

Chapter 14

Synchronous Remote Classroom

Connecting K-12 Schools in Developed and Undeveloped Areas: A Case Study from China

Liang Yu and Shijian Chen

Abstract The shortage of high-quality teachers is the crux for the undeveloped areas to improve education quality. With the development of digital technology and the Internet, Synchronous Remote Class (SRC) is one of the methods to solve this problem. SRC uses the video conferencing system to connect K-12 classes in developed and undeveloped areas to share the high-quality teacher's class with cyber face-to-face communication between classes. This chapter introduces the case of Chengdu NO. 7 online school in which the SRC model is developed and used to help classes in rural areas.

Keywords Synchronous remote classroom · Online school · Teaching system · Remote live education

14.1 Introduction

The unbalanced development of regional economy leads to the education gap between the developed areas and undeveloped areas. The shortage of high-quality teachers is the crux for the undeveloped areas to improve the education level. Synchronous Remote Classroom (SRC) is defended as using video conferencing systems to connect K-12 schools in developed areas and undeveloped areas, with the aim to share the high-quality teacher's class in urban school to classes in

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undeveloped areas. SRC is believed as a good way to solve the problem of the shortage of quality teachers in rural areas. Moreover, SRC allows learners from different locations to participate in class together through cyber face-to-face interaction, which gives the sense of “being there together”, or the so-called “presence” (Short et al. 1976). Many researches addressed the use of synchronous communication in online learning (Giesbers et al. 2013; Hrastinski 2008; Hrastinski et al. 2010). Teng et al. (2012) reported a method of holding an international online research seminar based at a computer-mediated synchronous learning environment, the Synchronous Cyber Classroom (SCC), which includes audi–video conferencing, text messaging, desktop sharing, joint web browsing and electronic whiteboard, allows learners to participate in class meetings. The SCC is launched for doctoral students in Canada, New Zealand, Italy, and Taiwan (Chen and Ko 2010; Chen and Wang 2008; Hastie et al. 2007; Wang et al. 2010). McBrien et al. (2009) explored the role of a virtual classroom in distance education and analyze the ways in which a synchronous learning environment affects students’ learning experiences by the software Elluminate Live. Kuo et al. (2014) reported research on the implementation of a web-based videoconferencing tool (Interwise) for synchronous learning sessions on an industrial technology course. Web video conferencing allow for more direct social interaction and feedback among learners and teachers and may lead to higher levels of learner engagement (Carr et al. 2004; Hrastinski et al. 2010; Strømsø et al. 2007). Most of these research focused on the learners, learning process and some items related to learning results. But little have been done to narrow the education divide between developed areas and undeveloped areas by the SRC. This article explores the way of using SRC to connect K-12 schools in developed areas and undeveloped areas in China by the case of Chengdu NO. 7 Online School.

14.2 The Development of Synchronous Remote Education in China

In 1999, Jiangsu Radio and Television University conducted an online teaching pilot. They established a two-way interactive synchronous television teaching system and opened a remote live classroom, using the provincial public communications network (ISDM). Moreover, they organized experienced teachers to teach and counsel students in the whole province by SRC in allusion to the curriculum lack of teachers relatively.

In 2012, University Network Alliance SRC was implemented by the cooperation of Beijing Normal University, East China Normal University, Northeast Normal University, Southwest University, Central China Normal University, and Shanxi Normal University. The synchronous classroom created a new type of live teaching platform and learning environment consists of two-way interaction and real-time communication. It can make students together to learn and conduct real-time interaction. In addition, it realizes intercollegiate cooperation teaching mode, which means that students can choose courses in other schools and make the advantages of

featured majors and faculty have a strong complementarity among the member universities in the end (Luo 2013).

101 Online School, established in 1996, is the first distance education web for K12 in China. It creates a new mode of Domestic distance education, realizing online teaching and braking through the restriction of time and space of learners. The school maximizes the outstanding education resources, and makes education ways more convenient. The interactive classroom of this online school carries out real-time teaching by the use of video. Furthermore, the classroom uses audio and video synchronous interpretation with dynamic blackboard writing to teach.

The online school of Beijing NO. 4 High School is the nationwide distance class to provide learning counseling for K12 students. Synchronous class combines classroom teaching with network technology, realizing real-time online teaching. Online school releases schedule in advance to remind students to enter the classroom on time. In the class, teachers will interact with students in the form of video, audio or text and assign homework for students to consolidate learning. The online school of Beijing NO. 4 High school has already realized real-time online course support system that allows almost 5000 learners to study at the same time. What is more, it also provides text, animation, video, audio and other multimedia forms for constructing learning materials.

The online school of Chengdu NO. 7 High School is a famous online school for K-12 in China, which has academic education qualifications and can issue the high school diploma (Zhang and Chen 2005). Its full-time synchronous remote teaching is a unique form of education, simply called “same lectures in different places”, which means that the same teaching activities take place at the same time but different physical space. Chengdu NO. 7 High School Synchronous Remote Teaching Mode found a “FOUR IN UNION” (Preparing simultaneously, Teaching simultaneously, working simultaneously, examining simultaneously) teaching realization mode and “FOUR IN ONE” (instructors, checking teachers, remote teachers and technology teachers) teaching organization mode, which can better ensure the Chengdu NO. 7 High School excellent educational resources to implement the whole teaching process of the school in the branch. It realizes the organization and management of distal students in the whole curriculum learning process and better promote the integration of teaching and learning.

14.3 The Case Study of Chengdu NO. 7 Online School

14.3.1 The Development Road

Chengdu NO. 7 Online School is established by Chengdu NO. 7 High School and Chengdu Eastedu science and technology development co., LTD Jointly. It is the first high school diploma distance education school all over the country. Besides it is the distance education information source of ethnic minority areas determined by Sichuan Provincial Government.

In 2001, Sichuan Province formulated “The decade action plan of education development in ethnic minority areas of Sichuan province”, in order to bring good education resources to ethnic minority areas. Synchronous Remote education has become the important means of this plan. Then NO. 7 Online School emerged at the right moment and developed taking advantage of the opportunity. In support of Sichuan Provincial Education Department and other units, the online school of Chengdu NO. 7 High School was located in the high-tech zone. Since September 2002, the high-quality classrooms in Chengdu NO. 7 High School have been broadcast live to the schools of remote areas by a full-time synchronous remote teaching system (Wang 2014).

The synchronous remote teaching form is beneficial to promote the teaching cooperation and information communication between good high schools and partner schools, to achieve full sharing of high-quality education and teaching resources, to narrow the gap between urban and rural areas in terms of education quality of running schools and education teaching level, as well as to improve the balanced development of basic education.

14.3.2 The Teaching System

The full-time synchronous remote teaching system is a comprehensive education private online system that relies on high-quality teaching resources, uses modern information multimedia technology, and combines hardware and software platform. Ren (2015) introduces that the hardware system consists of front-end teaching system, satellite transmission network system and terminal teaching system as shown in Fig. 14.1.

1. Front-end Teaching System

Front-end teaching system shown in Fig. 14.2 is comprised of the communication facilities and the equipment in the service of satellite live teaching, involving the online school front-end studios, digital lines, managed devices in the satellite master station and so on, which are used to finish capturing the video and audio signal of field teaching, making multimedia courseware, sending teaching information, managing teaching and dealing with technical issues, etc.

2. Satellite Transmission Network System

The satellite signal covers from the air without being limited by the Yamagata landforms. So compared with other communication mode, it has incomparable advantages in the regions where Yamagata landforms are complex, living is relatively dispersed, and terrain conditions are complicated.

Satellite communication distance is basically consistent with ground communication distance. And the cost of links has nothing to do with the transmission distance. What is more, the satellite network stability is strong. It supports multiple IP. The networking is flexible. The maintenance quantity is small. And the construction

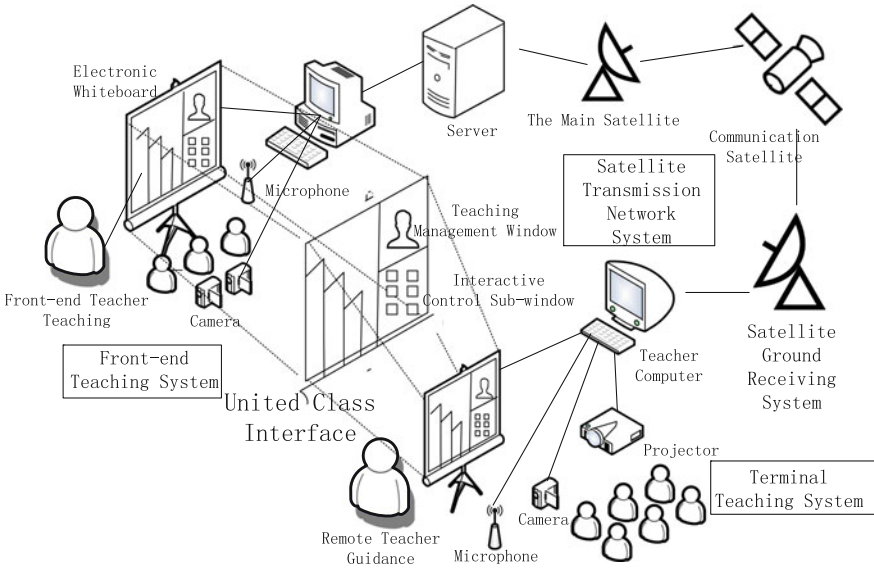


Fig. 14.1 Hardware system of Chengdu NO. 7 online school

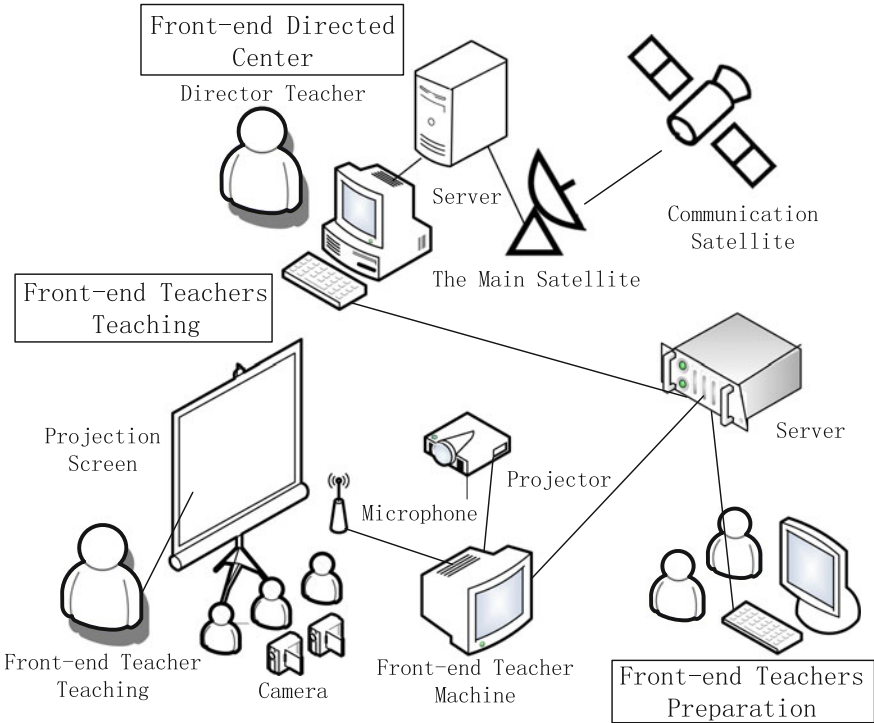


Fig. 14.2 Front-end teaching system shown

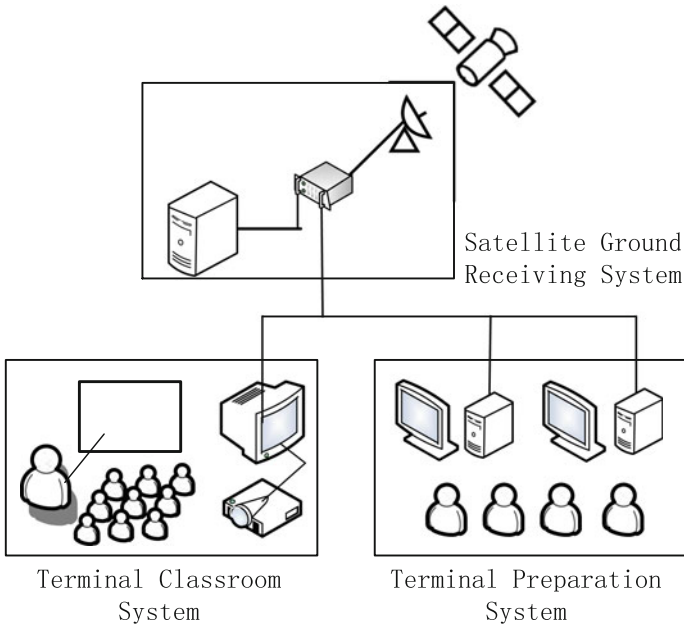


Fig. 14.3 Terminal teaching system

period is short. So, satellite communication becomes an important means to solve the communication problem in remote areas and underdeveloped areas.

Therefore, satellite transmission system is the network system supporting full-time synchronous teaching in the online school. Satellite transmission network system mainly includes the satellite and the equipment and facilities in the satellite master station, such as servers, switches, routers which support data exchanging and monitoring, as well as the satellite repeater, etc.

3. The Terminal Teaching System

Terminal teaching system consists of three subsystems including satellite ground receiving system, terminal classroom system, and terminal preparation system as shown in Fig. 14.3. The satellite ground receiving system needs to access online school satellite education network.

14.3.3 The Teaching Model

1. Four in Union

“Four in Union” is the teaching realization model of full-time synchronous remote school. It’s also the basic requirement and embodiment of “same lectures in

different places” in remote schools and Chengdu NO. 7 High School. Only by guaranteeing the “Four in Union” can the teachers of remote cooperative schools take part in the real-time collaborative teaching. And students can enjoy the pure lesson teaching of Chengdu NO. 7 High School vividly. “Four in Union” is specifically divided into four parts involving preparing simultaneously, teaching simultaneously, working simultaneously, examining simultaneously. The students of remote cooperative schools need to use the same daily schedule, curriculum schedule, learning materials, and test questions with the students of Chengdu NO. 7 High School. In addition, there is live preparing lessons at the same time in all subjects once a week. In this time, teaching teachers and remote teachers discuss the teaching and learning methods together. Through the “Four in Union,” live teaching transmits the classroom teaching and the corresponding management requirements of Chengdu NO. 7 High School to every remote school authentically and achieves the integration requirement in the key teaching links.

2. Four in One

“Four in One” is the teaching organization mode of full-time remote live teaching and the basic guarantee of teaching efficiency. “Four in One” means that four kinds of teachers with different roles and functions (instructors, checking teachers, remote teachers and technology teachers) perform the scheduled work at the same time in different positions according to the requirements of the full-time synchronous remote teaching form. Front-end teaching teachers complete the universal multimedia classroom teaching of live subjects under the guidance of checking teachers to ensure the quality of teaching in the teaching source. Remote teachers conduct a class at the same time in the whole process. They should finish the teaching organization, create the teaching situation and do a good job on the students’ individualized teaching and counseling by using the different places’ conditions.

3. Four in Interaction

“Four in Interaction” is an important means of overcoming the lack of remote teaching interaction and creating same lectures in different places. It includes real-time interaction, virtual interaction, alternative interaction, and transfer interaction.

Real-time Interaction: The full-time remote live teaching uses the two-way satellite system. Teaching teachers of Chengdu NO. 7 High School can carry out the real-time audio and video teaching Q&A with the students who are having the same class in other resource deficiency schools through the satellite network system.

Virtual Interaction: In the live teaching process, students of remote schools are asked to answer the teacher’s questions in time like the students of Chengdu NO. 7 High School. Actually, the interaction is between remote students and the teachers on the screen. It aims to ensure that remote students can participate in the thinking and meaning construction of new knowledge.

Alternative Interaction: Student representatives replace the other students who have the same opinions or questions and interact with teachers to make the common problems of remote students be solved.

Transfer interaction: Transfer interaction is the most important interactive mode of the “Four in One” design. It means that the interaction between teaching teachers and remote students is transferred to the interaction between remote teachers and remote students in order to solve the problem of students’ personality development in the scale situation of distance education.

14.3.4 Implementations and Impact

14.3.4.1 The Teaching Implementation of Chengdu NO. 7 Online School

Using modern communications technology, Chengdu NO. 7 High School Remote Live Teaching Mode shares the classroom teaching in the main campus of Chengdu NO. 7 High School entirely within online classroom. The images, sounds, text, multimedia animation, video materials and others, which is used in class by the teachers of Chengdu NO. 7 High School, present in the branch of Chengdu NO. 7 High School at the same time, to enable students in the branch to participate in the teaching activities of Chengdu NO. 7 High School in real time and to communicate with the teachers of Chengdu NO. 7 High School concurrently in two ways, which truly make same lectures in different places. In addition, according to physiological and psychological characteristics of students in secondary school and the partner schools’ actual demand of improving teaching quality and training teachers, Chengdu NO. 7 High School Synchronous Remote Teaching Mode found a “Four in Union” teaching realization mode and “Four in Union” teaching organization mode, which can better ensure the Chengdu NO. 7 High School excellent educational resources to implement the whole teaching process of the school in the branch.

“Four in Union” means teaching realization model, which is a teaching mode that teachers, respectively, from the main campus and the branch campus of Chengdu NO. 7 High School prepares lessons simultaneously and teach students simultaneously, as well as students, respectively, from the main campus and branch campus make schoolwork simultaneously and take an examination simultaneously. Preparing simultaneously: aim at five live main courses, instructor and remote teachers have a synchronous meeting together once a week, discussing one week teaching arrangements and teaching and learning method; Teaching simultaneously: students, respectively, from the main campus and the branch campus of Chengdu NO. 7 High School has the same timetable and curriculum. Moreover, they share same lectures in different places and real-time voice communication; working simultaneously: the main campus and the branch campus of Chengdu NO. 7 High School uses the same textbooks and supplementary materials, and students in the branch complete the assignments arranged by the teacher of Chengdu NO.

7 High School at the same time; examining simultaneously: the main campus and the branch campus of Chengdu NO. 7 High School uses the same exam papers at the same time, and the scores in periodic exams need to upload online teaching management unit, which is easy to analysis and research. “Four in One” means teaching organization mode, which is a teaching model that instructors, checking teachers, remote teachers and technology teachers cooperate with each other to promote synchronous remote teaching. Instructors: there are outstanding teachers in Chengdu NO. 7 High School and eighteen superfine teachers in Online School; checking teachers: the education specialist in Chengdu NO. 7 High School, consist of two professors awarded government allowances of the State Council and two doctoral tutors, guide instructors and supervise the teaching process; remote teachers: teachers in the branch of Chengdu NO. 7 High School is responsible for student teaching organization, management, teaching counseling and teaching subjects other than live courses; technological teachers: Chengdu Eastedu Technology Development Corporation computer professionals provide live technology and technical support.

“Four in Union” teaching realization mode (preparing simultaneously, teaching simultaneously, working simultaneously, examining simultaneously) can better ensure the Chengdu NO. 7 High School excellent educational resources to implement the whole teaching process of the school in the branch. Besides, aim at the lack of interaction between Front-End and Remote in live class, “Four in Interaction” teaching interaction mode—Real-time Interaction, Virtual Interaction, Alternative Interaction, Transfer Interaction, applied with “Four in Union”, which make up for the lack of face-to-face interaction between Front-End and Remote to a certain degree, promote the re-integration of teaching and learning in synchronous remote teaching.

In school-running mode, both sides have a division on the basis of parties areas of expertise at present. Chengdu NO. 7 High School is in charge of teaching and resource supply. The company is responsible for market and support services. For the schools in the branch, they are in charge of teaching and student management in synchronous remote class, and provide learning support for students. In the live teaching services, Chengdu NO. 7 High School is in charge of teaching investment, teaching activities and business support, and the Chengdu Eastedu Technology Development Corporation is in charge of equipment investment, technical inputs and business activities. Furthermore, after buying live teaching service, the schools in the branch themselves also need to invest in equipment and management. From the above we know this mode gives full play to each superior points of tripartite cooperation, and closely linked to their needs. This win-win symbiosis mode will stimulate partner’s greater ability, and improve cooperation effect.

Although Chengdu NO. 7 High School Synchronous Remote Teaching Mode lack the flexibility of distance learning, it still has some characteristics, such as full teacher–student interaction, real-time guide of the learning process, strict learning management systematically, etc. This mode achieve the organization and management of the full course of learning process for students in the branch, including classroom activities and school assignment and exams after classroom, which, as to

senior high school students who have the lack of self-learning ability, can better promote the re-integration of teaching and learning and ensure the quality and effect of learning.

Besides, in the form of live classroom, Synchronous Remote Teaching Mode not only share many resources with schools in the branch, such as excellent teaching handouts and information, but also realize the sharing of front-end teachers' teaching methods, teaching experience and teaching art. The teachers from the schools in the branch not just have the access to high-quality teaching resources, what is more, they study the front-end teachers' advanced teaching concept, teaching methods and techniques, which become an effective way for their professional development.

14.3.4.2 The Influence of Chengdu NO. 7 Online School

1. Student Growing

Full-Time Synchronous Remote Teaching, which makes students in different regions walk into Chengdu NO. 7 High School's classrooms, achieve the maximum and most comprehensive balance of high-quality educational resources in remote and core areas. Not only do remote students make prominent progress in study, but also self-learning ability, psychological quality, learning motivation and comprehensive literacy, which is improved.

Due to Full-Time Remote Live, students in the branch have the sense of belonging to Chengdu NO. 7 High School, and excellent teachers and resources of Chengdu NO. 7 High School enhances their learning self-confidence. Moreover, various cultural events that Chengdu NO. 7 High School and remote schools together participate in, organized by the EASTEDU, also increase the students' knowledge and overall quality. At the same time, the Chengdu NO. 7 Online School also reduces the financial burden on students, whose learning conditions requirement for students is lower, and it has better availability.

2. Teacher Promotion

By Remote Live Teaching Mode, the teachers from the schools in the branch not just have the access to high-quality teaching resources, what is more, they study front-end teachers' advanced teaching concept, teaching methods and techniques by collaborative teaching, which make their teaching philosophy constantly update, creative thinking constantly grow, professional development faster and information technology and curriculum integration capacity upgrade, then there is more sense of cooperation among teachers. In addition, teachers in the branch make use of "doing by learning, learning by doing." They participate in collective preparation for teaching on the virtual online platform, then they inspect and rethink the effect of preparation for teaching in the real online class teaching practice, which makes them learn Chengdu NO. 7 High School teachers team's practical knowledge by joining in discussion and practice.

3. School Development

Front-End schools and remote schools become a teaching practice community by the cooperation of Full-Time Synchronous Remote Teaching Mode. Because of the convergence of practice community awareness, remote schools consider the teaching research, student management, school culture, education concept and school-running idea in Chengdu NO. 7 High School as a target. This mode leads the remote school to adapt to coordinate and efficient management requirements, and guides the promotion of overall management efficiency, as well as the construction of the management mechanism. Moreover, it can promote the development of school management, which make partner schools' information technology upgrade, management efficiency promote, students backflow, ethos improve and academic atmosphere strong. In the end, with the promotion of school achievements and social recognition, the partner schools widen their horizons and improve their position, forming the ability of sustainable development.

4. Region Cooperation

Synchronous Remote Teaching Mode promotes cultural communication and cooperation between schools and regions. The mode combines Chengdu NO. 7 High School with each remote schools, making a large community of live teaching and study. The community organizes a variety of teaching, research and cultural activities on the subject of Live Teaching. These activities give the opportunity for teachers and students from different regions and schools to learn various education and cultural, widening their horizons. At the same time, with the deep development of remote live teaching, students in the branch make continual progress and school social reputation is promoted constantly. People from parents to residents have changed their attitudes from the questioning and negation into acceptance and support for remote live teaching. Hence, gradually, residents start to accept this way of distance education, and believe in the quality of distance education.

14.4 Problems and Suggestions

14.4.1 Problems

1. The deficiency of interaction between teaching and learning remains the major obstacle

The lack of the interaction between teaching and learning remains the core teaching issue in the teaching model of remote live broadcast. Although many schools of long-distance education take various measures, it is difficult to completely compensate for the lack of interaction in the live broadcast education. As a matter of fact, the lack of interaction is a common problem in all kinds of teaching models of

distance education, from the basic laws on remote teaching and learning. In order to solve this problem, the study suggests that the front-end teachers design and distribute teaching and activity plans before the class. Meanwhile, teachers who know more about the features and needs of the far-end students are able to make lesson plans, and also prepare various pre-class strategies and resources to aid teaching, with the purpose of promoting the various interaction in the live classes.

2. The selection of students and the education of them according to their different aptitudes

The teaching model of remote live requires students with high quality in certain aspects. Chengdu NO. 7 High School aims at elite education, so the live courses from this school are designed for the students at high academic levels. As a result, this type of teaching is featured by high starting point, extreme difficulties, high speed and large capacity, which is a little difficult for those ordinary students or students with poor academic qualities. To ensure the teaching effect, when the online schools organize the live broadcasting classes, they not only try to select the local schools with comparatively good teaching foundations, but also suggest the remote schools to select the most excellent students to attend the live class. As a result, the selection of students limits the spreading of this teaching model. If we want more students to get benefits from it, this teaching model is supposed to spread to a larger scope, which results in taking various means to educate different students according to their different aptitudes.

3. The influence of the external circumstances on the sustainable development of the live broadcast teaching model

The influence of the policies made by the central and local governments is decisively significant to the expenditure sources and the reasonable development of the remote live education. The governmental departments of all levels in the regions where many online schools are located have offered different forms of support for the synchronous remote education, but the supporting strength is not satisfactory, which is related to the situation that the country's educational authorities and relevant departments have not provided policy guiding and support for the rationalization of this model. Meanwhile, the remote schools lack policy guiding and regulations of carrying out the synchronous remote education, which restricts the local governments of all levels to integrate the online schools and the relevant local programs. As a result, the advantage of online schools is unable to be performed to the greatest extent, and in the same way limits the popularization of them in a larger range.

The more areas which are covered by the synchronous remote education, the stronger impact by the curriculum and college entrance examination reform. Because the synchronous remote education completely replaces the formal classroom teaching, it is better that the teaching materials and students' evaluation such as syllabuses and textbooks is in line with the front schools, and only in this way can be achieved more significant effects. However, the curriculum reform will lead

in the schools in different areas to have more right of selecting textbooks by themselves, and each province is allowed to make its own papers after college entrance examination reform, therefore, that will influence the effects of the synchronous remote education.

14.4.2 Suggestions

1. It is better to be applied in improving the educational quality in the educationally undeveloped areas

The synchronous remote teaching model is more suitably applied in the areas where primary and middle schools' educational sources do not meet the requirement, as well as the central and western regions. It is regarded as one of the means to improve the local schools' educational quality, share the teaching sources and develop teachers' professional capabilities, so it is better to be applied in the areas where the syllabuses, textbooks and, student evaluation are close to each other.

2. The integration of the relevant policies and programs promotes the rural educational quality

Education is a system and needs to be planned and implemented with an overall view. It is suggested to integrate the synchronous remote teaching model with the relevant national, regional and organizational programs and resources such as Modern Distance Education Project in Rural Schools, with the purpose of promoting the optimizing and utilization of the resources.

3. It is significant to provide supporting service for the teaching and learning process

It is very important to provide supporting service for the teaching and learning process, and the running of the model requires the professional organizations or institutes to offer service for teaching and learning. Therefore, some enterprises with the quality of providing teaching service are able to take advantage of offering customer service and managing customer relations in a better way.

4. The synchronous remote broadcast education is better to be applied flexibly according to the schools' reality

The management and support by the remote schools for the synchronous remote teaching is the key to the success of the synchronous remote education. The school synchronous remote education will be more successfully carried out and the potentials of it is better performed only by targeting at the different schools and their different stages of development, applying the synchronous remote teaching model flexibly, and providing more targeted service.

14.5 Conclusion

This chapter puts forward the method of SRC connecting K-12 schools from developed areas and undeveloped areas to solve the problem of unbalance development of education to some degree in China. It introduces the case of Chengdu NO. 7 online school in which the SRC is the most distinctive, elaborates development road, teaching system, and teaching model of it, and then analyzes the problems and gives some suggestions. Because we have not done empirical research about Chengdu NO. 7 online school, the results may be not enough rigorous. Therefore, further studies will trace the instructional practice and survey on stakeholders related the Chengdu NO. 7 online school.

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