



ANALYSIS ON THE EFFECT AND INFLUENCING FACTORS OF ONLINE LEARNING FOR MEDICAL UNDERGRADUATES — MEDICAL UNDERGRADUATES OF ADULT HIGHER EDUCATION

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Abstract : This study explored the main factors affecting learning effect and satisfaction by using a sample of 217 valid questionnaires in the form of self-reported questionnaire results from the College of Adult Education of Wenzhou Medical University and the College of Adult Education of Xi'an Medical College. The results showed that: the participants of online lectures for medical undergraduate students were mainly female students under 30 years old, and the highest proportion of them had participated in online lectures before; there were no differences in their learning effect and influencing factors among medical undergraduate students of different genders; there were no differences in their learning effect and influencing factors among medical undergraduate students who had participated in online lectures before or not; medical There was a direct correlation between undergraduate students' online learning effect and influencing factors. Finally, on base of the above findings, the shortcomings of the study and future prospects are proposed.

Keywords: online learning, learning effect, influencing factors, undergraduate medical students.

1.Introduction

1.1Research Background

A doctor is a sacred profession, a science that is closely related to people's lives and health, and China set up schools for people to practice medicine as early as the Tang Dynasty, and anyone who studied medicine was called a doctor. Chinese medicine in the feudal period has always been a "teacher-apprentice system", so Chinese doctors in the feudal period are not common. Doctors are front-line medical workers, and the staff involved have special characteristics, such as high pressure, heavy workload, unstable commuting time, and of course, the influence of family and life's trivialities. Modern doctors, especially during "epidemics", suffer unbearable hardships, including, of course, medical undergraduates, who have a period of internship in China during which the epidemic is spreading around the world and medical students obviously do not have enough time and energy to During this period, when the epidemic was spreading around the world, it was clear that medical students did not have enough time or energy to deal with work and study at the same time, or even to study in full, before they were engaged in the intense work of fighting the virus.

At the date of 26th, December 2022, China's National Health and Wellness Commission announced that the government renamed novel coronavirus pneumonia to novel coronavirus infection. According to the announcement, with the approval of the Chinese State Council which will be effective on January 8th of 2023, the preventive and control measures for novel coronavirus infection under the Prevention and Control of Infectious Diseases Law of the People's Republic of China for Class A infectious diseases will be lifted. Novel coronavirus infection will no longer be contained in the management of quarantine infectious diseases under the Law of the People's Republic of China on the Health and Quarantine of the State Border (Xinhua News Agency, 2022).

Because of the policy adjustment, the learning format of many schools in China has undergone a major shift, and major universities have adjusted from online teaching of online classes during the epidemic to offline teaching mode, and from offline teaching mode to online teaching when the epidemic caused by the inevitable, then there is one kind of medical students whose teaching format has never changed, and this kind of students is another kind of medical undergraduate students, namely medical undergraduates of adult higher education.

"Blended teaching" is not to abandon the traditional teaching mode, but to give full play to the advantages of traditional teaching methods and combine them with the advantages of network teaching. The so-called "hybrid teaching" does not abandon the traditional teaching mode, but makes full use of the advantages of traditional teaching methods and combines them with the advantages of networked teaching, so that the "double-optimal combination" can make full use of the leading role of teachers in inspiring thinking, leading, and monitoring the teaching process, while fully reflecting the initiative of students in the learning process, the enthusiasm of thinking and the creativity of completing tasks. In the era of "Internet +", the teaching reform of medical adult higher education adopts a hybrid teaching mode combining traditional face-to-face and online teaching, offline and online, with the advantages of the Internet, based on the network technology platform, so that high-quality educational resources can be shared and used to improve the quality of education, while also providing students with more convenient learning to truly achieve the purpose of lifelong education and improve the overall quality of health care personnel.

The main reason why such a combination of online and offline forms of teaching exists in Chinese adult education is that the contradiction between work and study is more prominent for this type of students. Among them, the contradiction of adult education medical students is more prominent. These in-service students do not have the pressure of employment, they have more social experience and rich practical experience, but the level of medical basic knowledge varies and is generally not solid enough, they only hope to obtain a diploma as soon as possible to facilitate the promotion of titles, job promotion or treatment, so their strong utilitarianism makes them pay less attention to continuing education learning. In addition, the theoretical basis of their medical-related knowledge before employment is different, which of course differs greatly from the teaching content at different times, but the main thing is that the age span of this type of students is large and their comprehension and memory ability cannot be compared with that of full-time medical education students (He Ma, Jiancheng Hou, Hong Zhang, Cheng Wang, Yanxia Jiang and Wei Zhang, 2018). In the "Internet + education" environment, adult medical higher education has more room for development, and the hybrid teaching mode combining traditional classroom lectures and online learning can not only improve the autonomy of students' learning, but also break the space and time constraints of students in the process of education, effectively alleviate the problem of engineering contradiction, and greatly improved the teaching quality of adult education, realized the diversification of teaching methods and learning methods, and made the teaching system of medical adult higher education continuously improved and developed (Chengmei Ji, 2019).

China's higher education has achieved a breakthrough in the 13th Five-Year Plan period, and the gross enrollment rate of higher education has been rising, reaching 54.4% in 2020, and higher education has entered a new stage of universal development. The core of the quality of higher education is the quality of talent cultivation, and the important index to test the quality of talent cultivation is the learning effect of students. In the practice of ensuring the quality of higher education, the status of college students as the subjects of learning and assessment has been paid more and more attention (Yuxin Chen, 2022). For this reason, it is no longer simply a matter of shifting the assessment of higher education quality from favoring the amount of resource input to focusing on assessing the learning outcomes of students, but also adding weight to assessing the learning effects of students, and the online learning effects and influencing factors of medical undergraduates will be the top priority in the future.

1.2 Motivation of the study

The advent of the Internet era has proposed new requirements for the learning mode of adult education, and the reform of the teaching mode has become a major trend. Because of the development of educational technology, a blended learning approach is replacing the traditional classroom by degrees, which creates a new chance for students who has different ages, grades and levels to sit in the same classroom and who can use media, equipment, tools, technologies and materials that match their previous knowledge and learning styles and arrange them on base of their own learning pace through the use of high-tech equipment such as computers (Xiaoping Cao). The hybrid in-class + online teaching design of mathematics in adult colleges and universities using mobile teaching assistants give the operation process of pre-class self-study stage, in-class teaching stage and post-class evaluation stage, which organically combines students' online self-study and teachers' offline teaching, and well accomplishes the teaching objectives of mathematics in adult colleges and universities, which plays a role in the development of adult college education (Jieqi Zhang and Wang Zhuo, 2019). However, for people who have entered society but lack new knowledge reserves, they need to re-educate only through the adult education mode, and because of time and other reasons, as well as various needs, education methods have become Internet-based, and online education makes people no longer need to go to school, saving a lot of time and costs (Xiaoli Chai, 2019). The group distribution, age differences, gender differences, whether they have participated in online lectures before and the correlation between online learning effect and influencing factors among adult education medical undergraduate students became the motivation for this study.

2.Literature Review

2.1 Research related to adult education

2.1.1 Definition and Concept of Adult Education

The term "adult education" originated from the active development of adult education activities, which was first documented in the Xenophon Encyclopedia, an account of adult education activities in Iran. The literature suggests that a more complete form of adult education began in Europe with the organization of the Compulsory School for the Poor in Britain in 1737, but the term "adult education" did not yet exist. The term "adult education" first appeared in the academic work "The Origin and Development of Adult Schools" by Ball in 1815 in England, and then began to be widely disseminated (Huaiyin Hou and Jianbin

Guo, 2016). In China, "adult education" is an imported term, and "adult" represents the object of education, and in 1911, when Yuanpei Cai was the chief of education of the Republic of China, he attached great importance to the active development of adult education, which started the introduction of the concept of adult education into China. In the early years of the founding of New China, China vigorously developed adult education, but the term "adult education" was not yet used, but was replaced by "worker-peasant education," "social education," and "amateur education. The term "adult education" was not yet used, but was replaced by "worker-peasant education", "social education" and "amateur education". Until 1982, the Department of Adult Education replaced the former Department of Worker and Peasant Education of the Ministry of Education, and the term "adult education" began to be used again in China.

A widely accepted concept of adult education appeared in the Recommendation for the Development of Adult Education adopted at the General Assembly of the 19th United Nations Conference held in Nairobi on November 26, 1976 (Qiuru Han and Xiang Li, 2019). In the Encyclopedia of Education, adult education generally refers to formal, non-formal, informal education for out-of-school youth and adults. At the same time it denotes a concept, a field of study, a field of educational activities including part-time vocational education, re-education, vocational training and self-learning for youth, literacy movements and community development (Chongde Lin, Lu Jiang and Desheng Wang, 1994).

Adult education can be interpreted as an endeavor of institutions of higher learning; as a distinctive relationship, such as that between pedagogy and adult education; as a profession or field of study: as originating in the identification with a social movement; and as a type of education that is distinguished from other kinds of education in terms of its main goals and functions (Courtney, 1991). Darken Wald and Merriam (1982) give the following definition: adult education is a process by which people who have the identity and status of adults from their social roles change their knowledge, attitudes, values, and abilities through systematic learning over time.

2.1.2 Definition of Adult Education

With the emergence and spread of the term "adult education", it has gradually become known and changed over time, and researchers have formed different understandings and opinions from different perspectives. Some researchers have taken a deeper look at the roots and current situation of adult education, ranging from the "roots" of adult education in primitive societies, the "roots" of adult education in national cultures, the "roots" of adult education theories, and the "roots" of adult education from postmodernist perspectives. The researcher explored the problems and "destinations" of adult education in China in four dimensions: the "roots" of adult education in primitive society, the "roots" of adult education in national culture, the "roots" of adult education theory, and the "roots" of adult education in postmodernism perspective (Zhi Yang and Guangquan He, 2010).

From the viewpoint of educational objects, adult education mainly targets "people who have entered adulthood and are regarded as adults by society and have left general education", with a large age span and reflecting a lifelong nature; general education generally targets people under 25 years old, with a relatively concentrated age (Zhi Jin Shi and Yanping Li, 2010). With the continuous development of the connotation and extension of higher education, there are certain distinctions between higher education and adult education, and there is no lack of inextricable connections (Huaiyin Hou and Jianbin Guo, 2016). The source of adult education objects is relatively broad, and the objects of adult education may be separated from the young people of general education, retired elderly people, or staffs who are laid off, unemployed people who are laid off, and also the majority of farmers' groups, state civil servants, etc. Therefore, adult education can satisfy the learning needs of different groups to the maximum extent, and continuously play the educational power for individual development and social development. On the other hand, because of the social nature embedded in the plurality of adult education objects, adult education can penetrate into different types of groups and penetrate into the society at large, and have a profound impact on society (Mingliang Jing, 2013). Other researchers believe that in the existing concepts related to adult education, the specific contents of adult education cannot be exhausted and there are certain omissions, which are mainly manifested in two aspects: first, the existing definitions cannot cover the diversity of adult education contents. Secondly, the existing definitions cannot express the complexity and contemporary nature of the content of adult education (Zhimin Gao, 2000).

Some researchers have defined the concept of adult education from the perspective of the "biological level of adult" education, while others have defined and analyzed adult education from the perspectives of the "sociological level of adult" education, the "psychological level of adult" education, the "legal level of adult" education, and the "comprehensive level of adult" education. There are also studies that define and analyze adult education from different perspectives, such as "sociological adult" education, "psychological adult" education, "legal adult" education, and "comprehensive adult" education. However, the latest research considers that the above description of adult education is too narrow. "Adult education involves all kinds of people, and there is no fixed curriculum for adult education." Defining adults based on a single aspect violates the integrity of adult existence, but it is difficult to grasp when analyzing adults based on a comprehensive perspective, which is a major problem in defining the object of adult education at present (Huaiyin Hou and Xiaodan Wang, 2020).

The researcher tries to use the above method to define the concept of adult education as follows: adult education is an active educational activity carried out in a certain society to meet and promote the needs of adult learning, life and individual development. According to this concept, the following connotations can be found: first, education, including adult education, is a product of social history and changes with the changes in social life; second, the target of adult education is adults with their own practical needs; third, adult education is an educational activity with a purpose, rather than spontaneous learning; fourth, the positive significance of adult education is that it can have a positive influence on the target of educational activities (Tongming Wang, 2016). The most obvious difference between adult education and other kinds of education lies in its educational object; whether the definition of adult education needs to highlight its purposefulness is also a difficult problem in the definition, and there will be different views of purpose for each definer's different understanding of the connotation of adult education; to accurately define the concept of adult education requires the adoption of scientific research and definition methods (Xingzhou Li, Dena Xu and Xiang Geng, 2015).

Summary: In fact, no matter from what perspective, the concept of adult education should reflect the essence of adult education and reveal the fundamental difference between adult education and other education. The content of adult education is complex and evolving, and some regional factors lead to inconsistent perceptions of its specific content, and there will be some obvious differences. A simple general description of adult education is that it is a part-time education that has been separated from full-time study and re-entered school.

2.1.3 The learning style of adult education

The British government attaches great importance to adult education, as it is known as "the world capital of continuing education". In 1840, the British Isaac Pitman started correspondence education, which was defined as the first generation of distance education. With the advancement of science and technology, the Open University, a television education in the UK, came into being from 1971. The Open University in the UK insists on the concept of open teaching, open learning place and open learning object in terms of teaching management. The creation of this form of learning brings out the universalization of distance education as well as lifelong learning. The flexible and diverse models, rich teaching resources, free choice of course system and multi-level teaching methods of the Open University also caused students to affirm it, and they were then able to achieve credit interchange and consequently re-enroll in other schools. After the 20th century, information technology began to flourish, and a large number of media tools were created and widely used in various fields in all walks of life. When the field of education was combined with information technology, the correspondence education abroad was then renamed as Distant Education. There are four ways to receive adult education in the UK - community colleges, open universities, education association training courses and colleges of further education.

Nowadays, the ways of realizing adult higher education in China basically include five major ways, such as radio and television university education, adult higher education, adult higher education held by general colleges and universities, higher education self-study examinations, and education run by social forces (as shown in Figure 2-1). (Department of Adult Education of State Education Commission, 1997).

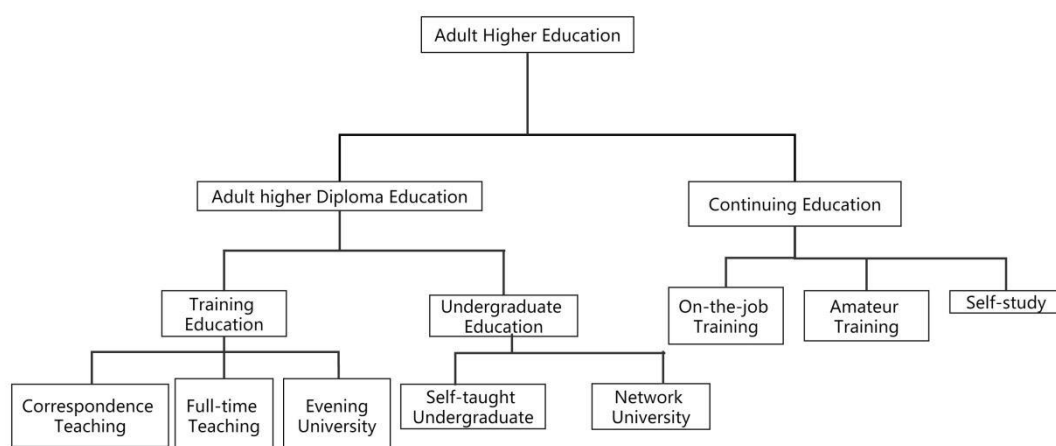


Figure 2-1 Translated from Chinese Map of the realization of adult higher education in China

Correspondence education is the main component of adult higher education in China. For foreign countries, correspondence education is equivalent to distance education, and the corresponding "open university" and "network education" in China can correspond to foreign distance education. Along with the rapid development of Chinese society and economy, the level of Internet technology has been greatly improved and the scope of its application has been increasing, and China has gradually attached importance to adult higher education, and at the same time, the learning mode of adult higher education has been changed and new learning modes have emerged. The Internet era advocates universal learning and common progress and development, and at the same time society has new requirements for people's comprehensive quality and professional ability, and people can only improve the quality of life better by keeping pace with the development of the times, and the traditional learning mode of adult higher education can no longer adapt to the needs of today's social development (Hua Cai, 2019).

Correspondence education occupies an important position in adult education and continuing education in China. Correspondence education is organically composed of several teaching links, and the quality of correspondence education can be ensured by properly implementing each teaching link. This feature determines that correspondence education can only meet the requirements of the development of the times by drawing the essence of network education, enriching and improving its own teaching methods, and network teaching has important practical significance to the reform of correspondence teaching methods. The integration of computer network and teaching is an important part of the modernization of education and teaching, and it is an important teaching means used in correspondence teaching (Lei Feng, Xin Zhang and Chunhui Liang, 2010).

Students in adult higher education off-cycle classes have special characteristics compared with other higher education students in that they have the same mode of study as full-time students in general higher education, but differ significantly in their learning ability. They are essentially adult higher education students, but the structure and age composition of the student body are quite different from those of the non-degree adult higher education classes. (Guijuan Qin and Mingdong Xu, 2011).

Evening university education is one of the earliest forms of contemporary adult education in China, with the People's University of China taking the lead in holding correspondence evening university higher education in 1953. Subsequently, this form of education was gradually carried out in colleges and universities in China, and in 1993, the State Education Commission promulgated the Essentials of Implementation of Correspondence Teaching Process (applicable to evening universities), which set out clear requirements for many aspects of correspondence and evening university education teaching and became the directive regulations for the teaching process of correspondence and evening university education. For a long time correspondence and evening university education has been based on ordinary full-time colleges and universities, not only making full use of the advantageous resources of colleges and universities, but also satisfying the knowledge-seeking needs of scientific and technical personnel and workers in general in the era of knowledge economy, cultivating higher talents in a more economical and more flexible way, and making positive contributions to China's economic construction and talent training (Yan Duan, Meiliang Pan, Wei Wang and Hong Chen, 2007).

The learning mode of evening university, correspondence course and electric university basically belongs to amateur learning, which is a combination of lecture and self-study, and the students' learning time is not compact enough, and the teaching connection is not close enough, thus affecting the teaching effect. Moreover, adult off-job learning can overcome these drawbacks, with rich learning time for students, abundant teaching contents, close connection between courses, more reasonable arrangement of teaching activities such as classes, experiments and internships, longer self-study time for students, and good learning environment, which helps improve the quality of teaching. Distance adult higher education is the product of the combination of adult education, higher education and distance education. It refers to the education in which higher education level is taught to adult learners under the condition that teachers and adult learners are relatively separated in space and time, and schools or other social institutions use various educational technologies and media resources to realize two-way communication between teachers and students, with learners' self-learning as the main body and teachers' assistance as the support (Ying Ji, 1995)

Blended Learning has long been present in traditional teaching and learning. Its original meaning refers to the combination of various learning methods, that is, in the traditional classroom teaching, in addition to the application of the teacher's lecture, laboratory practice, reading books for self-study and other forms of classroom-based learning, but also combined with a variety of other learning methods, such as the application of chalk blackboard traditional learning methods and the application of audio-visual media (slides, projection, video) learning methods, traditional learning methods and computer-assisted learning methods combined, self-learning methods and collaborative learning methods, Combination of self-learning and collaborative learning, etc.

Summary: There are various forms of learning in adult higher education in China, but they cannot be separated from the main "shadow" of network teaching, which is the main body of learning methods in adult higher education in China.

2.2 Studies related to online learning effect of college students

2.2.1 effect of online learning in China

Research on online learning among college students in China started relatively late and was focused on the period before 2019, that is, before the "new crown epidemic". In Shiyong Wu 's (2008) study, which focused on the design of interaction strategies between online and offline learning in distance education, the results indicated that the implementation of interaction between online and offline learning in distance education involves various elements of the teaching process, which is a complex system project. Researcher Yun Zhou (2017) conducted a study on blended teaching, which focused on the interaction characteristics of online learning based on The study on the interactive characteristics of online learning based on QQ groups, and he proposed the view that blended learning is a teaching model that is student-oriented, focuses on cultivating students' independent learning ability and collaboration ability, and combines traditional offline classroom teaching with online learning in online classrooms. Cheng Chen(2019) conducted an in-depth study on the path and strategy of online learning of wisdom teaching, and wisdom teaching as a new teaching method of informationization, intelligence, personalization and integration innovation has received wide attention from the higher education sector in recent years, and the application and promotion of university English wisdom teaching cloud platform in various universities is an inevitable trend of the development of informationization and intelligence in university English education. Yiliang Liu (2019) used a random whole group to extract the first and second year secondary school students of a vocational school in Foshan City as the research subjects, measured and verified the self-efficacy of online learning according to secondary school students, compiled a scale, and recovered a total of 244 valid questionnaires to provide a scientific and effective quantitative tool for the study of online learning of secondary school students. Fujun Zhao, Yuying Li and Ziqi Wu(2019) argued that with the advent of the information age, Internet-based online learning has also become one of the learning styles which are chosen by many learners, and the impact of learning styles on learners' learning effect is crucial, so it is necessary to conduct an in-depth study on the influence of learning styles on online learning effect by both questionnaire and interview methods.

Summary: Although the application of Internet in teaching in China is not late, the research on Internet teaching started late, and the research on the learning effect of online learning has not been covered in depth.

2.2.2 effect of online learning in countries other than China

For the invention and real use of computers is actually not in China, in some foreign countries, ordinary people or students have computers earlier, so the computer application for learning, the relevant research abroad is earlier than China. Shai Ben-David, Eyal Kushilevitz and Yishay Mansour (1997) proposed an offline variant of an error-bound model of learning. It is an intermediate model between the online learning model (Littlestone, 1988, Littlestone, 1989) and the self-directed learning model (Goldman, Rivest & Schapire, 1993, Goldman & Sloan, 1994), and just like the other two models, the offline model in which the learners must learn an unknown concept from a sequence of elements in the instance space, on the basis of which they perform "guess and test" trials. sociocultural context of online learning, the study argues that proponents of online learning claim that it can transform education by facilitating student-centered communication, collaboration, and inquiry. However, these claims must be weighed

against the actual implementation of online learning, which is influenced by a wide range of sociocultural factors (Mark Warschauer, 1998).

Twenty pairs of years ago, researchers in some developed countries outside of China began research related to online learning. Communications technologies (i.e., Internet, videoconferencing, etc.) have propelled distance education to a vibrant and burgeoning field. Online education, which is centered on the use of the Internet and the World Wide Web (Web), presents a new generation of distance learning tools. The online learning environment frees students from the constraints of time and place, and it can be made universally available (Ginger L. Rosenkrans, 1999). In the same year a researcher, Alan J. Cann (1999), created a detailed online questionnaire to provide subjective feedback about user responses. The results of this survey are discussed in the context of using the WWW for teaching and training. As human civilization enters a whole new era beginning in the year 2000, there are even more studies related to online learning, and since more is involved in the assessment or methodology of how to conduct online learning, this study will not be addressed here.

Regarding research related to online learning, this study does not address online learning for students in other professions, so for Online learning: one nurse's experience described by Healy K. (2000) expresses some of the current status of online learning in its infancy. The challenge for the faculty was to find meaningful learning activities to enhance online nursing education. The authors discuss how this technology was implemented and how it was accelerated into the online nursing program (Schmidt Bonnie & Stewart Stephanie. Stewart Stephanie., 2009). Online interactive learning can also help students develop problem solving skills, achieve deeper understanding, and achieve successful online learning outcomes (Leigh Disney & Gretchen Geng. 2010). Shih Yu-Shan, Lee Ting-Ting, Liu Chieh-Yu & Mills Mary Etta. (2013) Online learning is one of the latest initiatives in mainstream medical education. It is considered to provide an efficient and effective alternative learning medium. This study explores the acceptance of online induction programs by new healthcare employees and identifies several key factors that influence online learning outcomes.

Summary: Research related to online learning started relatively early in countries outside of China, and there is a wealth of research related to online learning applied to medical students. The stable position of online learning in the learning medium has been established relatively early.

2.3 effect of online learning for university students during the epidemic

Due to the global spread of the "new coronavirus epidemic" in 2020, many countries have adopted "online teaching" as the main mode of teaching and learning, especially some countries with a large population of "new coronavirus". In particular, some countries with a large population base infected with the "new coronavirus" have been temporarily forced to adopt this mode of teaching. A battle without smoke and mirrors was in full swing; a new term "New Coronavirus" shocked China, as well as teachers and parents of students in primary and secondary schools across the country, and teachers, parents and students were shocked and bewildered when the new school term started. The epidemic is undoubtedly an educational test for China. It is not only a test of schools' and teachers' online teaching abilities, but also a test of principals' strategies in the face of the new situation; overall, it is a litmus test for the level of information technology in school education (Education Test, 2020). With the new crown pneumonia epidemic, a shift from offline to online teaching has occurred in primary and secondary schools nationwide. The initiative has, to a certain extent, protected students' rights to education and alleviated the impact of the epidemic on the normal order of education and teaching (Xiaomei Fan, 2020).

During the special time of the "epidemic", education experts quickly conducted research on the effect of online learning during this special period. The factors influencing online learning of college students during the epidemic are mainly composed of three aspects: emotional influences on online learning, environmental influences on online learning, and social support influences on online learning (Xiang Yu, 2020). Xingju Meng, Li Yu, Tao Peng, Xinyi Cheng, Yang Chen (2020) based on the questionnaire survey of students, teachers and managers involved in online teaching during the epidemic in Maotai College, we conducted an in-depth study on online teaching platform, teaching mode and quality assurance to explore the problems and improvement strategies in platform operation, teachers' teaching and quality monitoring effect of online teaching during the epidemic time, so as to continue The study provides reference and reference for the future development of online teaching. Another study used 457 learners from 39 majors at Zhejiang University as a sample, and analyzed their learning experience and group differences under the special environment of home learning during the epidemic using self-reported questionnaire results, and explored the main factors affecting the learning effect and satisfaction, which showed that learners were satisfied with the online learning experience overall and were willing to take such online courses again (Yixuan Chen, 2021).

Some research results show that medical students learn well online, their satisfaction level is in the middle to upper level, and there are statistical differences in five dimensions, such as lecturer, lecture content, learning platform, online resources, and teacher-student interaction, among which grade, specialty, and ethnicity have an important influence, and measures can be taken to enrich lecture content, improve teacher lecture level, optimize learning platform, etc., to continuously improve medical students' online learning. The quality of online learning for medical students can be improved and experience accumulated for the development of online teaching (Junyan Yang, Wei Wang, Li Zhang and Yingwen Zu, 2021). Another researcher used a stratified whole-group random sampling method and concluded that the online learning effect of medical students is affected by various factors such as learners, teachers, and schools, etc. Schools should improve the online learning supervision system and provide high-quality learning resources, teachers should drive the classroom atmosphere and stimulate students' interest in learning, and students themselves should improve their independent learning and management skills so as to effectively improve online learning effect (Juan Liang, Chunsheng Yang, Hanqiang Guo, Shuang Liu, Lei Lin, Ya Liu, 2023). With the large popularity and application of online courses, online classes will also be an essential part of higher education after the epidemic. Through in-depth interviews with students who took the school's high-quality online courses, we collected feedback from college students to understand their feelings of conducting online learning and their evaluation and suggestions of online classes (Yan Wang, 2023).

Summary: The research related to the effect of online learning for various types of students during the epidemic was fruitful, with a variety of research methods, and the results of the research were very helpful for subsequent changes in online teaching.

Liwen Zeng(2020) analyzed the factors influencing online teaching satisfaction during the epidemic from both teacher and student perspectives. The analysis from the student perspective found that students' time devoted to online learning, using the learning platform to study other online video course resources independently after class, liking online teaching, work and rest habits, and attendance rate had significant effects on the overall evaluation of online teaching. In the analysis from the teachers' perspective, it was found that the way of classroom live streaming, classroom interaction, preparation of contingency plans, and teachers' teaching attitude had significant effects on the overall evaluation of online teaching. On the issue of improving online teaching. Long Zhou (2021) and others compiled and summarized the practical experience of online "college physical education" teaching on the Super Star Learning Platform and suggested that teachers should take the initiative to build high-quality online physical education courses. Xuefeng Hu(2020) suggests building a series of measures to guarantee the quality of online teaching. Wenming Yang (2020) emphasizes strengthening the construction of online quality resources, improving students' learning experience, and doing a good job of process monitoring and information feedback mechanism. Jianping Zhao(2020) emphasized the influence of family education on online education and analyzed it accordingly. Xiulin Ma(2019) et al. proposed a model of group perception effects for improving the quality of online teaching interactions and the persistence of online independent learning in three dimensions: cognitive perception effects, social perception effects, and behavioral perception effects, respectively. Xinyi Lan(2022) pointed out that strengthening online learning learning style, improve online communication between teachers and students, accelerating the construction of supporting facilities for online teaching, and also focusing on the psychological health of college students during the epidemic.

Summary: Among the many related studies, most of them consider the online teaching quality from the perspective of experts, scholars and students, and there are fewer studies that understand the effect of online learning from the perspective of adult education students during the new crown epidemic. After the shift in the global epidemic, little research has been conducted on the online learning effect of adult education medical undergraduate students. This study uses a questionnaire to understand the online learning of undergraduate medical students, and will continue to explore and study in depth the online learning effect and influencing factors of undergraduate medical students after the epidemic era.

3. Research Methodology

3.1 Research Methodology

The survey design of this quantitative study was conducted by means of a questionnaire, by which to understand the effect of online learning of medical undergraduate students and the scale of influencing factors. This study utilized the questionnaire star design software, which contains personal background information and a research questionnaire on the relationship between the effect of online learning of medical undergraduate students and influencing factors, mainly to research the effect of online learning of medical undergraduate students in Zhejiang Province, China and Shanxi Province, China and the influencing factors. The questionnaire was designed to investigate the relationship between the effect of online learning and the influencing factors of medical undergraduate students in Zhejiang Province and Shanxi Province. By collecting the valid questionnaires, counting the relevant data, and analyzing the data with the help of SPSS26.0 statistical software, we hope to obtain reliable data results with a large number of formal valid samples.

3.2 Research structure diagram

The research process of this study is as follows, classified according to each influencing factor of the independent variables and according to online learning effect and learning satisfaction of the dependent variables, which is clearly presented in Figure 3-1. Interest in learning, motivation, attitude towards learning, self-efficacy, learning environment, learning resources, individual learning process and teacher-student and peer interaction were used as independent variables, and medical undergraduates' online learning effect and learning satisfaction were used as dependent variables.

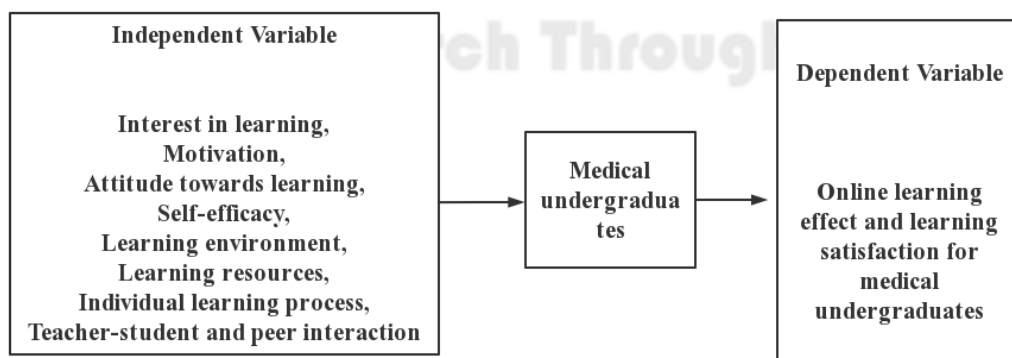


Figure 3-1 Research architecture diagram

3.3 Research tools

In order to investigate the relationship between online learning effect and influencing factors of medical undergraduate students, after searching and reading related literature, and according to the purpose and need of the study, the three main tools used are cell phone software questionnaire Star, "Medical undergraduate students online learning and influencing factors questionnaire" and SPSS26.0 statistical software. Among them, the online learning and influencing factors questionnaire for undergraduate medical students mainly consists of the following three forms: "Personal Basic Information", "Online Learning effect Questionnaire for Undergraduate Medical Students" and "Online Learning Influencing Factors Questionnaire for Undergraduate Medical Students", which are described in detail below.

3.3.1 Basic personal information

This section was compiled by the researcher based on the need for follow-up statistical data. The content mainly contains grade, age, gender, and whether they have participated in online learning before. This section omits the selection of names due to the principle of confidentiality of the participants who answered the questionnaire. It is only used as a reference for the validity of the questionnaire or not.

3.3.2 Online Learning effect Questionnaire for Medical Undergraduates

The online learning effect questionnaire for undergraduate medical students was designed to assess the effect of online learning by individuals who participated in the questionnaire. This study refers to the research scale on the influence of university student learners' characteristics on the effect of online and offline blended learning in Wang Caihua's (2020) doctoral dissertation, the online teaching questionnaire of the Confucius Institute Chinese Interest Class in Sofia used in Sun Xueyi's (2021) master's dissertation, and the online Chinese learning effect questionnaire of international students used in Lai Yuxiu's (2022) master's dissertation. The questionnaire was adapted from the above scales. The main contents include: 5="strongly disagree", 4="disagree", 3="average", 2="agree", and 1="strongly agree", which are divided into 5 levels according to the degree. Because the scale is a compilation of references, this questionnaire has good content reliability and validity, and peer experts have made several revisions and suggestions, which indicates that this scale has a certain level of expert validity. The details of the questionnaire are shown in Appendix I.

The online learning effect survey form for medical undergraduates is divided into 6 constructs of learning interest, learning motivation, learning attitude, learning satisfaction, self-efficacy, and knowledge mastery, with a total of 35 questions. The details are shown in Table 3-2 below.

Table 3-2 Medical undergraduate students' learning effect survey table

Variable Name	Dimension	Number of Questions	Content
Learning effect of medical undergraduates	Interest in Learning	3	1.I am interested in medicine 2.I am interested in online medical specialty courses 8.I think the online courses make me happy and enjoyable
	learning motivation	5	3.I took the online course so that I could pass the medical professional exam and graduate 4.I took the online study to help me with my work in the future 5.I took the online study to help me with my scientific research 6. I joined the online study to learn more about medicine 7. I joined the online study to be able to survive better in my own workplace
	learning attitude	7	9. I put a lot of effort in online classroom learning 10. I am able to complete the online classroom learning tasks assigned by the teacher on time 11. I make a reasonable study plan even without teacher supervision, and I consolidate and summarize my online classroom learning content 12. I can strictly implement the online learning plan I made 13. Even if my online learning environment is a bit noisy, I can adjust my state in time and focus on my study 14. When I encounter difficulties in the online learning process, I encourage myself to overcome them and continue to study
	learning satisfaction	8	15. I am satisfied with the simple operation of the online learning platform designated by the school

			16. I am satisfied with the interface design of the online teaching platform 17. I am satisfied with the design of the functional modules of the online teaching platform 18. I am satisfied with the design of the online course content I am studying 19. I am satisfied with the difficulty setting of the classroom tasks in the online course I am studying 20. I am satisfied with the teaching of my online course instructor 21. I am satisfied with the professionalism of my online tutor 22. I am satisfied with the promptness of my online tutor in answering questions
	self-efficacy	8	23. I think I can learn the subject matter well in my online courses 24. I can easily stick to my learning goals and complete my online learning tasks 25. In most cases, I am confident that I will answer the questions that the teacher asks me to answer, and I think I will answer correctly 26. I can keep myself focused on my studies even if I am not supervised in online classes 27. I am able to complete my online course assignments accurately 28. I can submit my online course assignments on time 29. I am able to attend each online class on time and within the school schedule 30. I can find a peer to participate in mutual evaluation after the online class
	mastery of knowledge	5	31. Online learning has improved my medical professional knowledge 32. Online learning has improved my accuracy in expressing medical terminology 33. Online learning has improved my medical (practice) ability 34. Online learning has improved my medical insight 35. Online learning has satisfied my learning needs, and I will actively participate in the future

3.3.3 Online Learning Influencing Factors Scale

Online learning influencing factors are multi-influential, and various influencing factors of learning can affect online learning and then influence learning outcomes to some extent. In this study, we refer to the contents of the questionnaire of the survey on the effect and influencing factors of online learning among college students during the new crown pneumonia epidemic by Xinyi Lan and Yu Chen (2022); we refer to the contents of the questionnaire used by Hongxiang Chen, Shan Yang, Wenjun Zhang, Xiaohan Ma, and Weiguang Ma (2021) on the current situation and influencing factors of time management tendencies of undergraduate nursing students during online learning; we refer to the questionnaire of the study by Feng Zhao, Suzhen Guan, and Zhihong Liu (2022), a questionnaire related to the analysis of preventive medicine undergraduate students' independent learning ability and influencing factors in the context of an epidemic; and the questionnaire used in the study of factors influencing college students' online learning quality by Huang Xiaolong, Feng Yan, Jiang Lu, and Wu Jiaqing (2021), which was partially modified from the above scales. The main content contains: the answers to the questions related to the factors influencing the online learning of college students. There are 15 options for the influencing factors, and each question option is divided into 5 levels according to the degree from 5="strongly disagree", 4="disagree", 3="average", 2="agree", and 1="strongly agree". Because the scale is a compilation of references, this questionnaire has good content reliability and validity, and peer experts have made several revisions and suggestions, which indicates that this scale has a certain level of expert validity. The specific contents of the questionnaire are detailed in Appendix I.

The Online Learning Influencing Factors Scale for Medical Undergraduates is divided into four dimensions: learning environment, learning resources, individual learning process, and teacher-student and peer interaction, with a total of 15 questions. The details are shown in Tables 3-3 below.

Table 3-3Online learning influence factor scale

Variable Name	Dimension	Number of Questions	Content
Influencing factors of online learning	Learning environment	7	1. The quality of the network during online learning 6. My spouse affects the effect of my online learning 7. My minor children affect the effect of my online learning 8. I have multiple children, so I often don't have time for online learning 9. I have an elderly person to support, so I often don't have time to participate in online learning 10. My work is often very busy, so I have no time to study 12. I don't really want to study this profession, so sometimes I don't care
	Learning resources	2	14. The type of teaching software is not rich enough (or the software is too complicated) 15. Lack of fixed learning equipment, need to frequently change the equipment to learn
	Individual learning process	5	2. Enjoyment of online teaching and face-to-face classroom teaching by teachers 3. Whether you often experience physical discomfort during online learning, such as dry eyes, dizziness, shoulder and neck pain, etc. 4. How much you like your major 11. Poor self-control, using the time that should be spent on studying for fun 13. I don't agree with the mode of online teaching
	Teacher-student and peer coaching	1	5. The learning atmosphere of the class

3.3.4 Implementation procedures

In order to protect the rights and privacy of the research subjects, the questionnaire was administered anonymously, and all personal information was kept strictly confidential. The implementation procedures were as follows:

(i) Preparation stage:

After the formal questionnaire scale was finalized, the questionnaire questions were imported into the WeChat Questionnaire Star app and released and 250 electronic questionnaires were edited for distribution.

(ii) Implementation phase:

The researcher will distribute the questionnaire on March 1, 2023, inviting colleagues and friends to help distribute and answer the questions to the study participants in this study.

(iii) Recovery phase:

To improve the efficiency of questionnaire collection, the researcher set the deadline for answering the official questionnaire to March 20, 2023, and collected all questionnaires on the deadline date.

3.4 Sample selection method

In order to obtain data for this study to facilitate the organization, save manpower, material and time, and easily control the quality of the survey, the whole group sampling method was used in 2 areas of Wenzhou Medical College in Zhejiang Province and Xi'an Medical College in Shaanxi Province, which was done mainly to facilitate the implementation of the calculation of the mean and its standard error. The questionnaire distribution was mainly in the form of simple random distribution of questionnaires in each university using Questionnaire Star, in order to obtain enough relevant data to ensure that the data analysis to obtain useful data for this study.

3.5 Scope of the Study

This section discusses the scope of the study with respect to the object of this study, the research variables and the methodology of the study, which is described as follows:

This study will randomly take two of medical universities according to the Chinese medical universities and college comprehensive strength ranking table, which is Wenzhou Medical University and Xi'an Medical college. Wenzhou Medical University School of Continuing Education undergraduate students who learn pharmacy subject are the main research object, and Xi'an Medical College

of Shanxi Province School of Continuing Education undergraduate students who learn pharmacy subject are the auxiliary research object. This study mainly explores the study of online learning effects of medical undergraduate students and learning influencing factors and other correlations. Wenzhou Medical University is a provincial general higher education school in Zhejiang Province. The school can be traced back to Zhejiang Medical College, which was founded in 1912, and was established in August 1958 by Zhejiang Medical College, which was moved from Hangzhou to Wenzhou, initially named "Zhejiang Second Medical College" and later named "Wenzhou Medical College" after the location of the school. It was renamed "Wenzhou Medical University" in 2013, and became a university jointly built by Zhejiang Provincial Government, National Health Commission and Ministry of Education in 2015, and a key university in Zhejiang Province in 2017. The university has formed a comprehensive and multi-level talent cultivation system from undergraduate to master, doctoral and post-doctoral students, from full-time to adult education, international students and students from Hong Kong, Macao and Taiwan. The quality of talent cultivation has been steadily improved, and the passing rate of clinical medicine graduates taking the National Qualifying Examination for Medical Practitioners has been ranked in the top 10% nationwide. Xi'an Medical College is a full-time general undergraduate institution organized by the provincial government, consisting of the Hanguang Campus, Weiyang Campus and Gaoxin Campus. The school was formerly known as Shanxi Provincial Health Technical School in 1951, renamed as Shanxi Xi'an Health School in 1959, and established as Shaanxi Health Cadre Training College on the basis of this school. 1994, the State Education Commission approved the establishment of Shanxi Medical College, which was upgraded to an undergraduate institution and renamed as Xi'an Medical College in February 2006 with the approval of the Ministry of Education.

4. Results and Discussion

4.1 Narrative statistics

This study took Wenzhou Medical University and Xi'an Medical College medical undergraduate students as the research sample, 250 questionnaires were sent out, 217 valid questionnaires were recovered, of which 217 valid usable questionnaires, 0 invalid questionnaires, the number of valid percentages 100%. On the basis of the number of statistical variables, the students' grade distribution, age distribution, gender distribution, whether they had previously participated in online courses, and the statistical results and other messages, the statistics are organized as follows Table 4.1:

Table 4.1 Basic information sample description (sample distribution table)

Sample Description (Sample Distribution)					
		Number of people	Percentage	Effective percentage	Cumulative percentage
Grade Distribution	Freshman year	65	30.0	30.0	30.0
	Sophomore	51	23.5	23.5	53.5
	Junior	51	23.5	23.5	77.0
	Graduated	50	23.0	23.0	100.0
Age Distribution	17-25 years old	122	56.2	56.2	56.2
	25-30 years old	53	24.4	24.4	80.6
	30-35 years old	20	9.2	9.2	89.9
	Over 35 years old	22	10.1	10.1	100.0
Gender distribution	male	79	36.4	36.4	36.4
	female	138	63.6	63.6	100.0
if participate in an online course before?	Yes	204	94.0	94.0	94.0
	no	13	6.0	6.0	100.0

4.2 Independent samples t-test

This section will show the t-test data analysis between the online learning effects and the influencing factor variables among medical undergraduate students of different genders and whether they had previously participated in online courses or not, respectively.

4.2.1 Analysis of t-test of online learning effect and influencing factors variables among medical undergraduate students of different genders

In this section, independent sample t-tests were used to test the differences between online learning effects and influencing factors among medical undergraduates of different genders.

According to Table 4-2, there was no significant difference in the characteristics of online learning effect and influencing factors between the undergraduate medical students of different genders, and the overall magnitude of the difference was very small.

The mean value of "interest in learning" for female and male was 1.954/2.068 respectively; the p-value of the significance result was 0.415, so the statistical result was not significant, indicating that there was no significant difference between female and male in interest in learning; the Cohen's d-value of the difference was 0.115, and the difference was very small.

The mean values of female and male on "learning motivation" are 1.812/2.078 respectively; the p-value of the significant result is 0.050**, therefore, the statistical result is significant, indicating that there is a significant difference between female and male on learning motivation; the Cohen's d value of the difference is 0.278, which is a small difference.

The mean values of female and male on "learning attitude" are 1.995/2.097 respectively; the p-value of the significant result is 0.456, so the statistical result is not significant, which means that there is no significant difference between female and male on learning attitude; the Cohen's d value of the difference is 0.105, which is a very small difference.

The mean values of female and male on "learning satisfaction" are 1.943/2.055 respectively; the p-value of the significant result is 0.403, so the statistical result is not significant, which means that there is no significant difference between female and male on learning satisfaction; the Cohen's d value of the difference is 0.118, which is a very small difference.

The mean values of female and male on "self-efficacy" are 1.956/2.152 respectively; the p-value of the significant result is 0.154, therefore the statistical result is not significant, indicating that there is no significant difference between female and male on self-efficacy; the Cohen's d value of the difference magnitude is 0.202, the difference magnitude is small.

The mean values of "learning effect" for females and males were 1.968/2.091; the p-value of the significance result was 0.397, so the statistical result was not significant, indicating that there is no significant difference between females and males in learning effect; the Cohen's d value of the magnitude of the difference was 0.12, which is very small.

The mean values of female and male on "learning environment" are 2.745/2.508 respectively; the p-value of the significant result is 0.118, so the statistical result is not significant, which indicates that there is no significant difference between female and male on learning environment; the Cohen's d value of the difference magnitude is 0.222, and the difference magnitude is small.

The mean values of female and male on "learning resources" are 2.815/2.557 respectively; the p-value of the significant result is 0.135, so the statistical result is not significant, which indicates that there is no significant difference between female and male on learning resources; the Cohen's d-value of the magnitude of difference is 0.212, which is a small difference.

The mean values of female and male on 'individual learning process' were: 2.513/2.461; the p-value of the significance result was 0.688, therefore the statistical result was not significant, indicating that there is no significant difference between female, male on individual learning process; the magnitude of their difference Cohen's d value was: 0.057, which is a very small difference.

The mean values of "teacher-student and peer interaction" for females and males were: 2.014/2.165; the p-value of the significance result was 0.326, therefore the statistical result was not significant, indicating that there is no significant difference between females, males on teacher-student and peer interaction; the magnitude of their difference Cohen's d value was: 0.139, the magnitude of the difference was very small.

Table 4-2 Independent sample t-test for gender

Variable Name	Variable Value	Sample Size	Mean	Standard Deviation	t	P	Mean Difference	Cohen's d Value
Interest in Learning	Female	138	1.954	0.903	-0.816	0.415	0.114	0.115
	male	79	2.068	1.114				
	total	217	1.995	0.984				
Learning Motivation	Female	138	1.812	0.878	-1.972	0.050**	0.266	0.278
	male	79	2.078	1.088				
	total	217	1.909	0.966				
Learning Attitude	Female	138	1.995	0.921	-0.746	0.456	0.102	0.105
	male	79	2.097	1.044				
	total	217	2.032	0.967				
Learning satisfaction	Female	138	1.943	0.87	-0.838	0.403	0.112	0.118
	male	79	2.055	1.08				
	total	217	1.984	0.951				
Self-efficacy	Female	138	1.956	0.889		0.154	0.196	0.202

	male	79	2.152	1.102	-1.432			
	total	217	2.027	0.974				
Learning effect	Female	138	1.968	0.964	-0.849	0.397	0.123	0.12
	male	79	2.091	1.129				
	total	217	2.013	1.026				
Learning Environment	Female	138	2.745	1.05	-1.57	0.118	0.237	0.222
	male	79	2.508	1.107				
	total	217	2.659	1.074				
Learning Resources	Female	138	2.815	1.168	-1.5	0.135	0.258	0.212
	male	79	2.557	1.306				
	total	217	2.721	1.224				
Individual Learning Process	Female	138	2.513	0.879	-0.402	0.688	0.052	0.057
	male	79	2.461	0.991				
	total	217	2.494	0.92				
Teacher-student and peer interaction	Female	138	2.014	1.004	-0.985	0.326	0.151	0.139
	male	79	2.165	1.203				
	total	217	2.069	1.08				
Note: ***, **, * respectively represent 1%, 5%, 10% significance levels.								

4.2.2 T-test analysis of online learning effects and influencing factors for medical undergraduates with or without previous participation in online learning courses

In this section, independent sample t-tests were used to test the differences between the effect of online learning and the influencing factors among medical undergraduates who had attended online learning courses before.

According to Table 4-3, there is no significant difference between the online learning effect and the influencing factors of medical undergraduates with or without previous participation in online learning courses, and the magnitude of the difference is very small overall.

Table 4-3 Independent sample t-test for whether or not the course was previously taken online

Variable Name	Variable Value	Sample Size	Mean	Standard Deviation	t	P	Mean Difference	Cohen's d
Interest in Learning	Yes	204	1.987	0.999	-0.501	0.617	0.141	0.143
	No	13	2.128	0.74				
	total	217	5.986	2.953				
Learning Motivation	Yes	204	1.914	0.983	-0.3	0.765	0.083	0.086
	No	13	1.831	0.663				
	total	217	1.909	0.966				
Learning Attitude	Yes	204	2.028	0.981	-0.27	0.787	0.075	0.077
	No	13	2.103	0.722				
	total	217	2.032	0.967				
Learning satisfaction	Yes	204	1.987	0.962	-0.2	0.842	0.054	0.057
	No	13	1.933	0.775				
	total	217	1.984	0.951				
Self-efficacy	Yes	204	2.028	0.992	-0.03	0.976	0.009	0.009
	No	13	2.019	0.647				

	total	217	2.027	0.974				
Learning effect	Yes	204	2.019	1.042	0.325	0.746	0.096	0.093
	No	13	1.923	0.773				
	total	217	2.013	1.026				
Learning Environment	Yes	204	2.66	1.091	0.075	0.941	0.023	0.021
	No	13	2.637	0.809				
	total	217	2.659	1.074				
Learning Resources	Yes	204	2.701	1.235	0.964	0.336	0.337	0.276
	No	13	3.038	1.01				
	total	217	2.721	1.224				
Individual Learning Process	Yes	204	2.479	0.935	0.926	0.355	0.244	0.265
	No	13	2.723	0.614				
	total	217	2.494	0.92				
Teacher-student and peer interaction	Yes	204	2.093	1.095	1.299	0.195	0.401	0.372
	No	13	1.692	0.751				
	total	217	2.069	1.08				
Note: ***, **, * respectively represent 1%, 5%, 10% significance levels.								

The mean values of engaged, not engaged in terms of interest in learning were: 1.987/2.128; the p-value of the significant result was 0.617, therefore the statistical result was not significant, indicating that there is no significant difference between engaged, not engaged in terms of interest in learning; the magnitude of their difference Cohen's d value was: 0.143, the magnitude of the difference was very small.

The mean values of participated and not participated in learning motivation are 1.914/1.831 respectively; the p-value of the significant result is 0.765, so the statistical result is not significant, indicating that there is no significant difference between participated and not participated in learning motivation; its difference magnitude Cohen's d value is: 0.086, the difference magnitude is very small.

The mean values of participated and not participated in learning attitudes are 2.028/2.103 respectively; the p-value of the significant result is 0.787, so the statistical result is not significant, indicating that there is no significant difference between participated and not participated in learning attitudes; its difference magnitude Cohen's d value is: 0.077, the difference magnitude is very small.

The mean value of participated, not participated in learning satisfaction is 1.987/1.933 respectively; the p-value of the significant result is 0.842, therefore the statistical result is not significant, indicating that there is no significant difference between participated, not participated in learning satisfaction; its difference magnitude Cohen's d value is: 0.057, the difference magnitude is very small.

The mean values of participated, not participated in self-efficacy are: 2.028/2.019 respectively; the p-value of the significant result is 0.976, so the statistical result is not significant, indicating that there is no significant difference between participated, not participated in self-efficacy; its difference magnitude Cohen's d value is: 0.009, the difference magnitude is very small.

The mean values of participated and not participated in the learning effect are 2.019/1.923 respectively; the p-value of the significant result is 0.746, so the statistical result is not significant, indicating that there is no significant difference between participated and not participated in the learning effect; its difference magnitude Cohen's d value is: 0.093, the difference magnitude is very small.

The mean values of participated, not participated in the learning environment are: 2.66/2.637 respectively; the p-value of the significant result is 0.941, therefore the statistical result is not significant, indicating that there is no significant difference between participated, not participated in the learning environment; its difference magnitude Cohen's d value is: 0.021, the difference magnitude is very small.

The mean value of involved, not involved in learning resources is: 2.701/3.038 respectively; the p-value of the significant result is 0.336, therefore the statistical result is not significant, indicating that there is no significant difference between involved, not involved in learning resources; its difference magnitude Cohen's d value is: 0.276, the difference magnitude is small. Involved, not involved in the individual learning process mean values are: 2.479/2.723 respectively; the significance result p-value is 0.355, so the statistical result is not significant, indicating that involved, not involved in the individual learning process does not have a significant difference; its difference magnitude Cohen's d value is: 0.265, the difference magnitude is small.

The mean value of participated, not participated on teacher-student and peer interaction was: 2.093/1.692, respectively; the p-value of the significant result was 0.195, therefore the statistical result was not significant, indicating that there is no significant difference between participated, not participated on teacher-student and peer interaction; its difference magnitude Cohen's d value was: 0.372, the difference magnitude was small.

4.3 Regression Analysis

This section will show the learning satisfaction of regression analysis and the learning effect of regression analysis respectively.

4.3.1 Regression Analysis - Learning Satisfaction

According to Table 4-4 Model Summary and Table 4-5 Variance and Table 4-6 Coefficient Analysis, the analysis of the results of the F-test can be obtained that the significance P-value is 0.000***, which presents significance at the level and rejects the original hypothesis that the regression coefficient is 0. Therefore, the model basically meets the requirements.

The formula of the model is as follows: $y = 0.065 + 0.134 \times \text{interest in learning} + 0.194 \times \text{motivation to learn} + 0.226 \times \text{attitude to learn} + 0.403 \times \text{self-efficacy} + 0.085 \times \text{learning environment} - 0.033 \times \text{learning resources} - 0.1 \times \text{individual learning process} + 0.058 \times \text{teacher-student and peer interaction}$.

Table 4-4 Model Summary

Model	R	R ²	Adjusted R ²	Errors in Standard Estimation
1	0.959 ^a	0.920	0.916	0.274756
a. Predictor variables: (constants), teacher-student and peer interaction, learning resources, learning motivation, learning environment, learning attitude, individual learning process, interest in learning, self-efficacy				

Table 4-5 ANOVA

Model		Sum of Squares	Degrees of Freedom	Mean Square	F	Statistical Significance
1	Regression	179.523	8	22.440	297.259	0.000 ^b
	Residuals	15.702	208	0.075		
	Total	195.225	216			
a. Dependent variable: learning satisfaction						
b. Predictor variables: (constants), teacher-student and peer interaction, learning resources, learning motivation, learning environment, learning attitudes, individual learning process, interest in learning, self-efficacy						

Table 4-6 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Statistical Significance	Colinearity Statistics	
		B	Standard Error	Beta			Tolerance	VIF
1	Constant	0.065	0.056		1.148	0.252		
	Interest in Learning	0.134	0.053	0.138	2.530	0.012	0.1305	7.71
	Learning Motivation	0.194	0.047	0.197	4.136	0.000	0.1714	5.85
	Learning Attitude	0.226	0.058	0.230	3.910	0.000	0.1129	8.95
	Self-efficacy	0.403	0.064	0.413	6.321	0.000	0.09131	11.0
	Learning Environment	0.085	0.040	0.096	2.122	0.035	0.1900	5.25
	Learning Resources	-0.033	0.028	-0.043	1.206	0.229	0.3082	3.24
	Individual learning process	-0.100	0.054	-0.096	1.858	0.065	0.1440	6.96
	Teacher-student and peer interaction	0.058	0.034	0.066	1.698	0.091	0.2571	3.89
a. Dependent variable: learning satisfaction								

4.3.2 Regression analysis - learning effect

Based on Table 4-7 Model Summary and Table 4-8 Variance and Table 4-9 Coefficient Analysis, it can be seen that the analysis of the results of the F-test can be obtained that the significance P-value is 0.000***, which presents significance at the level and rejects the original hypothesis that the regression coefficient is 0. Therefore, the model basically meets the requirements.

The formula of the model is as follows: $y = -0.15 + 0.187 \times \text{interest in learning} + 0.146 \times \text{motivation to learn} + 0.072 \times \text{attitude to learn} + 0.485 \times \text{self-efficacy} + 0.048 \times \text{learning environment} - 0.014 \times \text{learning resources} + 0.023 \times \text{individual learning process} + 0.113 \times \text{teacher-student and peer interaction}$.

Table 4-7 Model Summary

Model	R	R ²	Adjusted R ²	Errors in standard estimation
1	0.948 ^a	0.899	0.895	0.3318
a. Predictor variables: (constants), teacher-student and peer interaction, learning resources, learning motivation, learning environment, learning attitude, individual learning process, interest in learning, self-efficacy				

Table 4-8 ANOVA

Model		Sum of Squares	Degrees of Freedom	Mean Square	F	Statistical Significance
1	Regression	204.580	8	25.573	232.237	0.000 ^b
	Residuals	22.904	208	0.110		
	Total	227.484	216			
A. Dependent variable : learning effect						
b. Predictor variables: (constants), teacher-student and peer interaction, learning resources, learning motivation, learning environment, learning attitudes, individual learning process, interest in learning, self-efficacy						

Table 4-9 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Statistical Significance	Collinearity Statistics	
		B	Standard Error	Beta			tolerances	VIF
1	Constant	-0.150	0.068		-2.202	0.029		
	Interest in Learning	0.187	0.064	0.180	2.942	0.004	0.130	7.715
	Learning Motivation	0.146	0.057	0.137	2.574	0.011	0.171	5.854
	Learning Attitude	0.072	0.070	0.068	1.031	0.304	0.112	8.959
	Self-efficacy	0.485	0.077	0.461	6.305	0.000	0.091	11.031
	Learning Environment	0.048	0.048	0.050	0.987	0.325	0.190	5.250
	Learning Resources	-0.014	0.033	-0.017	-0.426	0.670	0.308	3.242
	Individual learning process	0.023	0.065	0.021	0.360	0.719	0.144	6.960
	Teacher-student and peer interaction	0.113	0.041	0.119	2.748	0.007	0.257	3.891
a. Dependent variable: learning effect								

4.4 Credibility Analysis

4.4.1 Reliability Analysis

Reliability analysis is a method used to assess the reliability and consistency of a survey questionnaire or scale. The results of reliability analysis can be expressed in terms of reliability coefficients, which are usually calculated using Cronbach's alpha value or fold-half reliability, the larger the reliability coefficient, the more stable and accurate the measurement results are.

In general, the value of Cronbach's alpha coefficient of the scale should be at least 0.6, if it is lower than 0.6, the reliability of the scale is poor and the questionnaire needs to be revised or reissued. The values of Cronbach's alpha correspond to the following Tables 4-10 and 4-11.

Table 4-10 Correspondence of the values of Cronbach's alpha

0.60-0.65	0.65-0.70	0.70-0.80	0.80-1.00
Basically not accepted	Minimum Acceptable Value	Pretty good	Excellent

The results of the reliability analysis of this questionnaire are shown in Table 4-11.

Table 4-11 Results of the reliability analysis of the questionnaire

Cronbach's Alpha	Number of items
0.983	50

According to the results of the reliability analysis of the questionnaire in this study in Table 4-11, the clone Bach Alpha of this questionnaire was 0.983, which reached a very good level, indicating that the questionnaire has good internal consistency and reliability. Therefore, we can assume that this questionnaire is suitable for the purpose of this study.

4.4.2 Validity Analysis

Validity analysis is a method used to assess the validity and applicability of a research method or instrument. The results of a validity analysis can be expressed as a coefficient of effect or effect size, which is usually calculated using Cohen's d or eta-squared. The larger the effect size, the more effective and applicable the research method or tool is.

In general, the KMO value should be 0.6 or higher, and if it is lower than 0.6, it indicates that the question items need to be reworked or the questionnaire reissued. The numerical correspondence of KMO values is shown in Tables 4-12 and 4-13 below.

Table 4-12 Correspondence of values of KMO values

0-0.5	0.5-0.59	0.6-0.69	0.7-0.79	0.8-1.0
Unacceptable	Reluctantly accepted	General acceptance	Good	Excellent

The results of the effect analysis of this questionnaire are shown in Table 4.13 below.

Table 4-13 Results of questionnaire validity analysis

KMO Sampling suitability quantity		0.973
Bartlett's sphericity test	Approx. Chi-Square	13168.624
	Degree of freedom	1225
	Statistical significance	0.000

According to the results of the questionnaire validity analysis in Table 4-13above, the KMO value of this questionnaire was 0.973, which reached a very good level, indicating that the method or instrument has a good amount of effect. Therefore, we can assume that the questionnaire is suitable for the purpose of this study.

4.5 Correlation analysis

The correlation analysis focuses on the direct correlation between the online learning effect of medical undergraduates and the factors. According to the literature, correlation coefficients between .60 and .79 are "high correlation", correlation coefficients between .40 and .59 are "moderate correlation", and correlation coefficients between .20 and .39 are "low correlation", and the data of correlation analysis in this study are shown in Table 4-14. The correlation coefficient of the influencing factors in the second part of the questionnaire and the third part of the questionnaire is 0.651, and the p-value is 0.000, which indicates a significant positive correlation.

Table 4-14 Correlation analysis table

		The second part	The third part
The second part	pearson correlation	1	0.651**
	sig.(2-tailed)		.000
	Number of cases	217	217
The third part	pearson correlation	0.651**	1
	sig.(2-tailed)	.000	
	Number of cases	217	217
**. Significant correlation at the 0.01 level (2-tailed).			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5. Conclusion, Suggestions, Shortcomings and Prospects

5.1 Conclusion

The program of this chapter is to synthesize the results of the previous studies as well as the findings, and to analyze and summarize them. This study takes Wenzhou Medical University and Xi'an Medical College as the main research subjects, and uses the questionnaire method to carry out a comprehensive analysis using the statistical software spss26.0, and mainly draws the following conclusions.

In response to this study's question one, the differences in the age distribution and gender ratio of medical undergraduate students' online learning subjects and whether they have participated in online lectures were explored, and the conclusions of this study are as follows:

The participants of online lectures for undergraduate medical students were mainly female students under 30 years old, with the highest proportion of students who had participated in online lectures before.

In response to this research question two, the gender differences in online learning of medical undergraduate students were explored in relation to the effect and influencing factors of online learning, and the conclusions of this study are as follows:

There is no difference in the effect and influencing factors of online learning among medical undergraduate students by gender.

In response to this research question three, whether medical undergraduates' online learning had previously participated in online learning on the online learning effect and influencing factors related to the investigation, the conclusion of this study is as follows:

There was no difference in the effect of online learning and influencing factors for medical undergraduate students who had previously participated in online lectures.

In response to this research question four, the correlation between the learning effects and influencing factors of online learning of medical undergraduate students was explored, and the conclusions of this study are as follows:

There is a direct correlation between the online learning effect of medical undergraduate students and the influencing factors.

5.2 .Research Shortcomings and Recommendations

From the findings in the previous section, this section will describe the direction of the deficiencies of this study and review the whole study to suggest that there are still some deficiencies in it.

5.2.1 Deficiencies and Suggestions of the Research Scope

From the scope of the research, the case institutions are two medical schools, Wenzhou Medical University and Xi'an Medical College, which are not from the same province, and there may be some differences in the performance of the policies of the two universities for education management due to the differences between the geographical areas of China. The conclusions drawn from this study may not be applicable to other medical undergraduate online taught adult higher education students in China. It is recommended that future studies increase the number of study participants in the same province and geographic area.

5.2.2 Deficiencies and suggestions of the study participants

In accordance with the study participants, the participants in this study were the adult education colleges of Wenzhou Medical University and Xi'an Medical College, respectively, and no questionnaires were collected from online learners of medical specialists, and the conclusions drawn from this study cannot be applied to other adult higher education students taught online by medical specialists in China. It is suggested that subsequent researchers can conduct related studies on medical specialist students, or other levels.

5.2.3 Shortcomings and Suggestions on the timing of the study

Due to the late opening of China's measures for the prevention and control of the "new crown epidemic", the students may have misunderstood the learning pattern during the "epidemic", which led to the bias of the questionnaire data collection. The researcher can conduct another study in the next few years to prove the accuracy of this study. Therefore, the conclusions drawn from this study may not necessarily be the true feedback of the current online learning effect and influencing factors of the students in undergraduate medical adult education colleges. It is suggested that increasing the sample size from different colleges in the future, after the online learning platform is integrated into the learning life on a regular basis, may yield more valid and accurate results.

5.2.4 Shortcomings and Suggestions of the Self-Reporting Approach

The measurement of online learning effects and influencing factors of medical undergraduates in this study used a self-reporting approach to answer questions through a questionnaire, and its selection is more subjective. If the average grades of learners in face-to-face classroom learning and online course learning in the school's academic system can be obtained and compared, it can more objectively and accurately reflect the research on the correlation between online learning effects and influencing factors of medical undergraduates. It is recommended that future researchers add a research study method, such as interview method, etc.

5.2.5 Shortcomings and suggestions of the learning environment section

The learning environment section of the questionnaire in this study is affected by the choice of options for the online learning effect by children, multiple minor children, taking care of multiple children, having elderly people to support, and major not being what they want to study section. It is suggested that future researchers can add self-administered options by the participants of the questionnaire so that the participating researchers can express their own ideas and actual situations.

5.3 Prospects for future research

Although this study has several shortcomings, it can help us understand the situation of online learning effect of medical undergraduates in universities at this stage, and can provide some implications for adult education related administrators to improve teaching. Future research could compare the differences in the effect of online learning among medical undergraduates and the factors influencing it among participants of different majors with respect to the differences in the nature of courses in different majors.

At the same time, future studies need to increase the sample size and expand the sample to other types of universities or groups of learners, covering all academic periods and using online learners from different schools as research subjects for a more comprehensive scientific study.

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