR)/virtual reality (VR) and artificial intelligence in medical education can not only alleviate the lack of teaching resources, but also vividly link basic medical knowledge with clinical medical knowledge [10, 11]. In general, there are some problems and challenges in medical education in comprehensive universities. The solution of these problems will greatly improve the professional skills of medical students and train them to become medical talents.

METHODS

According to the principle of purposive sampling, students and educators from Medical School of Anhui University of Science and Technology, Henan Polytechnic University were selected as the research objects. The selection criteria for clinical medicine undergraduates are those who attended three medical schools and have taken basic medicine and clinical medicine courses or participated in clinical medicine internships. The selection criteria of educators are basic/clinical teachers with rich experience in teaching practice or educational managers engaged in undergraduate teaching management.

The study used one-to-one semi-structured interviews. The interview questions are based on research questions designed to gain an in-depth understanding of the problems and recommendations of basic and clinical medical education in medical schools. The questionnaire for students focuses on the learning experience, learning gains and suggestions of basic and clinical medical education. Finally, interview records of 9 educators and questionnaire survey data of 285 medical students were obtained. Descriptive statistical methods were used to analyze the data. This study was approved by the Ethics Committee of Anhui University of Science and Technology.

RESULTS

Information of the Students Surveyed and the Teachers Interviewed

A total of 285 clinical medical students participated in the questionnaire survey, including 132 males (46.32%) and 153 females (53.68%). The number of students in the class of 2023 is 80 (28.07%), and the students of this year have completed the study stage of undergraduate course; There are 205 students (71.93%) in the class of 2024, who have completed basic medical courses and entered the learning stage of clinical medicine courses. The distribution of gender and grade of medical students is shown in Figure 1. The 9 teachers we interviewed included 3 basic medicine teachers and 6 clinical medicine teachers. They are master's degree or above, associate professor or above, and have been engaged in teaching work for a long time. The basic information of interviewed educators is shown in Table 1.

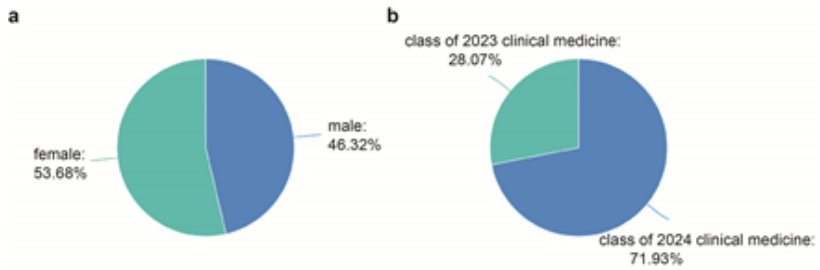

Figure 1. Information of medical students surveyed. a: distribution of gender of the medical students; b: distribution of grade of the medical students.

Table 1. Basic information of interviewed educators

Interviewee	Gender	Age (years)	Degree	Title
T1	female	42	Doctor	Vice-senior
T2	male	51	Doctor	Senior
T3	female	58	Master	Senior
T4	male	55	Master	Senior
T5	male	49	Doctor	Senior
T6	female	50	Doctor	Senior
T7	male	52	Doctor	Senior
T8	male	55	Master	Senior
T9	male	51	Master	Senior

The Mastery Level of Medical Knowledge and the Post Competency of Medical Students Surveyed

We surveyed students about their learning and their future abilities in related careers. The results showed that 89.47% of medical students have a career goal of being a clinician (Figure 2a). However, over 23.86% of medical students said they were not sure or even able to successfully pass the medical practitioner qualification

examination (Figure 2b). At the same time, 39.30% of students think that they are not fully qualified for resident doctor after graduation (Figure 2c). Further investigation found that the reason for the above adverse results is that they do not have a good grasp of basic medical and clinical medical knowledge (over 62.81% and 59.30%, respectively) (Figure 2d, 2e).

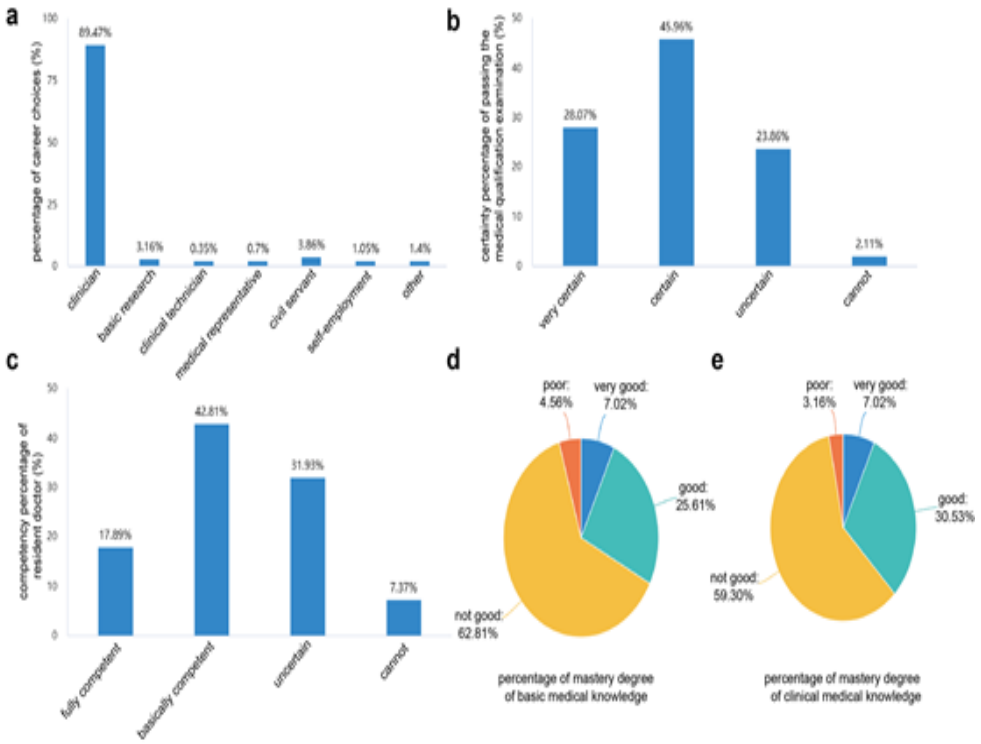

Figure 2. The mastery level of medical knowledge and the post competency of medical students surveyed. a: percentage of career choices of the medical students; b: certainty percentage of passing the medical qualification examination of the medical students; c: competency percentage of resident doctor of the medical students; d: percentage of mastery degree of basic medical knowledge of the medical students; e: percentage of mastery degree of clinical medical knowledge of the medical students.

Reasons for the Low Level of Knowledge Mastery and Post Competence of Medical Students

Further investigation results showed that the main reasons for medical students not having a good grasp of basic/clinical medical knowledge and to think that they can not successfully pass the medical practitioner qualification exam or can not be qualified for the work of resident doctor are concentrated in the following aspects: 57.48% of the students believe that because clinical practice overlaps with the time of postgraduate exam preparation, most of the time and energy are spent on postgraduate exam preparation, resulting in less clinical practice during the internship; 51.18% of the students think that too many courses and too few class hours to study comprehensively and systematically; 41.73% of the students think that the examination of medical practitioners mainly uses clinical cases to test comprehensive analysis ability, which increases the difficulty of the examination; In addition, 7.09% of the students believe that teachers fail to impart knowledge to students effectively (Figure 3a). The above factors also reflect some problems in basic medicine and clinical medicine education (Figure 3b). These problems are mainly manifested in the disconnection between basic medicine and clinical medicine, and the separation between theory and practice, which results in medical students lack of clinical thinking and skills.

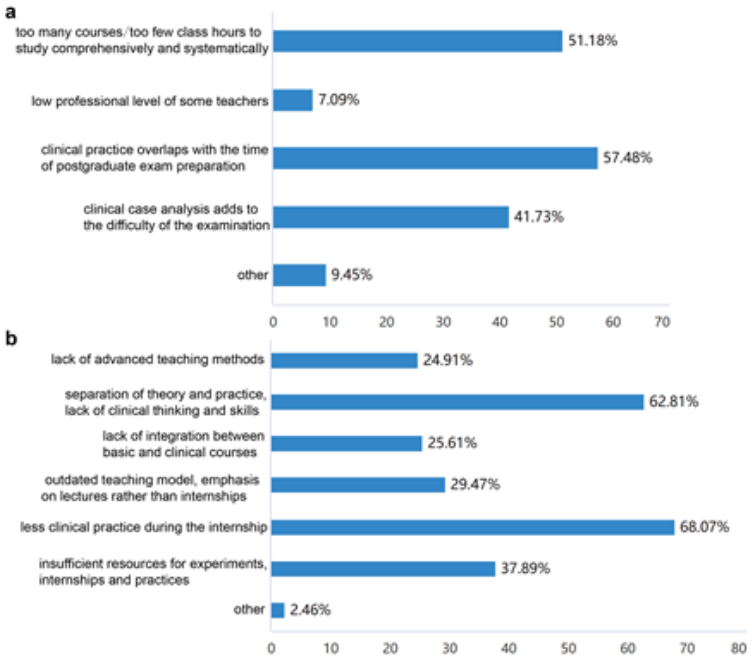

Figure 3. Current situation of basic medicine and clinical medicine education. a: reasons for the low level of knowledge mastery and post competence of medical students; b: the deep-seated problems exist in the teaching of basic medicine and clinical medicine.

Reform Thinking of Integrating the Basic Medicine Course with the Clinical Medicine Course in Comprehensive University

According to the results of the questionnaire survey of medical students, we further interviewed 9 educators. Similarly, they believe that there are some problems that need to be solved in the current medical education of comprehensive universities, which is mainly reflected in the traditional "three-stage" teaching mode (that is, "public basic course - basic medical course - clinical medical course"). This mode divides the knowledge system artificially and restricts the students' overall understanding of human body and disease and the formation of clinical thinking. Therefore, they put forward the suggestion of integrating the basic medicine course with the clinical medicine course, which would not only improve the teaching effect but also shorten the class time and avoid affecting preparation for the graduate examination. We proposed the teaching mode of "organ system as the main line, disease as the center, clinical thinking path as the guide". Here we take "bronchial asthma" as an example to explain how to integrate the curriculum taking advantage of a comprehensive university (Figure 4).

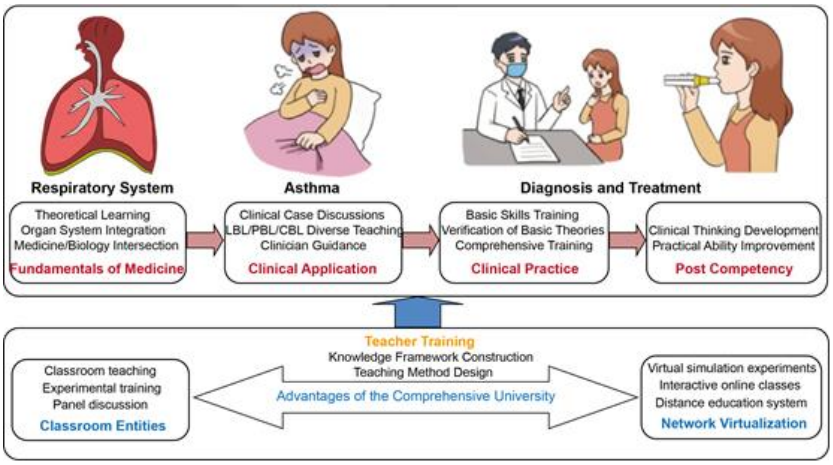

Figure 4. The integrated teaching mode of "organ system as the main line, disease as the center, and clinical thinking path as the guide".

DISCUSSION

Basic medical and clinical medical courses are two core courses in medical education. The former mainly involves basic theories such as anatomy, physiology, biochemistry, and pharmacology, while the latter focuses on practical contents such as body anatomy, disease diagnosis and treatment, and medical ethics [12, 13]. However, the segmented teaching mode separates the basic and clinical courses, disconnects theory and practice, and disintegrates the knowledge of medical students. As medical technology and the field of medicine continue to advance, the traditional division between basic and clinical medical courses is inadequate to meet the needs of students applying basic theory to clinical practice [14, 15]. This situation is prevalent in medical education at comprehensive universities, as we have obtained from the results of the questionnaire.

The integrated teaching mode of "organ system as the main line, disease as the center, and clinical thinking path as the guide" efficiently integrates basic medical courses and clinical medical courses, which can provide students with more practical opportunities, enhance the connection between basic theoretical knowledge and practical skills, improve the comprehensive and practical abilities of medical students, and better meet the needs of society's development for medical talents [16-20]. Of course, the successful implementation of the integrated model focuses on the construction of a comprehensive knowledge framework for teachers and the design of appropriate teaching methods, as well as construction of a comprehensive medical course system, which requires comprehensive universities to use their own advantages to carry out teacher training, and to monitor and feedback the effectiveness of training. Although the integrated teaching mode has been carried out in some medical school, the overall effect needs to be further improved [21]. There are several issues that need to be addressed.

Firstly, the connection between integrated basic and clinical medical courses is not close enough, and students find it difficult to apply basic theoretical knowledge to clinical practice. The primary task to resolve this issue is to enhance the professional quality and teaching abilities of teachers [22]. Comprehensive universities have the advantage of cross-integration of medicine, science and engineering, which is conducive to the construction of knowledge framework and the design of teaching methods for training teachers. During the training process, teachers should continuously communicate and collaborate with other teachers, and constantly improve and perfect the curriculum to ensure that basic medical knowledge and clinical practice can be integrated efficiently, thereby improving the quality of teaching. In addition, it would be beneficial to explore more flexible and diverse teaching methods to better integrate basic and clinical medicine [23, 24].

Secondly, there is still a lack of strong connections between basic and clinical medical courses. This issue can be addressed through communication with experts, clinical facility visits, and other interactive activities. These activities help students to master academic frontiers and current developments of medicine, better understand the clinical practice, and efficiently apply theoretical knowledge learned earlier. Furthermore, schools can establish cooperation relationship with regional hospitals and medical institutions, allowing students to participate in actual diagnosis, treatment work, and help students better understand clinical practice, and apply previously learned theoretical knowledge in practice.

Thirdly, there is a tendency for disconnection between disciplines. In response, the disciplinary system should be improved to emphasize course integrity, and traditional teaching methods need to be changed as much as possible to consider actual student needs and abilities. For instance, interdisciplinary content should be included in the teaching plans to strengthen the connections between different subjects, thus, improving the overall and coherence of the course [25-28].

Fourthly, school educational resources are insufficient to meet student demands. This issue can be resolved by establishing high-quality internship platforms. These platforms can provide students with more opportunities to participate in diagnosis and treatment services, case discussions, surgical observations, and other clinical practice activities, thereby better mastering clinical operational skills [29]. In addition, promoting a practice teaching mode of "learning by doing" can help students better understand academic knowledge and improve their practical abilities [30].

Finally, the school course assessment system should focus more on testing students' practical and comprehensive abilities. The testing methods should be as close to clinical practice as possible to reflect real clinical operational

skills [31]. Moreover, the content of examinations should effectively reflect the study and mastery of the course, thus allowing students to better apply and understand basic theoretical knowledge [32].

To effectively integrate basic medicine and clinical medicine courses, comprehensive universities should strengthen teacher training and professional quality improvement, establish a multi-level course connection, establish internal and external teaching linkage mechanisms, construct a comprehensive medical course system centered on students' clinical abilities, strengthen the discipline evaluation system, and strengthen students' participation in clinical practice activities, thereby improving students' overall quality and health service quality.

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