

Online teaching in China during the COVID-19 pandemic

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ABSTRACT

This study was undertaken to understand the overall impact of China's online education practices at all levels during the COVID-19 pandemic. A study of remote learning was an opportunity to better understand the long-term impact and adoption of structural and pedagogical practices in the post-pandemic period. The main research subjects were teachers and administrators in K-12 primary, vocational colleges and universities. The adult learning andragogy model was utilized as a framework for understanding the conditions under which students and faculty learned and taught in a remote learning environment. Statistical analysis of survey data indicated the research subjects had expectations for a change in teaching methods into the future. Future research is needed to carry out an in-depth analysis of how to build a model for online education. As a result of this study, it was determined that the continuous evaluation of online education would help in shaping best practice for teaching and learning in a remote environment within China's educational system.

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1. INTRODUCTION

The swift transformation of the educational system to online and virtual as a result of the sudden outbreak of the pandemic COVID-19 has altered teaching and learning at all levels of education. The ministry of education of China issued a notice on January 29, 2020 requiring schools across the country to make full use of online platforms to carry out teaching activities and put forward the idea of "no stop teaching, no stop learning" [1]. There are 518,800 schools of all types and at all levels in China, with 16,728,500 full-time teachers and 276 million students. This is a huge scale and an unprecedented challenge for China's educational system. The COVID-19 crisis left all teachers-at all levels of education-unprepared for the challenges of teaching in a remote learning environment [2].

The sudden change in teaching methods brought challenges to educators, students and parents involved in online education around the world. According to a bulletin released by the international labor organization (ILO) on 11 August 2020, more than 70% of young learners worldwide were adversely affected by the pandemic of COVID-19 [3]. The countries with relatively underdeveloped information technology faced challenges trying to implement online teaching during the pandemic [4].

The onset of the COVID-19 pandemic was a rare opportunity to observe the transformation of education by online educational practice. China's online teaching during the pandemic provided a reference point for other countries in managing the sudden impact of teaching and learning during the global outbreak. This study provides a large amount of practical data and a reference for the future development of educational information about large scale educational reform.

With the development of information technology, many new methods of online teaching have been integrated within pedagogical practice. Interpretive animation, instructional videos, hypertext containing illustrated printed text, educational games and simulations, and other software driven pedagogical practices have become preferred teaching practices [5]. Demand for online courses soared. More than 80% of universities in Europe offered online courses for students in remote locations [6].

An advanced form of “independent learning + cooperative discussion + research” gradually emerged [7]. Online teaching has increasingly become the main way of course content dissemination. Part of its appeal is that online delivered locally has the same characteristics and appeal as online delivered internationally. In China, as in other countries, the efficacy of remote instruction has to be weighed against the cost and quality of learning when viewed as a common sense innovative educational advancement that serves the needs of the individual learner at the local level.

The debate over the effectiveness of online education has been mixed with acrimony and hyperbole. Some supporters express blind worship that online education can solve all the problems of traditional education. Opponents argue that online education is not as effective as traditional face-to-face teaching and that it will never be its equal. However, when the educational unit of analysis is focused on adults as learners, there is a growing body of evidence that indicates online education is suitable and more effective for adult education.

The prevalence of online technology has become the preferred way for the adult learner to continue one’s education, advance a career, or train for a new profession. Distance learning affords the adult learner flexibility and accessibility. Online education increases the possibilities and approaches for adult learners to receive lifelong learning. The emerging literature reveals that online learning programs and online learners are growing at a rapid rate. A compelling reason is that, regardless of place or time, adults who pursue further education through online learning adapt to the virtual environment and demand high quality learning [8]. A report from the American national center for education statistics found that a large proportion of students who study online are older with a seriousness of purpose in seeking out degrees, training, or specific knowledge to advance careers [9].

Adult learners can be defined as the those who continue their education by balancing their family and work and are, generally, older than 21 years of age [10]. Consistent with relevant literature, we identify nontraditional students as older learners, often with multiple roles and responsibilities. A report from the American national center for education statistics found that students aged 30 years and older, who are often married with children and have part or full-time jobs, make up the largest percentage of students enrolled in online courses [9].

Andragogy [11] is based on the assumption that adult learners have the ability, need, and desire to control and be responsible for their own learning. They are self-directed. They have a wealth of experience to draw from as they pursue and gain understanding from new knowledge and skills. Their readiness to learn is reflected in their social roles. Adult students show a strong need for a variety of educational methods. Their engagement in education is more irregular and varied compared with traditional student roles and expectations [12]. Specifically, they display significant differences from traditional students in terms of their academic, psychological, and life characteristics.

At the outset of the COVID-19 outbreak in the spring of 2020 offline teaching activities were stopped. Hence, students' learning and training needs were temporarily transferred to the online school. Online education became the dominant teaching method rather than an auxiliary means of teaching. In addition to personal computers, tablets and mobile phones became the main learning tools, and the internet and online teaching platforms became essential elements of teaching. The distance between teachers and students in the virtual teaching environment was bridged by using audio, video and online software that was an integrated system of education networked over the internet [13].

Instructional supervision in many countries involves the implementation and adoption of a supervisory process that measures teaching quality. Standards that guide instructor pedagogical practice, many believe, ensure high standards for teaching quality. It is therefore essential that appropriate pedagogical tools be utilized to help schools assess the quality of teaching. For example, Australia's national regulator, the tertiary education quality and standards authority (TEQSA), has recommended establishing benchmarks in a range of areas as a means for institutions to calibrate their quality processes [14].

Regardless of standards and institutional effort to improve the quality of online instruction there are people who do not accept online courses. The primary reason leading to a poor online learning experience for students is the lack of quality in online instruction [15]. Perceptions about the quality of online learning are complex because of the diversity of models and delivery methods [16]. Standards do not automatically lead to better quality, but they can be a tool for improving quality. Thus, the quality assurance of online teaching needs to be considered in the design process of online courses. Standards for online learning should be transparent, open, adaptable, and extensible [17].

During the formative growth of online learning, two organizations, namely the National Education Association (NEA) and Blackboard inc., a widely used online education platform provider, explored the adequacy and necessity of existing distance education quality benchmarks. They commissioned a study that identified 24 benchmarks considered essential to ensuring excellence in internet-based distance learning [18]. The research verification benchmark consists of eight aspects: i) Schools' support; ii) Curriculum development; iii) Teaching and learning; iv) Curriculum structure; v) Student support; vi) Teacher support; vii) Process assessment; viii) Outcome assessment.

These eight aspects of distance learning excellence have remained consistently valid. In 2020, the pandemic led to a worldwide emergency in organizing for high quality online teaching. The design time for making the transition to online teaching was short. The pedagogical transition to remote teaching was an unplanned process that created urgency, panic and a need for action. The adoption of a functional learning management system (LMS) for online teaching was a quick response mechanism for organizing learning. The integrated use of a LMS helped teachers diversify and design instruction that attracted and motivated students to more meaningfully engage with instructors and content in online learning [19]. Establishing two-way communication was key for ensuring the effectiveness of online teaching during the pandemic. Collecting teachers' and students' feedback in a timely manner was also a way to gather data on the impact of remote teaching and learning [20].

Online education can integrate high-quality educational materials and resources that can be utilized by any student, anywhere in the world. A defining quality of remote learning is that it has an international learning dynamic that is, as well, incorporated into the design and delivery of internet-based delivery. Good instruction is good instruction regardless of purveyor. A quality of twenty-first century learning is that internet delivery of instruction isn't constrained by time, space or distance. Big data and the optimization of programs, courses, and content delivery will push the development of learning that is meaningful and relevant within a delivery system that extends beyond the confines of a twentieth century concept of time sensitive and place-bound learning.

Online instructional design is contingent upon the full integration of content, teaching method and educational technology. In the virtual teaching environment, it is necessary to rethink the teaching method and teaching content. The principle of course development is to inject technology into virtual teaching method in order to improve remote teaching pedagogy and content delivery [21].

2. RESEARCH METHOD

2.1. Research design and participant

The Andragogic model of learning was utilized as a theoretical and conceptual framework for studying the pedagogical practice of K-12 teachers, higher vocational college teachers, university faculty, and administrators at all levels of instructional delivery. A comparative study was conducted through observation, data collection, and statistical analysis. The research subjects were teachers and administrators in primary and secondary schools, higher vocational colleges and universities. Stratified random sampling was utilized in this study to ensure that online education samples were gathered at different levels and were representative of the population [22]. By June 20, 2020, a total of 17 primary schools, 16 middle schools, 14 vocational colleges, and 15 full-time ordinary universities had participated. The category and number of survey responses are outlined in Table 1.

Table 1. Valid questionnaires responses

Category	Type	No.
Teachers	K12	1,494
	Vocational colleges	742
	Universities	1,245
	Total	3,481
Administrators	-	146

2.2. Research procedures

A developed province in the east, a moderately developed province in the middle of China, and a less-developed province in the southwest were selected as the geographic research areas. This study received extensive participation and support from schools within each province. Survey questions were divided into single choice questions, multiple-choice questions, and open questions. Questionnaire data collection was carried out through the questionnaire star network platform (<https://www.wjx.cn/app/survey.aspx>). Through statistical analysis a comparative analysis was conducted to determine teacher and administrator perspectives about online education, acceptance, and expectations.

2.3. Research instrument

Questionnaire star network platform (Wenjuanxing) is a professional online questionnaire survey, examination, evaluation and voting platform in China. It is focusing on providing users with powerful and humanized online questionnaire design, data collection, custom reports, survey results analysis and other services. Compared to traditional survey methods and other survey websites or survey systems, Wenjuanxing has obvious advantages of fast, easy to use and low cost, and has been widely used by many organizations and individuals.

2.4. Data analysis

Data collection took place from April to June 2020. There were 3,481 valid survey responses from teachers and 146 survey responses from administrators. All respondents from the teachers' group were directly involved in conducting online teaching. The questionnaire also included queries on general respondent characteristics such as gender, age, e-learning platform used and general comments. Survey questions were divided into single choice questions, multiple-choice questions, and open questions. Opinions, and perceptions of online education from teachers and administrators were collected and analyzed. Existing problems and issues in online education were identified. The study, through data analysis, provided some specific areas of emphasis in the development of online education in China.

3. RESULTS

During the COVID-19 outbreak the schools involved in this study were able to respond quickly to an unplanned transition to remote learning. This study is a snapshot that analyzes the decision to support the implementation of online learning for "No stop teaching, no stop learning." The Chinese Ministry of Education decision to implement "no stop teaching, no stop learning" by using the Internet for teaching and learning prompted provinces to work against time to meet the needs of teachers, students, and parents in transitioning to remote learning. Schools, principals, faculty, and teachers had to design and prepare online instruction without pre-planning.

3.1. Online teaching infrastructure in China

According to the report on education informatization and cyber security in China, by 2019, 98.4% of primary and secondary schools (including teaching centers) had access to the internet. Of these schools 90.1% had multimedia classrooms and 10 million teachers had participated in the "Excellent teacher and excellent course resources" activity to construct courses. China's Ministry of Education introduced achievements that were fully applied and tested in the epidemic. The ability to transition to remote learning during the COVID-19 pandemic laid a solid foundation for the future of online education in China [23].

As of February 2, 2020, the ministry of education organized 22 online course platforms to develop a diversified online teaching solution. The platforms were free of charge to access online resources for the schools involved in this study. These platforms included 1,291 national class quality online open courses. As well, more than 24,000 online courses (including 401 national virtual simulation experimental courses covering 12 disciplines) in 18 major categories were developed for vocational colleges [24].

According to the survey data average 70.75% of teachers thought online learning resources had become abundant during the pandemic. During the online teaching period an average 86.57% of the teachers expressed "satisfaction" with the operation of network infrastructure while an average of 31.19% were "very satisfied". The data are presented in Table 2. After the pandemic of 2020-2021 the Chinese Ministry of Education disseminated a large-scale online education plan of action. The internet and educational programming delivered via television each had advantages that, when used together, alleviated the pressure of an overloaded internet network. Importantly, online and tele-learning were promoted as technology options to address the lack of quality learning in rural, outlying, and poverty-stricken areas that had no network or limited network connectivity [25]. The goal of developing educational technology was hastened by the pandemic for supporting large-scale educational reform for high quality Chinese online education.

Table 2. Percentage of teachers who are satisfied with online teaching resources and network speed

Category	Believes that online teaching resources are abundant	Believes that online teaching resources are very abundant	Satisfied with the network speed	Very satisfied with the network speed
K12 teachers	74.84%	32.42%	85.77%	27.41%
Teachers of vocational colleges	49.23%	13.31%	83.52%	24.53%
Teachers of universities	88.17%	49.72%	90.41%	41.62%
Average percent	70.75%	31.82%	86.57%	31.19%

3.2. Survey acceptance of online teaching

"Classroom in the air" and "Live class" were used mainly by primary, middle and secondary school teachers as presented in Table 3. "Classroom in the air" was a new online course teaching software that was made available via television or downloaded as an app to study on a mobile phone. A "Classroom in the air" learning zone also provided free internet access service to help students in primary and secondary schools to study at home. The curriculum resources of "Classroom in the air" were carefully selected from the existing high-quality curriculum resources for primary and secondary schools and shared by primary and secondary schools in each of the provinces participating in this study.

Table 3. Online teaching methods were used mainly by primary, middle and secondary school teachers

Category	Classroom in the air	Live class
Primary school teachers	80.50%	15.42%
Middle school teachers	52.38%	42.64%
High school teachers	17.84%	80.73%

To solve the problem of insufficient curriculum resources, the provincial Department of Education coordinated deployment and clarified the resource deficiency by organizing teachers to develop appropriate curriculum materials. Newly recorded course resources were also made available for free through classroom in the air. Teachers of primary and secondary schools used social network platforms to tutor students and assign homework. However, due to the lack of online teaching experience, more than 90% of all teachers encountered difficulties in utilizing these online teaching resources.

According to the data collected 46.15% of the primary and secondary school teachers thought the online teaching effect was "normal", 40.39% thought the effect was "bad" and 13.46% thought the effect was "good". Teachers indicated that "the traditional face-to-face teaching effect was better than online teaching" by a proportion as high as 90.38%. Teachers facing discipline issues reported that "classroom discipline monitoring as difficult" and "lack of online teaching methods" were the highest proportions at 75.24% and 74.29%. "There is no good way to understand students' learning situation", accounted for 65.71% of the difficulties encountered by the teachers of primary and secondary schools. The data are presented in Figure 1.

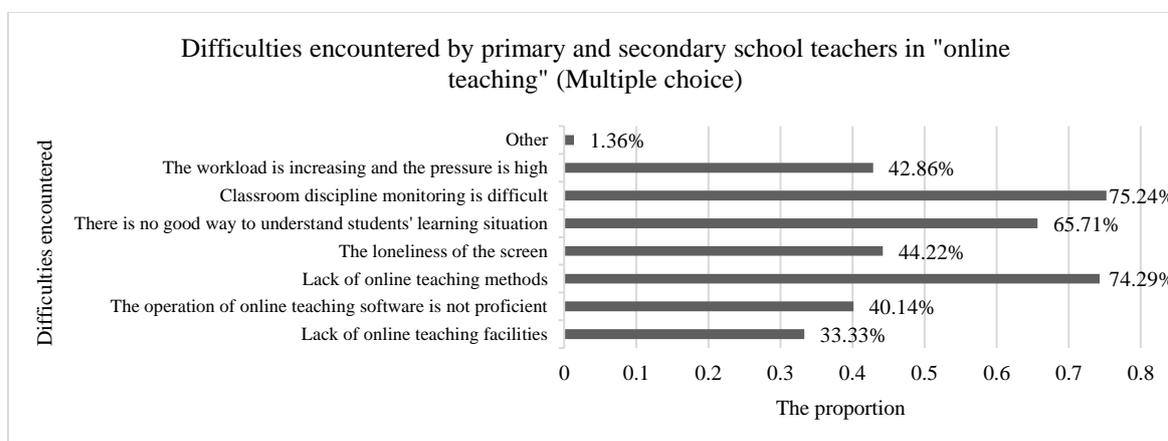


Figure 1. Difficulties encountered by the teachers of primary and secondary schools in online teaching (multiple choice)

Teachers in vocational colleges conducted "live class" lessons as the teaching method, accounting for 91.07%, and "push online learning materials" accounted for 60.71% as the ways used by teachers of vocational colleges in online teaching. Meanwhile, some other teaching methods also used are presented in Figure 2. There are 89.29% of higher vocational teachers believe that "face-to-face traditional teaching is better than online teaching". Hence, 75.12% of teachers think that "the effect of practical training courses is particularly bad". The difficulties encountered in the teaching process are the same as those encountered by primary and secondary school teachers.

The teaching methods of university teachers are diverse with a similar proportion of various teaching methods and the use of online platforms. Only university teachers indicated they had ever thought of teaching online before the pandemic. 51.76% of university teachers thought the online teaching effect during the epidemic was “good”, among which 18.33% thought it was very good. Compared with online teaching, 71.21% of teachers thought face-to-face teaching was better. The proportion of university teachers willing to adopt the online teaching method in the future was completely different from that of primary and secondary school teachers.

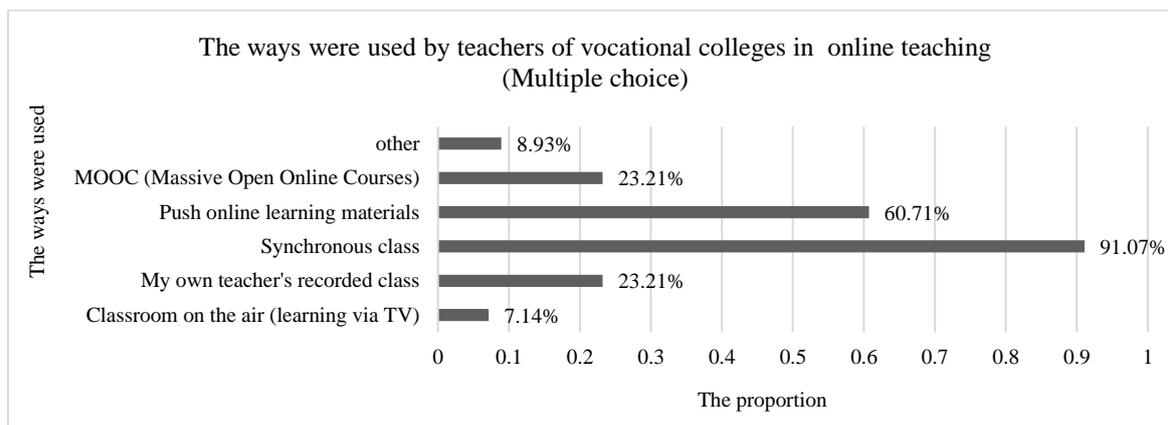


Figure 2. The ways were used by teachers of vocational colleges in online teaching (multiple choice)

4. DISCUSSION

During the COVID-19 pandemic, curriculum schedules and offline content were moved online. Teachers used information technology tools to carry out teaching. The temporary emergency remote online instructional delivery during the crisis suffered from a lack of quality. Teachers found it difficult to quickly master the methods of online teaching. The lack of adequate planning resulted in less than favorable student experiences for online learning. Face validity indicates that when the quality of teaching is lacking, so is student learning [2].

Online teaching in an emergency is a process and activity in which teachers and students use information technology to carry out long-distance learning. This kind of emergency online teaching was different from well-designed online teaching. Although it used existing networks to carry out teaching activities [26], it was not certain what specific teaching activities were carried out according to the best pedagogical practice for distance education and online teaching [2]. As Milman indicated, those teaching using technology under abnormal teaching conditions were under abnormal pressure to implement distance learning and teaching [27]. The results are predictable given the difficult circumstances under which teaching and learning were so dramatically altered.

For an online teaching course, the typical plan to prepare and develop a class takes anywhere from 6-9 months [26], during the pandemic academic teaching moved to the online network. The abruptness of the change resulted in a significant deviation in methods and teaching requirements leading to poor online learning experiences. According to the survey data, more than 75% of teachers of primary and secondary school did not expect to conduct online teaching in the future. However, more than half of them expressed they were willing to try the hybrid method, a combination of online teaching with traditional face-to-face teaching. The data indicated that teachers still had expectations remote learning was a viable alternative to face-to-face teaching. The data also indicated that teachers, were slowly forming positive attitudes about online education. The development of online instruction and the widespread use of information technology was viewed positively by respondents indicating a willingness to try new online teaching methods.

In the interviews with the front-line administrators of the schools involved in the study, more than 80% of them thought that online teaching training and services were inadequate. Administrators also recognized that proficiency in the operation of teaching platforms (i.e., quality of the LMS) and tools, students' proficiency in using the platform; student equipment support; system support of online teaching; policy support for online teaching; and online technical support services had a great influence on the success of online teaching. In our study, adults had a different perspective in their acceptance of distance education. Darden [28] proposed that not all adult students were willing to accept distance education as a learning platform. A lack of confidence in online learning, therefore, meant a low acceptance of distance education.

4.1. An optimized area of online education development in China

Based on the data of primary and secondary schools, higher vocational colleges, and universities this research study found that secondary schools and universities showed different results. The postgraduate education data was separately classified and subdivided into undergraduate education data and postgraduate education data. In responding to the question “Whether to continue online teaching” teachers within the university indicated by more than half, the hope to continue online teaching. According to the separated postgraduate education data, a higher percentage of teachers supported online teaching in the future, with 87.23% of graduate supervisors supporting online teaching in the future. Postgraduate tutors recognized that among the advantages of online teaching, "breaking geographical limits" and "sharing more learning resources with students" accounted for the highest proportion, which were 89.66% and 76.62% respectively and presented in Figure 3.

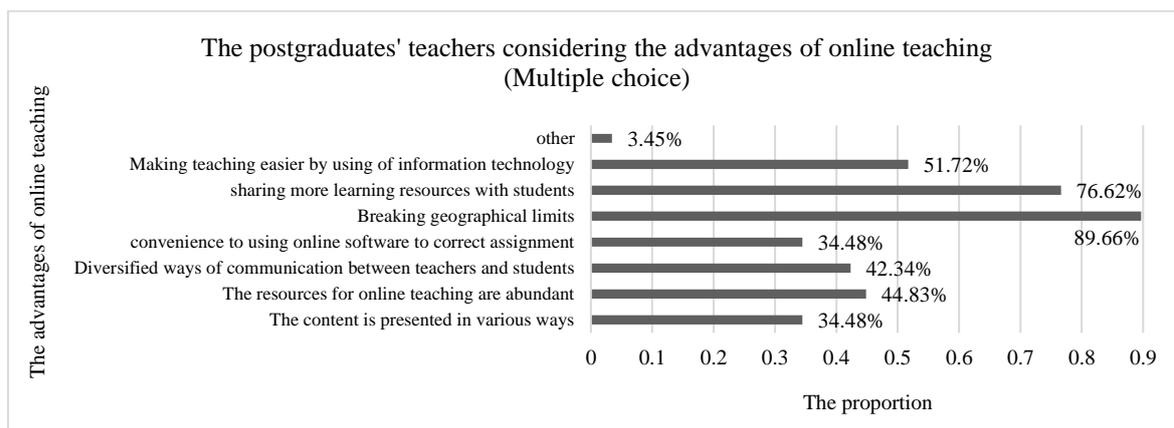


Figure 3. The Postgraduates' teachers considering the advantages of online teaching (multiple choice)

4.2. The feasibility of developing distance education for Chinese postgraduate students in China

At present, Chinese universities have not carried out distance postgraduate education. But, as distance education in China gradually moves from compensatory education to lifelong education, it is an inevitable choice to carry out distance graduate education [29]. Postgraduate teaching focuses on students' exploration and knowledge acquisition. Although there are a few courses, postgraduate students are highly motivated to take online classes. China's postgraduate enrollment is limited. After being screened by the national examination, universities must manage the application process and acceptance rate for specialized courses. Only outstanding students can be admitted. This ensures the quality of the students and integrity of the programs.

The age of postgraduates was generally over 22 years. Compared with students in K-12 education and undergraduate education, they have the advantage of being able to self-manage their online learning behavior. This study identified the basic requirements for participating in online learning as a student's ability to: be good at time management; have learning initiative; manage career aspirations to prepare for social role changes (which is also the main feature of students' strong demand for online learning); utilize technology and software for the delivery of learning to communicate well online.

The Andragogy Model by Knowles is based on assumptions that adult learners have the ability, need, and desire to control and be responsible for their own learning [11]. This study reinforced the premise that adults are self-directed. They have a wealth of experience to draw from in acquiring new knowledge and skills. Their readiness to learn is reflected in their social roles. An adult is drawn to the remote learning environment because it efficiently maximizes time commitments and learning requirements to achieve career and personal goals.

In China, online teaching was rarely used for traditional higher education and basic education before the pandemic of COVID-19 [30]. Network education refers to online higher education for adults in universities [31]. Since 1999, 69 universities in China have set up online education colleges which use online platforms to carry out higher and advanced continuing education for adults. At present, online education has become the main form of adult continuing education for the pursuit of advanced diplomas in China [32]. Network education is only engaged in junior college and undergraduate education.

In the past 20 years, network education in China has been developing and achieved a remarkable transformation, which accumulating useful material and institutional experience for the future distance postgraduate education in China. Moreover, large-scale online education during the pandemic of COVID-19 created an opportunity for the existing information technology to operate as a foundation for supporting a quality future for distance education. This research revealed the advantages of online teaching from postgraduate teachers' perspectives and, hence, investigated the solutions and difficulties encountered by graduate students as they pursued their course of study [12]. It can be predicted that distance postgraduate education has a broad development prospect in China towards a learning-oriented society.

5. CONCLUSION

The massive online education experience driven by the pandemic has become a rare observation of a burgeoning online educational system. Through investigation and research, it was found that the online teaching effect during the pandemic had marginal success. In traditional education, online education is not well accepted by teachers from primary school to undergraduate level. This is consistent with the research results of many researchers before the pandemic. Mainly, traditional teaching ideas and methods are affected by the limitations of technical application and pedagogical practice when applied to online learning. However, most teachers at all levels had expectations for improved online teaching as part of their future.

The study also indicated that the development of a model distance education platform for postgraduates would ease the limitations for acceptance into postgraduate programs. This study identified online learning as an emerging path for career progression and lifelong learning in China. This study offered insight into the online postgraduate education delivery system in China. There is not a definitive model that supports or assures quality in online delivery of learning. It is suggested that international cooperation would offer the opportunity to develop quality in postgraduate education.

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