Construction and Implementation of Blended Online Teaching Mode Based on Live Broadcasting and MOOC

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Abstract—In view of the current affected by the COVID-19 outbreak under the special circumstances, we analysis the online teaching mode of current situation, propose a blended online teaching mode based on "live broadcasting + MOOC", specifically describe how to construct the teaching mode, and use "Tencent-classroom + ZJOOC" with practice of four different courses in Taizhou university as an example, to explain the implementation process and effect of this teaching mode.

Keywords—Blended teaching, Online teaching, Live broadcasting, Tencent-classroom, MOOC, ZJOOC

I. Introduction

From January 2020, a sudden outbreak of the new coronavirus pneumonia (COVID-19) delayed the start of classes at all schools across over the world, preventing face-to-face teaching. Be responsible for it, the ministry of education of China has put forward the idea of " suspended class, ongoing learning". It is requiring local education departments and schools to earnestly do a good job in students' study during the term of epidemic situation, and to provide learning resources and learning support services for the all students to solve learning difficulties. Under the guidance of this idea of the ministry of education of China, all colleges and universities across the country are fully carrying out "pure" online teaching [1]. "Pure" online teaching moves the university classroom to the Internet. It is a new challenge for teachers and students. In view of the particularity of online teaching, there are various teaching and learning methods used by teachers and learners in colleges and universities across the country. According to their own courses' characteristics, teachers provide different instructional designs and their thinking about online teaching [2]. Various teaching platforms, MOOC platforms and live broadcasting platforms have launched their own online teaching programs.

Therefore, in view of the current online education faced problems and development directions, we propose and construct a kind of " live broadcasting + MOOC" blended online teaching mode, from multi-dimensions of the teaching management, teaching process and students' learning, which superimposes live broadcasting platform and online teaching platform (MOOC) application in the teaching activities, serves the teachers and students, achieves the deepening development of the "Internet + education".

II. Analysis of Current Online Teaching Mode

The main requirement of "suspension of classes without suspension of learning ("no suspension" for short) is that students study at home. To this end, teachers need to adjust the inherent teaching methods, carefully arrange the teaching contents, and maintain contact with students through the Internet, and remotely guide students to make full use of the online teaching platform and digital resources to carry out independent learning. Although the use of information technology to carry out "no suspension" is a somewhat helpless choice, but it also brings a rare opportunity for the rapid popularization and deep integration of information technology in the education industry. Currently, there are about three online teaching modes: live broadcasting, MOOC, and blended of live broadcasting and MOOC.

Live broadcasting. Generally speaking, live broadcasting platform provides a new experience of scene teaching for education on Internet, which is equivalent to moving the classroom to Internet [3]. Affected by the epidemic, live broadcasting teaching has seen an explosive growth, such as the Ding talk and the Bilibili. Live broadcasting shortens the distance between teachers and students, enables real-time and effective interaction between them, and is the closest to the traditional way of class in form. However, live broadcasting also has the problem that teachers cannot supervise the learning process of students in real time. When students do not take the initiative to initiate feedback, teachers cannot grasp the learning effect of students. In addition, simple live broadcasting cannot form a complete teaching process for students' pre-in-after class, so it is not suitable to exist as a separate teaching form.

MOOC. MOOC platform is based on the constructivist education concept, and has the characteristics of comprehensive and powerful functions and intuitive and practical interface, which plays an important role in online teaching. MOOC can break through the limitation of time and space in the application of teaching resources and are widely welcomed by students. However, in this way, students can learn by watching the micro-course videos recorded by the teacher in advance, while the teacher cannot understand the students' mastery of the knowledge points in the teaching process in real time, so as to adjust the teaching strategy. In addition, in the absence of guidance and supervision, the learning process of students is completely

dependent on the learner's awareness of autonomous learning, which does not have a good effect.

Blended of live broadcasting and MOOC. Combining the advantages of live broadcasting and MOOC, it is equivalent to classroom teaching under the network environment [4]. The network environment here refers to the network teaching platform, namely the MOOC platform, including educational and teaching resources. It provides effective support for blended teaching and learning. The teaching behavior of teachers extends from "classroom in the air" to the outside of the classroom, and is extended in both time and space, which can greatly improve the learning efficiency and learning effect of students. After the completion of live broadcasting teaching, teachers can carry out pre-class preview, after-class consolidation and feedback based on MOOC platform, which can not only play the leading role of teachers, but also play the main role of students [5]. Teachers can make use of teaching resources on the MOOC platform during the live broadcasting. After class, students can use the MOOC platform to review videos of the live broadcasting again, and watch micro-course videos prepared by teachers for learning and discussion.

Currently, there are over 30 million college students in Chinese universities, and many more in the world. Therefore, simply using a certain platform for live broadcasting or MOOC teaching will inevitably lead to network congestion or the collapse of the platform. Instead of focusing on getting knowledge to students, focus on how well they learn. So we should consider how to divide teachers' teaching into parts and track students' learning in a fragmented way. In other words, teaching through the combination of live broadcasting and MOOC can not only accurately and efficiently realize real-time teaching[6], but also realize students' review, homework and study notes, which fully reflects the concept of learning anytime and anywhere.

III. CONSTRUCTION AND IMPLEMENTATION OF THE TEACHING MODE

A. Teaching mode construction

We propose the online teaching mode of "live broadcasting + MOOC". According to the characteristics of the courses and the analysis of learning situation, in order to ensure the teaching effect and achieve the goal of "homogeneous and equivalent" between online teaching and traditional classroom teaching as far as possible, we choose the online teaching method of "Online live broadcasting is the main, and MOOC is the auxiliary". Through the attempts of live broadcasting and the preliminary survey on the MOOC platforms before class, we conduct the online course on the live broadcasting platform of "Tencent-classroom", and the MOOC platform of ZJOOC. The auxiliary learning materials such as teaching micro-course videos, PPT courseware and electronic teaching materials needed before class were spread.

B. Teaching tasks and assignments

Teachers need to release specific task lists related to course learning in advance, including design the task list of the course and specify the specific preview task before class; show students the teaching content and teaching arrangements in class, and assign online tests and other learning tasks after class. As is shown in Fig.1.

Time	Assignments	Implement-way	Evaluation-way	Feedback
Preview learning before class	Watch micro videos of the course	ZJOOC	Record on ZJOOC	Published data
	Read the specified material	ZJOOC	Interaction / Test	Individual communication
	Complete preview test	ZJOOC	Test scores	Statistics
	Master knowledge points	Self check	Test / Exams	Concentrated check / Individual conversations
Live broadcasting in class	Live broadcasting with Tencent-classroom	Tencent-classroom	Data of Live broadcasting	Statistics
	Communication/ Interaction	Tencent-classroom	Interactive data	Artificial statistics
	Online quiz	ZJOOC	Quiz scores	Automatic corrects
Consolidating after class	Online assignments	ZJOOC	Marked results	Artificial marking
	Chapter test	ZJOOC	Test scores	Automatic corrects
	Team work	ZJOOC	Team performance	Feedback after report

Fig. 1.   Teaching tasks and arrangements

C. Teaching mode implementation

Before the formal class, according to the characteristics of online teaching, in order to activate the interactive atmosphere of the class and cultivate students' teamwork ability, students are required to form study teams, and each study team is required to take a team name related to the course content, as shown in Fig. 2.
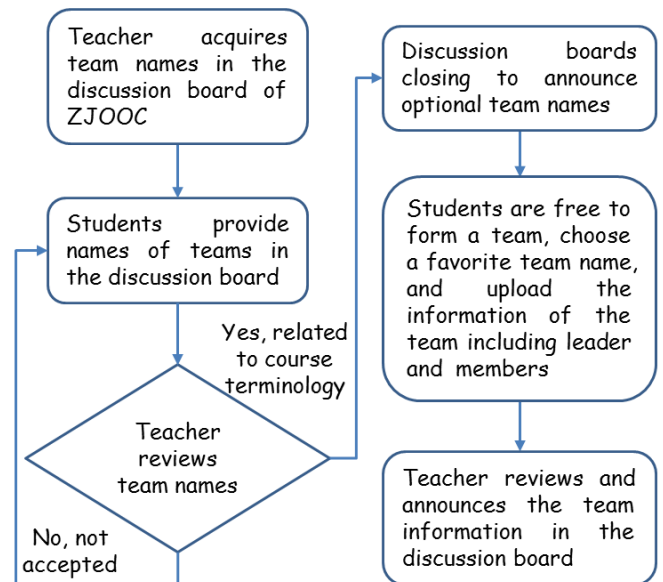

Fig. 2.   The rules and procedures for team names

We selected students from four different courses for the teaching mode implementation, and the number of students in each class was about 60.

1) pre-class learning

In the pre-class learning stage, students' subjective initiative is stimulated by the form of team peer instructions, so as to promote students' independent and exploratory learning. The teacher record the micro-course videos and release the instructional plan and corresponding teaching resources before the class based on the teaching requirements of the course. The students watched the micro-course videos for self-study, initially constructed their own knowledge framework, completed the punching tasks and tests in the micro-course videos in the context of independence or under peer instructions and mutual assistance, recorded difficulties in their learning processes and gave feedbacks.

2) In-class teaching

During the in-class teaching process, stratified teaching and real-time interaction are implemented according to

students' emotional attitude, knowledge and test feedbacks. Through two-way interaction with students, teachers push teaching resources to meet the actual teaching needs. Students participate in class interaction. The "Tencent-classroom" system enables students to answer questions in teams, interact with each other, answer questions in a race, and call names at random. Students can also share and communicate with each other through live broadcasting.

3) After-class consolidating

The after-class consolidating stage is to conduct compensatory teaching on ZJOOC platform and assign corresponding online assignments (homework and test) , homework correction, Q&A and so on. According to the corresponding data analysis of ZJOOC, the teacher confirms the teaching starting point, organizes corresponding peers to guide the teaching according to the personalized characteristics of students' team performance, that is, outstanding students within or outside the team conduct compensatory cooperative teaching to other students, and make targeted lesson preparation.

IV. THE TEACHING EFFECT

During the epidemic of COVID-19, we adopted the proposed blended online teaching mode. Teachers and students can hear each other's voices and see each other's faces through online live broadcasting. Although the space is far from each other, it feels like the distance between students and teachers is suddenly closing. It feels like in a real class. Through the camera, the teacher is presented on the screen of the students. There is a kind of feeling that "the teacher is standing in front of each student". A screenshots of the students' viewing during the live broadcasting is shown in Fig.3.
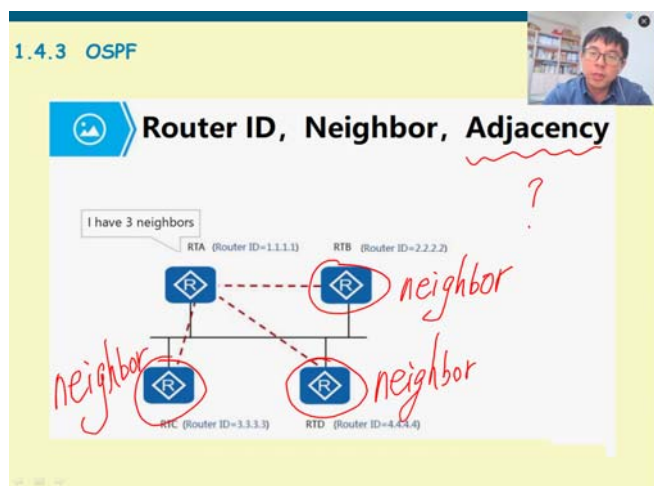

Fig. 3. Screenshots of the students' viewing during the live broadcasting

In order to evaluate the scientificity and rationality of the data, we selected students from four different courses to carry out classroom teaching. The number of students in each class is about 60. Since February 17, 2020, after five weeks of implementation, a total of 3 teachers and 239 students in four courses have carried out the teaching practice of the proposed teaching mode. We collected the data of teachers and students using "live broadcast + MOOC" through the statistics of Tencent-classroom (mainly the duration time of class), data capture of ZJOOC background (including video watching, homework, discussion, notes, etc.) and questionnaire survey, conducted quantitative and qualitative analysis.

A. Quantitative analysis

In view of the quantitative data calculated from the quantitative data captured, Students' participation in online learning based on Tencent-classroom and ZJOOC platform (mean = 7.43, standard deviation = 1.53) and team collaborative learning (mean = 7.28, standard deviation = 1.96). Pearson correlation coefficient is 0.726. There is a significant positive correlation between live broadcasting participation and MOOC participation. It is easy to analyze that there is a mutual promoting effect between live broadcasting and MOOC. In addition, there is no significant difference between students of different courses in their learning involvement, as shown in Table I.

TABLE I. MEAN AND STANDARD DEVIATION OF STUDENT PARTICIPATION

Courses	The number of students	Online learning engagement		Engagement in team collaborative learning	
		Mean	Standard deviation	Mean	Standard deviation
Computer Network	51	7.16	1.57	7.39	2.38
Python Programming	58	7.49	1.58	6.86	1.97
Linear Algbra	62	7.85	1.42	7.48	1.86
Data Structurts and Algorithms	63	7.22	1.55	7.39	1.63

B. Qualitative analysis

View from the qualitative data of the questionnaire survey. Of the 239 students and 3 teachers who participated in the questionnaire survey, 211 teachers and students are very satisfied with the teaching mode based on the blended of "live broadcast + MOOC ", 3 are relatively satisfied, and 9 are basically satisfied, with a satisfaction rate of 92.15%.In addition, 192 students said they used the platforms very frequently, and 170 students said they contacted teachers through the platforms. All 3 teachers said the teaching mode made them more connected to their students, who apparently understood the course knowledge points better.

V. DISCUSSIONS

Due to the force majeure of new coronavirus pneumonia (COVID-19), this is the first time for us to carry out "pure online" teaching. Although the participation and satisfaction of teachers and students are high, the effect of real teaching, that is, students' mastery of knowledge after learning through this teaching mode, still needs to be tested. Personally, we believe that the blended of live broadcasting + MOOC is indeed one of the best online teaching methods, which is worth promoting. However, it is worth exploring how to ensure the teaching quality and urge students to watch the live broadcasting with people in mind and keep the teaching effect not getting out of shape. The management of online teaching based on the MOOC platform, including timely release of students' learning dynamics and test scores, constant urging of students to complete the assigned tasks, and collection of students' online learning data (or track), is conducive to better improving the online teaching effect.

However, we are concerned about the effectiveness of experiments conducted through simulation software in engineering disciplines such as Computer Science (e.g., using eNSP to complete computer network experiments).Practical teaching has always been a relatively weak link in classroom teaching, so it is worth thinking how to carry out online experiments to achieve the goal of keeping theory and practice in line.

In addition, this live broadcasting + MOOC teaching mode provides a relatively convenient learning environment for learners. But we still need to pay attention to stimulate students' enthusiasm for learning. Whether it is live broadcasting or MOOC, they are only means, and students are the main body of learning. If students are not engaged in online teaching, it is difficult to achieve real teaching effect. Compared with the traditional simple classroom teaching, students need to participate in multiple links before and after class in online teaching. Therefore, teachers need to design the teaching links carefully, not only to expand the knowledge reserve for students in advance, but also to actively provide students with learning feedback and further guidance.

VI. CONCLUSIONS

Both live broadcasting teaching and MOOC teaching is typical applications of Internet + education [7-8]. The combination of the two is in line with the general trend of educational informatization, which can help universities improve the accuracy of online teaching and the application ability of educational informatization under special circumstances, such as the new pneumonia outbreak (COVID-19) this time. For teachers, they can use the latest teaching function of live broadcasting platform and MOOC platform to carry out new exploration of informatization and digitization, and through the analysis of the learning and the application of the technology such as big data to implement efficient preparation and precise teaching with records of students in the teaching activities of pure online application data (such as learning time, learning interest, assignment, teacher evaluation, etc.) and learning behavior. For students, firstly, by virtue of the abundance of available resources of mobile learning terminals, they can broaden their vision and cultivate their ability of independent thinking. Second, through the docking of mobile learning terminal and network

learning space, students can be supported to carry out personalized independent learning and exploratory cooperative learning, so as to meet the needs of personalized demand. In general, the live broadcast +MOOC teaching mode provides a mobile and personalized learning environment for learners, realizes the "learner center", and provides more possibilities and expansibility for the smooth implementation of online teaching in universities in special periods.

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