

The Construction and Effect of the MOOC-based One Plus Three Teaching Model During the COVID-19 Pandemic

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Abstract—“Undisruptive learning with disruptive classes” is the principle for Chinese higher education institutions to handle the challenge they encounter during the COVID-19 pandemic. The purpose of this study is to promote online teaching across three scenarios: online teaching for students within one college, online teaching for students across different colleges, and online training for primary and secondary school teachers. Guided by the “Internet+” concept, we design the MOOC-Based One Plus Three teaching model. Moreover, we apply the model in designing and developing online courses on the Chinese Universities MOOC platform. Empirical results have shown that the model effectively solves the needs of large-scale emergency teaching during the pandemic across online teaching for students within one college, online teaching for students across different colleges, and online training for primary and secondary school teachers. This model supports the rapid implementation of online teaching in more than 180 colleges and over more than 20 courses across the country with 58,107 pre-service teachers, in-service teachers, related business employees enrolled. This highly feasible model embodies the Internet thinking and consists of various teaching methods, and thus maximize the effectiveness of online teaching. This model especially supports the online teaching of the Instructional Technology program at universities (e.g., Hubei University of Education) which are severely affected by the pandemic. Therefore, the model has a positive promotion and application value.

Keywords—The pandemic, MOOC, “One Plus Three” teaching model, construction, effect

I. INTRODUCTION

In order to reduce the impact of the pandemic of the Chinese colleges' normal classroom teaching during the pandemic, the Chinese Ministry of Education issued "The guidance of organization and management work about common colleges online teaching during the pandemic" on February 4, 2020, providing guidance for carrying out online teaching in colleges to realize “undisruptive learning with disruptive classes”[1]. Physical isolation between teachers and students is a major problem in teaching and learning activities during the pandemic. Online teaching and home learning have become the main forms of online teaching in colleges. Integrating Internet thinking to reconstruct teaching content and structure and innovating teaching model and method have become essential skills for college teachers to

implement online teaching. Since 2013, China's higher education has been actively adapting to changes and seeking changes. More than 12,000 MOOCs have been built in the past six years. During the pandemic, the strategic layout and careful construction in recent years come in handy in times of crisis, which further demonstrates that MOOCs are a key measure for China's higher education to achieve “changing track overtaking”. At present, Chinese college online teaching practice presents the characteristics of all regions, all coverage, all directions, forming a new online teaching paradigm. But in the process of implementation, there are some problems: the existence of the misunderstanding of the value, lack of innovational guidance of the theory and guarantee conditions of the organization, which leads to a single model in many regions or schools and effect in doubt [2][3]. Therefore, this study is guided by the “Internet+”, fully considering the large-scale emergency teaching needs during the pandemic, taking effective measures to ensure that it can shrink the gap of quality between face-to-face and online teaching. The MOOC-based One Plus Three teaching model was constructed, and the validity of the model was verified through the empirical application. It can provide experience for MOOC-based online teaching in colleges during the pandemic.

II. LITERATURE REVIEW

A. Online Teaching Model During the Pandemic

Under the background of “undisruptive learning with disruptive classes”, in response to the education crisis, many scholars have conducted studies on online teaching, so as to provide experience for online teaching in higher education, such as Yuanyuan Zou constructed the “bay area model” of online teaching in colleges [4]. Dongshu Zhang constructed the schema-interactive visualization teaching strategy supported by the rain classroom [5]. hui Jiang constructed a set of feedback interactive teaching models through the investigation and personal practice of various live interactive tools[6]. In addition, all colleges have formulated online teaching guidelines, providing multiple solutions for teachers and students to carry out online teaching. For example, Jinan university advocated a diversified, collaborative and blended teaching model and encouraged teachers to adopt a personalized “One Plus N” teaching model[7].

In summary, it can be found that teachers actively adjusted the online teaching model by using the online platform and

technology during the pandemic. But the targets are blurred; the forms are single; the structure is loose and the resources apply formally. How to correctly understand the value of online teaching, innovate the online teaching model, and shrink the gap of quality between face-to-face teaching and online teaching is still to be further explored.

B. MOOC-based Teaching Application During the Pandemic

During the pandemic, the Ministry of Education provided free access to more than 24,000 online courses, including 1,291 national quality open online courses and 401 national virtual simulation experiment courses, which effectively guarantee the sustainable development of online education [8]. Zhu Zhiting proposed that it was the choice for future development to integrate various online teaching models, construct all-media learning ecology, and integrate the advantages of online open courses and online live teaching[9]. At present, as one of the most important online education resources, MOOCs were widely used in online teaching. For example, the course “*Prevention and Control of the COVID-19*” created by academician Zhong Nanshan’s team was launched on the MOOCs platform, using the authoritative point of view to explain the knowledge of the COVID-19 to help win the national war. The teaching team of higher mathematics of Shenzhen university reconstructed its own MOOC course structure based on the teaching process of “problem-concept-theory-method”, and constructed a student-centered and teacher-led blended teaching model during the pandemic [10]. In addition, “MOOCs to sea” was an important contribution to the world to fight disease [11]. Besides, the Ministry of Education launched an online teaching platform for international construction projects and made contributions actively for online high education in the world.

The review of existing studies showed that MOOC-based online teaching has been relatively common under the guidance of different concepts and for different research objects. However, the existing application model focused on a single course, which cannot meet the teaching needs of different scenarios during the pandemic. Therefore, the MOOC-based One Plus Three teaching model was constructed for three scenarios, so as to fully meet the needs of large-scale emergency teaching during the pandemic.

III. RESEARCH PROCESS AND METHODS

This study adopted the literature research, theoretical deduction and empirical research, case study and evaluation research and carried out in accordance with the process of status quo analysis, theoretical analysis, model construction, implementation and application and effect analysis. The MOOC-based One Plus Three teaching model was constructed guided by the basic principle of online teaching and “Internet +”, fully considering the large-scale emergency teaching needs and relying on the Chinese Universities MOOC platforms. This model was applied to practice orienting online teaching for students within one college, students across different colleges and online training for teachers. Then, it made an overview evaluation using the academic performance, evaluation scale and the data from the MOOC platform. According to the community scale, grades, interactive learning, self-efficacy to evaluate the model. The specific process is shown in figure 1.

A. Status quo Analysis

This study used the literature research method to systematically sort out the characteristics, problems and innovations of online teaching methods during the pandemic, as well as the construction and application of MOOCs. Then it made the necessity and urgency of building the model.

B. Theoretical Analysis

This study used the literature research method, took the basic theory of online teaching as the guidance, combined the teaching needs during the pandemic and integrated the “Internet +”, so as to form the theoretical basis and provide theoretical guidance for the model construction.

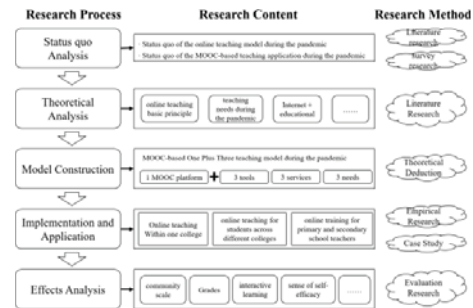


Fig. 1. Research processed and methods

C. Model Construction

Based on the theoretical guidance, the model was constructed for students within one college, students across different colleges and online training for primary and secondary school teachers. In order to meet the teaching needs of three scenarios, the model took the Chinese Universities MOOC platform as the core and provided three types of teaching tools and three kinds of support services.

D. Implementation and Application

This study combined empirical research and case study to apply the model in three scenarios. Online teaching for students within one college was carried out based on the *Principle and Method of Instructional Design* and took the junior students majoring in educational technology from South China Normal University as the participants. Online teaching for students across different colleges was carried out based on the *Research Method of Educational Technology* and selected the students from the Hubei University of Education. Online training for primary and secondary school teachers took the learners from *Smart Classroom Teaching*.

E. Effect Analysis

According to the teaching needs during the pandemic and the requirements of shrinking the gap of quality between face-to-face teaching and online teaching, this study made an overview evaluation through the academic performance, community scale, interactive learning, self-efficacy and the data from the MOOC platform.

IV. CONSTRUCTION OF THE MOOC-BASED ONE PLUS THREE TEACHING MODEL

A. Rationales

1) Embody the idea of Internet + education

The model used the “Internet+” to innovate teaching methods, reshape teaching content, restructure teaching

structure, reengineer teaching process, reorganize teaching evaluation, innovate teaching concepts and teaching design, and then systematically transform education and teaching.

2) *Meet the teaching needs during the pandemic*

The model bridged the teaching time and space relied on the online teaching environment, turned the epidemic into teaching materials, paid attention to the physical and mental health of students, improved students' knowledge level and cultivated their tenacious will, responsibility and patriotism.

3) *Shrink the gap of quality between face-to-face teaching and online teaching*

Through collecting and developing emergency resources in a "short and fast" way, the model refined the content of the course, shortened the duration of the course, reduced the difficulty of production, and lowered the barriers for teachers and students applying technology to shrink the gap of quality between face-to-face teaching and online teaching.

B. *Construction of the MOOC-based One Plus Three Teaching Model*

The MOOC-based One Plus Three teaching model was supported by the MOOC platform and high-quality course resources. It adjusted the objectives, content, resources and evaluation of the course dynamically during the pandemic. The model is shown in figure 2.

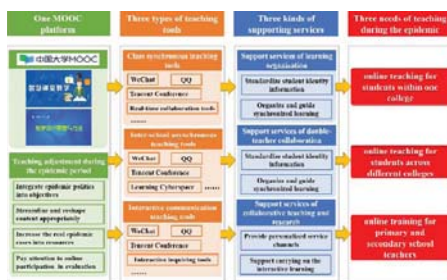


Fig. 2. The MOOC-based One Plus Three teaching model

In this model, "one" referred that it was based on the Chinese Universities MOOC platform and "three" referred that it used three types of tools that included class synchronous teaching tools, inter-school asynchronous teaching tools and interactive communication teaching tools, three kinds of online learning support services that consisted of learning organization, double-teacher collaboration teaching and collaborative teaching and research, and three needs of online teaching for students within one college, students across different colleges, and online training for primary and secondary school teachers.

1) *Online teaching for students within one college*

It was carried out with synchronous teaching tools and learning organization support services. This scenario supported students to independent learning and use synchronous interactive communication as a collaborative inquiry method, so as to realize MOOC-based online teaching within one college.

2) *Online teaching for students across different colleges*

It was carried out with inter-school asynchronous teaching tools and double-teacher collaboration teaching support services. This scenario supported students across different colleges to learn independently and used discussion forums or learning cyberspaces to organize asynchronous collaboration between teachers and students from other colleges. Interactive live broadcast tools were used to implement collaboration, so

as to realize MOOC-based inter-school double-teacher collaboration online teaching.

3) *Online training for primary and secondary teachers*

It was carried out with interactive communication teaching tools and collaborative teaching and research support services. This scenario mainly supported the teachers' independent learning with MOOCs, collaborative exploration, knowledge generation and visualization with social tools such as MOOC discussion areas, educational blogs and forums. It provided personalized support services for teachers with the work system and used video conferencing tools to support online lectures and online training for teachers, so as to realize MOOC-based online training for primary and secondary teachers.

C. *Innovation of the MOOC-based One Plus Three Teaching Model*

1) *Reflect Internet thinking and highlight the value of online teaching*

Future education must be a new education built on the Internet and a new type of education ecology under the support of informatization will surely be formed [12]. Entering the era of education informatization 2.0, the transformation of teaching methods from application-driven to innovation-led called for rebuilding educational value system, innovating educational target matrix, reshaping educational content resources, reorganizing educational structure process, and reorganizing educational evaluation paradigm. The model was constructed in this case which fully reflected the Internet thinking. Besides, it provided corresponding teaching tools and support services oriented to three scenarios, which followed the regulations and characteristics of home learning of different students. Therefore, the model innovated the online teaching organization and implementation methods and highlighted the value of online teaching.

2) *Diverse teaching methods and a wide range of benefits* Home learning was the main form of online learning during the pandemic. The model was proposed to promote online teaching across three scenarios according to different learners participating in MOOCs. It can effectively meet the requirements of learners in different regions, styles and guarantee the effect. It can also support collaborative learning of different courses and provide targeted teaching and research assistance for primary and secondary teachers across the country, especially in Wuhan where the pandemic was

severe. Therefore, the benefit of this model was widespread.

3) *Simple implementation and strong operability*

Online education cannot be "one size fits all" during the pandemic. It cannot require all teachers to carry on live classes and all students to punch online every day. In addition, it cannot move face-to-face teaching to online teaching directly and turn into a veritable "technical performance". Three teaching methods constructed in this case had low technical operation requirements for teachers and students and can be operable and quickly implemented. Besides, it can avoid the problems that appeared in online teaching. Therefore, it shrank the gap of quality between face-to-face teaching and online teaching.

V. IMPLEMENTATION OF THE MOOC-BASED ONE PLUS THREE TEACHING MODEL

A. *The Implementation of Online Teaching for Students within One College*

1) *Organizing teaching community*

Since the Ministry of Education issued the notice of “undisruptive learning with disruptive classes”, the course team has released the course opening information to the public and organized the teaching community extensively. On February 6, 2020, the action of “Concentric Anti-epidemic, Using MOOC to realize the ‘undisruptive learning with disruptive classes’” was launched. Subsequently, the relevant opening information was forwarded by the MOOC platform to its WeChat public platform, expanding the scale of the curriculum teaching community. As is shown in Figure 3, “Concentric Anti-epidemic, Four MOOCs Help You realize the ‘undisruptive learning with disruptive classes’” was tweeted by the public account of “The Instructional Design Studio”, “MOOC Assists Learning in Anti-epidemic, and the MOOC of the Instructional Design Studio of South China Normal University Helps You Realize the ‘Undisruptive Learning with disruptive classes’ ” was tweeted by the public account of the MOOC platform, etc.



Fig. 3. Organization of teaching community by WeChat public platform

2) Developing learning support services

The course team provided online teaching and learning organization support services for junior students in South China Normal University and support the implementation of online synchronous teaching. Teachers and students created WeChat groups in school classes for interactive communication and used the "Tencent conference" tool to carry out audio-video communication, presentation display, real-time text discussion and other teaching activities.

B. The Implementation of Online Teaching for Students Across Different Colleges

1) Organizing teaching community

The course team used new media means to release course opening information for other colleges and organized teaching communities' point-to-point. It was sent out to other colleges across the country and welcomed the teachers who taught " *Research Method of Educational Technology*" to choose this MOOC to assist online teaching, so as to achieve undisruptive learning with disruptive classes. Subsequently, the course team received help from teachers in Hubei Province with severe pandemic through a self-built personalized support service system and arranged special personnel to follow-up, so as to ensure that teachers chosen this course in Hubei can carry out online teaching, as is shown in Figure 4.



Fig. 4. Assist Hubei teachers in organizing teaching community

2) Developing learning support services

The course team provided online teaching double-teacher collaborative support services for students across different colleges to watch teaching videos, browse expanding resources, consult relevant materials, participate in interactive communications, submit learning results, carry out practice tests, share learning insights and carry out other learning activities through the MOOC platform. Teachers from other colleges used the discussion area to organize their own students to carry out teaching activities. Course team teachers also used the discussion area to push teaching resources and organized theme inquiry. In addition, learning cyberspace was utilized to organize cooperation and interaction between MOOC teachers and students from other colleges to realize double-teacher collaborative teaching.

C. The Implementation of Online Training for Primary and Secondary School Teachers

1) Organizing teaching community

The course team released the course opening information to the vertical group and accurately organized the teaching community. Through the vertical social network, the question in Zhihu community “as a teacher, have you conducted online teaching? How do you feel about it?” was answered and it got the highest number of approval votes for this question. It realized the vertical course information pushing for the primary and secondary school teachers who paid attention to “Undisruptive Learning with disruptive classes” and organized the teachers to participate in the course learning and carry out online training, as is shown in Figure 5.



Fig. 5. Using vertical social network to organize teaching community

2) Developing learning support services

The course team provided collaborative teaching and research support services for primary and secondary school teachers, used the personalized support service system to provide channels and guided them using educational blogs and forums and other social tools to support their collaborative inquiry and knowledge generation and visualization.

VI. EFFECTIVENESS ANALYSIS OF THE MOOC-BASED ONE PLUS THREE TEACHING MODEL

Where there is a pandemic, there is an order. To solve the practical problem of online learning for tens of millions of college students in China during the pandemic. This model supports the rapid implementation of online teaching in more than 180 colleges and over more than 20 courses across the country with 58,107 pre-service teachers, in-service teachers, related business employees enrolled. It was necessary to fully rely on the MOOC to carry out teaching innovation and realized the organic integration of large-scale implementation and emergency needs.

A. Effectively Addressing the Need for Large-scale Emergent Teaching During the Pandemic

1) Large scale of curriculum community

According to the statistics of the MOOC platform, up to now, there were teachers and students from more than 180 universities, such as China University of Geosciences (Wuhan), Jinan University, etc., especially the Hubei University of Education in the severely affected areas, as well as primary and secondary school teachers and related business employees all over the country, a total of 58,107 students joined the course. The large-scale curriculum community provided a personnel basis and a self-organized environment guarantee for the model implementation. The scale of the curriculum community is shown in Figure 6.



Fig. 6. The scale of curriculum community

2) Good interaction

According to the statistics of the MOOC platform, since the beginning of the course, there were more than 67500 course discussion data, and the daily growth rate was relatively high. In the discussion area, the discussion among the participants was heated, and there was an obvious situation of self-organized learning. The participants can solve the problems with each other. The line chart of numbers of posts in the discussion board is shown in Figures 7.



Fig. 7. The line chart of numbers of posts in the discussion board

3) High satisfaction

According to the statistics of the MOOC platform, the overall score of the courses was 4.7 points (5 points in total), and the overall satisfaction of the courses was high. Some students said, "Although the courses are closely related to the Internet+ education and highly operational, with the progress of the curriculum, they are getting better. The content of this course is systematic and detailed, and the structure is arranged orderly." Other students commented that "Teachers' explanations are vivid, concise and in-depth level; teaching resources are rich, video images are bright presentation and distribute time appropriately. We originally thought that MOOC learning is high and unattainable, but it is so easy and convenient! Learning goes on to the end" and so on, from which we can see that students gave a high evaluation of the course.

B. Effectively Solving the Needs of Online Teaching for Students within One College During the Pandemic

In order to solve the needs of online teaching for students within one college, this study focused on the MOOC course of *Principle and Method of Instructional Design* and junior students majoring in educational technology from South China Normal University. Before the implementation of online teaching, this study used the college students' self-efficacy scale of online learning to test the students' self-efficacy [13]. At a certain stage of the course, the college

students' self-efficacy scale of online learning was used again. Results show that there is no significant difference between the pretest scores ($M=3.3200$, $SD=0.51150$, $n=23$) and the posttest scores ($M=3.5109$, $SD=0.42361$, $n=23$), $t=-1.82$, $p=0.082$. Further detailed analysis of each dimension of self-efficacy is shown in Table 1.

TABLE I. PAIRED-SAMPLES T TEST OF PRE-TEST AND POST TEST OF EACH DIMENSION

Variable	n	M	SD	t	p
Ability sense-pretest	23	3.5026	.54535	-1.379	0.182
Ability sense-posttest	23	3.6704	.51094		
Effort sense-pretest	23	3.3622	.66670	-.570	0.574
Effort sense-posttest	23	3.4487	.53751		
Environment sense-pretest	23	3.0004	.66890	-2.186	0.040
Environment sense-posttest	23	3.2835	.52727		
Control sense-pretest	23	3.4130	.47439	-1.789	0.087
Control sense-posttest	23	3.6413	.45743		

Table 1 shows the t-test results of paired samples of pretest and posttest of "ability sense" that the average difference of scores before and after "ability sense" is -0.16783 , $P=0.182 > 0.05$, which indicates that the model can guarantee the "ability sense" in the self-efficacy of online learning of college students. According to the t-test results of paired samples of pretest and posttest of "sense of effort", the average difference of scores before and after test of "sense of effort" is -0.8652 , $P=0.574 > 0.05$, which shows that the model can guarantee the "sense of effort" in the self-efficacy of online learning of college students. According to the t-test results of paired samples of pretest and posttest of "environmental sense", the mean value of the difference between the pretest and posttest scores of "environmental sense" is -0.28304 , $P=0.04 < 0.05$, which indicates that the model can not only guarantee the "environmental sense" in the self-efficacy of online learning of college students, but also significantly improve the "environmental sense". According to the t-test results of paired samples of pretest and posttest of "sense of control", the mean value of the difference between the pretest and posttest scores of "sense of control" is -0.22826 , $P=0.087 > 0.05$, which indicates that the model can guarantee the "sense of control" in the self-efficacy of online learning of college students during the pandemic. Therefore, the model can shrink the gap of quality between face-to-face teaching and online teaching, among which "sense of environment" is the most significant, followed by "sense of ability", "sense of effort" and "sense of control".

C. Effectively Addressing the Online Teaching for Students across Different Colleges During the Pandemic

60 students majoring in the educational technology of Hubei University of Education were selected to apply the model based on the *Research Method of Educational Technology*. In project practice activity one, the research plan was completed and submitted by each student, and it was evaluated with reference to the research plan evaluation table (as shown in Table 2). After mutual evaluation, 30 students were randomly selected to make statistics on the evaluation of project practice.

TABLE II. THE EVALUATION OF RESEARCH SCHEME

index	Specific description	Total score
topic (30 points)	Research topics are novel and perspective is unique	5
	Research topics have distinct theoretical significance and practical value	10

	The domestic and foreign research status of the topic is detailed and comprehensive, and the discussion is targeted	15
Research plan (50 points)	Clear research ideas and objectives	10
	The research contents are closely related to the research objectives and are clear and specific	15
	Proper choice of research methods and accurate discussion	15
	Research process planning is reasonable and procedural	10
expression (20 points)	The writing structure of the research plan is complete, logical, clear-cut, detailed and appropriate, with outstanding emphasis	10
	The language expression is scientific, accurate and in line with the specification	10
Total score		100

Results showed that the average score of the 30 students' research program is 77.73 (SD=8.21743), which is higher than the average score of 71.2 of all the students in this course. It can be concluded that although there is a certain gap in the mutual evaluation scores due to different understanding of the evaluation table, the average score of the overall research program of the students is higher, which indicates that the students' research design can be improved after online teaching. At the same time, when students design research programs, they can start from the problems based on the current pandemic situation, select practical and innovative topics, determine specific and feasible research objectives and content, and select appropriate research methods to plan the research process, highlighting the transformation of research paradigm during the pandemic.

D. Effectively Solving the Needs of Online Training of Primary and Secondary Teachers During the Pandemic

This study conducted practice of online training for teachers based on "Smart Classroom Teaching". Teachers carried out online interactive discussions in the discussion area set up in the course. At the same time, with the help of social tools, teachers cooperated and explored, generated and visualized knowledge, and realized multi-dimensional interactive communication. There are 21 discussion questions in this course. Through the analysis of the discussion data, the average number of discussions on a single topic is 583, the average number of discussions per capita is 22.8, and the maximum number of personal posts is 306. Therefore, teachers can make full use of the interactive MOOC discussion area and social tools to actively express their own ideas and opinions. In addition, teachers can discuss the current situation of online education and form online teaching design scheme and teaching innovation model. Therefore, the model can effectively promote the formation of online training community, improve the theoretical level and ability of online teaching of teachers, and effectively meet the research needs of primary and secondary teachers during the pandemic.

VII. CONCLUSION

The purpose of this study is to promote online teaching across three scenarios: online teaching for students within one college, online teaching for students across different colleges, and online training for primary and secondary school teachers. Guided by the "Internet+" concept, we design the MOOC-Based One Plus Three teaching model. This highly feasibly model embodies Internet thinking and consists of various teaching methods, and thus maximize the effectiveness of online teaching. The model effectively solves the needs of

large-scale emergency teaching during the pandemic across online teaching for students within one college, online teaching for students across different colleges, and online training for primary and secondary school teachers. This model supports the rapid implementation of online teaching in more than 180 colleges and over more than 20 courses across the country with 58,107 pre-service teachers, in-service teachers, related business employees enrolled. This model especially supports the online teaching of the Instructional Technology program at universities (e.g., Hubei University of Education) which are severely affected by the pandemic. Finally, we hope that this study can provide theoretical guidance and model reference for online teaching in colleges during the pandemic.

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