

Innovative development ideas of web-based medical teaching during the COVID-19 epidemic

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Abstract. – OBJECTIVE: In response to the sudden COVID-19 epidemic outbreak, China's Ministry of Education proposed "continuing teaching and learning regardless of suspending classes" to provide "available courses and teachers" for students. Web-based teaching has become the main teaching method of medical colleges and universities during the COVID-19 epidemic period. Before the outbreak, the concept and technology of web-based teaching had been partially implemented. The epidemic situation has promoted the implementation of large-scale web-based teaching and the multidimensional development of education in China. Furthermore, there are higher requirements for information teaching. Teachers and students cannot adapt to the web-based teaching mode. The lack of interaction is a problem in the web-based teaching. To adapt to the rapid development of information technology, medical colleges and universities must consider the COVID-19 epidemic as an opportunity to quickly update educational concepts, train teachers' Internet thinking, innovate the web-based teaching mode, and make full use of the network platform to provide better teaching and services. Moreover, medical colleges and universities should eliminate the weaknesses of web-based teaching and improve the quality and connotation of teaching.

Key Words:

Web-based teaching, Innovative development, Teaching methods, Online teaching, Universities and colleges.

Introduction

The outbreak of COVID-19 forced students not to return to school and to stay at home. All universities and colleges have had to cope with the issue of ensuring that students have lessons to learn and teachers to teach and improve stu-

dents' learning efficiency at home. The web-based teaching mode is an important educational method developed with the iteration and updating of information technology (IT). It has high applicability as a new teaching mode¹. In fact, prior to the outbreak of the COVID-19 epidemic, we had realized the importance of renewing educational concepts and innovating teaching modes, as educational informatization is driving the modernization of education². With the outbreak of the epidemic, the medical colleges were forced to implement only the web-based teaching mode to guarantee the learning progress and quality of medical students. Online teaching may be provided on a variety of live platforms, such as Tencent Meeting, Tencent Classroom, and Enterprise WeChat.

The web-based teaching mode has the advantage of timeliness and repeated viewing. However, it also poses a great challenge to the teaching of higher medical colleges. With the transformation of traditional offline education into online education, many teachers lack teaching experience in this field and cannot learn about the students' learning situation. Some students cannot adapt to the teaching or focus on the class. Therefore, teachers are required to constantly update the web-based teaching thinking and methods to display different teaching contents to students and resolve the existing problems in different channels under the web-based teaching mode.

The Situation Of Web-Based Teaching in Medical Colleges Before the Outbreak of COVID-19

Prior to the outbreak of COVID-19, web-based teaching has been piloted in some medical colleges as an auxiliary teaching method. However, it was not used as the main teaching meth-

od. Regarding the learning of medical colleges, many people first think of human anatomy and laboratories. It is believed that teachers and students in white gowns can complete their teaching and learning in classrooms and laboratories. In fact, distance education teaching methods such as “mobile learning” and “leap-forward teaching” have long been applied by teachers in medical colleges and universities^{3,4}. The teaching space has now moved from a classroom with a blackboard to a multimedia classroom. Teachers at medical colleges have diversified the learning space, greatly mobilized students’ learning interests, and improved the teaching effect by using different teaching methods, such as micro lectures, Maker, flipped classroom, and Massive Open Online Course (MOOC). In 2017, some offline theory courses were transformed into online teaching through MOOC in Harbin Medical University to eliminate the inconvenience of offline teaching. For example, the master’s graduates should rotate their studies in different departments to participate in the standardized training. The time may be flexible with online teaching.

Prerequisites for Innovation in Web-Based Medical Teaching

First, Medical Teachers Must Cultivate Internet Thinking

In the modern IT society, Internet thinking is an irresistible trend. It has been agreed by the universities that “Internet + education technology” has played a greater role in driving and promoting the education modernization⁵.

Professor Guo Shaoqing discussed the influence of computers, mobile interconnection, big data and artificial intelligence technology in the learning space in “Web-based Learning Space for School Education Transformation”. Experts and teachers in medical colleges and universities should cultivate Internet thinking as soon as possible. Teaching and educating people are the mission and responsibility of medical educators. The students in medical colleges and universities have learned and obtained knowledge online as a part of their lives. They no longer accept simple and inflexible traditional classroom teaching methods and teaching models. If teachers explain the book knowledge using a piece of chalk and a blackboard and examine students’ performance by rote, students will not pay attention to the

teachers’ hard work. Therefore, medical teachers should consciously incorporate Internet thinking and technology into education and teaching, impart knowledge in an attractive way to students, and maintain the concept of synchronizing with students. With Internet thinking, a larger and wider population can learn the medical knowledge online with the infinite extension of web-based teaching. With Internet thinking, we have the modern consciousness of medical teachers. On this basis, we can gladly accept and innovate the new technology of medical teaching.

Second, Medical Teachers Should Make Full Use of the Network Platform to Provide Better Teaching Services

We can imagine that if students walk into a multimedia classroom full of modern facilities and skillfully operate various applications on the information platform, they can see vivid human anatomy charts and magnified data. Will they be bored and play with their mobile phones? The yearning for new knowledge is bound to arouse students’ curiosity and maximize their enthusiasm for learning. Therefore, medical teachers should teach on the online platforms. In the article “Developing Education Informatization and Promoting Education Modernization 2030”, Mr. Du Zhanyuan highlighted that the web-based teaching mode and learning methods provide effective solutions and play a prominent role in promoting the education equity and quality in China⁶. The web-based learning environment, which can be accessed everywhere and anytime, plays an important role in supporting the development of higher education⁷. With the development of MOOC, quality teaching resources are no longer limited to university lectures. Students and teachers can interact and communicate with each other on various platforms. The team building and practice teaching can be implemented on platforms. Therefore, medical teachers should undertake the training in web-based teaching skills after their busy working day and strive to create a modern classroom atmosphere.

Weaknesses of Web-Based Teaching During the COVID-19 Epidemic Period

The survey report of web-based teaching during the COVID-19 epidemic period showed that most students approved of the web-based teaching method. However, some weaknesses were identified. First, the effect of web-based teaching is far beyond the scope of the classroom.

Even if there is a small mistake, it is not easy to correct and make up for it. Therefore, in the use of modern information teaching methods, we should be more rigorous to avoid mistakes. Second, some online teachers are tired of coping with the teaching tasks. Finally, some doctors are more interested in IT application and innovation and more focused on the PowerPoint characteristics and advantages but ignore the actual teaching content and effect.

Innovative Development Ideas of Web-Based Medical Teaching

Student-Centered Teaching

Web-based medical teaching must abandon some traditional teaching models. Teachers should not blindly read PowerPoint slides, ignoring the students' learning feelings. They should develop students' learning enthusiasm and autonomous learning ability and establish correct clinical diagnostic thinking in the early stage by centering teaching on students⁸. Teachers should make full use of thematic learning platforms, guide and help students in cooperative learning and autonomous learning combining the subject contents and students' characteristics, and upload students' learning achievements on the platform to achieve the sharing and communication and promote the mutual learning among students.

Individualized teaching is one of the innovation goals to achieve student-centered web-based teaching. However, it is difficult to implement individualization, namely one-on-one tutoring. Personalized teaching cannot be realized in the traditional teaching mode because of the many students majoring in clinical medicine at medical colleges and universities. However, special attention should be paid to individual students. It is easy to innovate them if they are correctly guided or provided with open learning spaces. How can personalized web-based teaching be carried out? We all know that proficiency in clinical skills and mastery of professional knowledge are essential for every medical student⁹. Considering the fewer hands-on opportunities for medical students in the internship stage, we can simulate the patients' physiological changes and disease characteristics in the virtual web-based teaching mode. Various skills and operations can be demonstrated through videos to compensate for the defects of tradi-

tional teaching by using IT in teaching¹⁰. In this way, each student can have the opportunity to operate. Moreover, the network teacher platform has been established to guide students and explain the problems and difficulties encountered by students in the process of simulation operations. This can not only meet the students' learning requirements and improve the teaching quality, but also avoid the possibility of students concentrating in skill training centers and causing disease transmission. Regarding theoretical learning, we can identify the weaknesses of students through online examination and random classroom examination. The purpose of teaching is to enable all students to master professional knowledge and skills. Students are ever-changing and uneven in levels, learning basis, and ability. Teachers must make good use of network technology for personalized teaching and be guides for students¹¹.

Diverse Forms Will Be Used in Teaching Medical Knowledge

Unlike the traditional classroom teaching, the web-based teaching cannot monitor or constrain students, and the students cannot discuss in groups. Therefore, an innovative reform of the teaching process should be implemented to avoid boring explanation of PowerPoint slides. For example, Hao Xin Cloud meetings can be adopted to communicate with students and learn about students' learning outcomes. The case-based learning method is used to cultivate the initial clinical diagnosis thinking by combining theory with practice and lay a solid foundation for transformation from students to doctors in line with the student-centered principles¹². Teaching medical knowledge should avoid isolated and one-sided dependence on textbooks. The medical knowledge should be taught by integrating organ systems. Teachers should focus on the relationship between the global and local areas and step outside the boundary between the internal and external disciplines and the boundary between the three-level disciplines. It is better for students to master the knowledge and grasp the patient's overall condition in this way than to explain the individual system in isolation since the disease of any system affects not only the structure and function of the system, but also other systems and even the whole body. For example, the same symptom, such as retrosternal pain, may be due to gastroesophageal reflux or pneumonia, angina, and other systemic lesions. Therefore, when thoracic surgery and respiratory medicine

teach lung diseases, general surgery and digestive medicine should teach abdominal diseases at the same time.

Clinical probation is an important learning step for medical students. However, during the COVID-19 epidemic, students cannot return to school and directly follow the teacher to treat patients. Students cannot be asked to answer more questions to compensate for this. Teachers should change their teaching ideas and record their rounds (including asking about patients' medical history and performing standard physical examination) after obtaining consent from patients. Teachers should instruct while examining and send videos to students. This can not only enhance the students' understanding and immersive experience, but also allow patients to have a full understanding of their disease and cooperate better with the treatment. Furthermore, it will standardize the diagnosis and treatment behavior of medical teachers and have a threefold effect¹³.

Sharing Web-Based Teaching in Medical Colleges

Web-based teaching cannot be confined to a medical college. Colleges and universities should communicate with each other, discuss their needs, and improve each other. Stanford University Professors Andrew Ng and Daphne Koller collaborated to create Coursera free online courses for American universities. The development of network education resources and the improvement of the overall development level of network education depend on the medical colleges and universities. Therefore, all colleges and universities should share web-based teaching to achieve common progress. To attain this goal, colleges should encourage teachers and relevant personnel to develop the production standards, codes, and professional and specialized web-based teaching courseware and videos as the organizer and promoter of web-based teaching resources. They should be concentrated in the unified information library to achieve the teaching information sharing in medical colleges under the corresponding management system.

In the Course Of Web-Based Teaching, We Should Constantly Identify and Solve Problems

The following measures could be implemented to compensate for the weaknesses of web-based teaching: (1) add peer review, deliver PowerPoint slides for peer review, and identify and correct

the shortcomings and weaknesses; (2) instruct the contents in the teaching supervisor through presentation for criticism and correction since in this way, the error can be avoided to the largest extent in the online instruction process to make the whole live broadcast process unblocked; (3) as students cannot be immersed in the online teaching process, the animation simulation and three-dimensional methods should be used to make the students feel a sense of space and deepen their understanding of knowledge; and (4) the web-based teaching should strengthen ideological and political education and responsiveness to public health emergencies and resolutely support the "anti-epidemic" policies and measures of the state. During the COVID-19 epidemic period, the COVID-19 knowledge should be taught to allow students to strengthen their understanding and memory of prevention and control knowledge and learn to inform and educate people around them.

Conclusions

The development of the information age requires medical teachers who are capable of treating people and educating and cultivating students using network means. The web-based teaching mode not only includes the teaching of theoretical knowledge, but also can simulate the real clinical situation and realize the innovation of the teaching mode^{14,15}. The occurrence of COVID-19 has placed the web-based teaching at the forefront of teaching, although many medical teachers are busy with teaching. However, over time, medical teachers will certainly improve their ability to keep pace with the times and explore quality teaching design and other practical measures to adapt and promote the web-based teaching mode. Medical teachers should fully motivate students' enthusiasm on the psychological level and respond to the teaching challenges arising from the COVID-19 epidemic.

Conflict of Interest

The Authors declare that they have no conflict of interests.

References

- 1) STEENBEEK H, VAN GEERT P. The emergence of learning-teaching trajectories in education: a complex dynamic systems approach. *Nonlinear Dynamics Psychol Life Sci* 2013; 17: 233-267.

- 2) SHOVEIN J, HUSTON C, FOX S, DAMAZO B. Challenging traditional teaching and learning paradigms: online learning and emancipatory teaching. *Nurs Educ Perspect* 2005; 26: 340-343.
- 3) RYAN M, CARLTON KH, ALI NS. Reflections on the role of faculty in distance learning and changing pedagogies. *Nurs Educ Perspect* 2004; 25: 73-80.
- 4) RYAN M, HODSON-CARLTON K, ALI NS. A model for faculty teaching online: confirmation of a dimensional matrix. *J Nurs Educ* 2005; 44: 357-365.
- 5) LIPING H. Relying on "Internet+education technology" to promote the reform of modern senior vocational informationized teaching mode. *Jiao Yu Xian Dai Hua* 2019; 23: 223-226.
- 6) ZHANYUAN D. Developing information technology in education and promoting modernization of education 2030. *Zhong Guo Nong Cun Jiao Yu* 2017: 11-12.
- 7) GOLDBERG LR, CROCOMBE LA. Advances in medical education and practice: role of massive open online courses. *Adv Med Educ Pract* 2017; 21: 603-609.
- 8) MUIRHEAD RJ. E-learning: is this teaching at students or teaching with students? *Nurs Forum* 2007; 42: 178-184.
- 9) CHUNLI H, XUEHONG H, RONGZHEN G, CHEN L. Research and analysis on the reform of medical virtual network teaching model. *Zhong Guo Bi Ye Hou Yi Xue Jiao Xue* 2019: 223-226.
- 10) RASSIE K. The apprenticeship model of clinical medical education: time for structural change. *NZ Med J* 2017; 130: 66-72.
- 11) KEIFENHEIM KE, TEUFEL M, IP J, SPEISER N, LEEHR EJ, ZIPFEL S, HERRMANN-WERNER A. Teaching history taking to medical students: a systematic review. *BMC Med Educ* 2015; 15: 159.
- 12) BLOOD-SIEGFRIED JE, SHORT NM, RAPP CG, HILL E, TALBERT S, SKINNER J, CAMPBELL A, GOODWIN L. A rubric for improving the quality of online courses. *Int J Nurs Educ Scholarsh* 2008; 5: Article 34.
- 13) VANDEVUSSE L, HANSON L. Evaluation of online course discussions. Faculty facilitation of active student learning. *Comput Nurs* 2000; 18: 181-188.
- 14) ALTURKISTANI A, LAM C, FOLEY K, STENFORS T, BLUM ER, VAN VELTHOVEN MH, MEINERT E. Massive open online course evaluation methods: systematic review. *J Med Internet Res* 2020; 22: e13851.
- 15) WEN Q, JINMIN Z, HANLEI S, ZHAOMING H, FENG H. Teaching reform and practice of combining clinical online courses with virtual simulation and PBL teaching mode. *Xian Dai Yi Yao Wei Sheng* 2018; 7: 2244-2246.