ADAPTABILITY OF ONLINE TEACHING DURING THE COVID-19 PANDEMIC AMONG TEACHERS IN QIANLING TOWNSHIP RURAL PRIMARY SCHOOLS

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FACULTY OF EDUCATION
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ABSTRACT

With the pandemic of the COVID-19, online teaching has temporarily replaced traditional face-to-face teaching as an important teaching method. However, it exists many issues when implementing online teaching in rural areas. It is the first time that online courses has been wide-ranging implemented in rural districts, and it remains to be seen whether primary schools teachers can adapt to online teaching. Therefore, this research aims to understand the teachers' adaptation of online courses during the COVID-19 pandemic in primary schools focusing in rural district. The research method is a quantitative data analysis through online questionnaire surveys. It will use descriptive analysis to analyze the adaptation of teachers to online teaching. This study will choose one-way ANOVA to analyze the effects of different teaching ages or degree levels on the teachers' adaptability to online teaching. Also it will use correlation analysis to analyze the correlation between the TPACK Adaptation. This study chose 113 primary schools teachers at Qianling Township as the sample by random sampling. This study shows that during the COVID-19 pandemic, the teachers of Qianling Township primary schools were qualified to adapt to online courses and were at a moderate level. And teaching age and degree level show no effect on the teachers' adaptability to online teaching. Meanwhile, it has a positive correlation between the four

dimensions of TPACK Adaptation, and each dimension influences each other. Through the findings, this research found that primary schools teachers' adaptability on online courses is useful for teachers who may in a special situation similar to the COVID-19 pandemic to improve online teaching adaptability and institutes to optimize online teaching platform. This study gives the recommendation the future researcher to expand the sample size to other rural primary schools teachers in China, add qualitative data and use the experiments in the study on different educational groups.

KESESUAIAN PENGAJARAN SECARA DALAM TALIAN SEMASA

PANDEMIK COVID-19 DALAM KALANGAN GURU SEKOLAH RENDAH

LUAR BANDAR DI PERBANDARAN QIANLING

ABSTRAK DISERTASI

Dengan pandemik COVID-19, pengajaran dalam talian telah menggantikan pengajaran bersemuka tradisional sebagai kaedah pengajaran yang penting. Namun begitu, terdapat banyak masalah dalam pelaksanaan pengajaran dalam talian di kawasan luar bandar. Ini adalah kali pertama pengajaran dalam talian dilaksanakan secara besar-besaran di kawasan luar bandar, dan masih belum dapat dilihat sama ada guru sekolah rendah boleh menyesuaikan diri dengan pengajaran dalam talian. Oleh itu, kajian ini bertujuan untuk memahami penyesuaian guru terhadap kursus dalam talian semasa pandemik COVID-19 di sekolah rendah yang berfokus di daerah luar bandar. Kaedah kajian adalah analisis data kuantitatif melalui tinjauan soal selidik dalam talian. Ia akan menggunakan analisis deskriptif untuk menganalisis penyesuaian guru terhadap pengajaran dalam talian. Kajian ini akan memilih ANOVA sehala untuk menganalisis kesan umur pengajaran atau tahap ijazah yang berbeza terhadap kebolehsesuaian guru terhadap pengajaran dalam talian. Ia juga akan menggunakan analisis korelasi untuk menganalisis korelasi antara Penyesuaian TPACK. Kajian ini memilih 113 guru sekolah rendah di Perbandaran Qianling sebagai sampel secara persampelan rawak. Kajian ini menunjukkan bahawa semasa pandemik COVID-19, guru sekolah rendah Perbandaran Qianling layak untuk menyesuaikan diri dengan kursus dalam talian dan berada pada

tahap sederhana. Dan umur mengajar dan tahap ijazah tidak menunjukkan kesan ke atas kesesuaian guru terhadap pengajaran dalam talian. Sementara itu, terdapat korelasi positif antara empat dimensi Adaptasi TPACK, dan setiap dimensi saling mempengaruhi. Menerusi penemuan penyelidikan, kajian ini mendapati bahawa kebolehsuaian guru sekolah rendah dalam kursus dalam talian berguna untuk guru yang mungkin berada dalam situasi khas yang serupa dengan pandemik COVID-19 untuk meningkatkan kebolehsuaian pengajaran dalam talian dan institut untuk mengoptimumkan platform pengajaran dalam talian. Kajian ini memberi cadangan kepada pengkaji masa depan untuk mengembangkan saiz sampel kepada guru sekolah rendah luar bandar lain di China, menambah data kualitatif dan menggunakan eksperimen dalam kajian ke atas kumpulan pendidikan yang berbeza.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In this high technology era, technology has been developed rapidly to meet human needs in life as well as make our lives in an easier way. Technology plays an important role in our life as we rely on the technological products in the workplace, home as well as educational setting. Technology has also changed education. China's Education Modernization 2035（2019）calls for promoting education reform and puts forward requirements for future education reform at the national level. In 2015, Premier Li put forward the Internet plus strategy in his government work report. After the meeting, Internet plus has set off a wave of reform in all social circles. Internet technology has also been diffusely and deeply applied in education (Xing & Li, 2021), which has resulted in a split-new education form such as online education. Online education is a new form of education produced by the deep integration of modern information technology and education as represented by the Internet. Online education is an important component of educational services (Ministry of Education of China, 2020). Through the use of high-tech products, the intervention of interactive tools and multimedia can be applied and used in teaching and learning, making the classroom more efficient and interesting, and allowing students to learn online. As such, many believe that technology in education is good for student' grades and the efficiency of the

teaching and learning process (Jiang, 2016).

Using technology in education is not synchronized across China, and teachers' information literacy is also uneven (Fu & Zhou, 2020). Rural schools are not fully equipped, and teachers' information literacy is deviated (Li & Fu, 2020). With the blowout of knowledge and the continuous updating of digital technology in the information age, online education requires teachers to have high information literacy and strong adaptability (Li & Fu, 2020). For providing guidance for online education in rural primary schools during future severe catastrophes, research must be done to investigate how teachers adapted to online courses during the COVID-19 pandemic in primary schools focusing on rural district.

1.2 Background of the study

At the conclusion of 2019, the COVID-19 broke out in Wuhan, China, and then infected to the whole of China and the world. Around January 20, 2020, Chinese experts found that there was human-to-human transmission in this outbreak. Subsequently, Wuhan and other cities in Hubei Province began to lock down. By early February, the number of confirmed cases in Wuhan had risen sharply to several thousand or even tens of thousands (Health Commission of Hubei Province, China, 2020). Confirmed cases of the COVID-19 have also begun to appear in other parts of China. As of March 10, 2020,

the cumulative number of confirmed cases of COVID-19 reported in China has exceeded 80,000 (Office of Health Emergency, China, 2020). The epidemic situation is very serious. As of early April 2020, 194 countries throughout the world had completely suspended schools because to COVID-19, preventing 1.6 billion children from attending class as usual (UNESCO, 2020).

For effectively curbing the spread of the COVID-19, on January 27, China's Ministry of Education requested that all nearby schools delay the beginning of the spring semester. (Ministry of Education of China, 2020). And on January 29th, an initiative was issued: use the network platform to conduct Closing Classes and Non-stop Learning (Ministry of Education, China, 2020). Under the call of the Notice on Work Arrangements for Closing Classes and Non-stop Learning During the Delayed Opening of Primary and Secondary Schools, all provinces and localities responded positively. Qianling Township is one of them. At that time, all schools have suspended classes and adopted online teaching. All of them quit holding face-to-face lessons in favor of using online teaching and learning platforms to deliver online courses in order to safeguard teachers' and students' health.

In the traditional teaching model, schools require students to be present and take part in conventional teaching activities in the classroom. However, during the COVID-19 pandemic, for the health of teachers and students, face-to-face teaching activities must

be banned. Online courses have become a more suitable teaching method at this stage. At the beginning, online course is a teacher recording or making a teaching video, and students use a computer or television to watch the video to complete the teaching and learning process. This method can break the boundaries of time and space (He, 2020), allowing teachers to transfer knowledge to more students. However, this method has the characteristics of lack of face-to-face interaction (Guo, 2016), lack of emotional communication (Zhong, 2018), and poor organizational management (He, 2020). With the continuous advancement of Internet technology, online live teaching activities have begun to appear. Online live teaching activities require very high network quality (Wang et al., 2021).

In March 2020, the Standing Committee of the Political Bureau of the CPC Central Committee held a meeting to emphasize "accelerating the construction progress of new infrastructure such as 5G networks and data centers" (Sina Finance, 2020). China has promoted the building of 5G base stations. By April 2020, nearly 2,000 5G base stations have been constructed and opened in Xuzhou, and the application scenarios of 5G smart city have been preliminarily constructed, namely, 5G education circle, 5G life circle, 5G traffic circle and 5G tourism circle (Liu, 2020). During the COVID-19 pandemic, online live education flourished with the advocation of the Ministry of Education of China to Closing Classes and Non-stop Learning. Online live teaching attracted much attention, leading the new development trend of online education (Wang et al., 2020). Together, teachers and students can engage in educational activities when using this teaching

approach. Because of the progress in 5G technology and the launch of 5G base stations, online live learning is quickly growing and improving (Wang et al., 2021). This new teaching method improves the previous phenomenon of network problems, such as stuck, low definition, and stumbling courses that affect the user experience, so that the teaching mode of online courses is accepted and loved by more people. During the COVID-19 pandemic, China used this teaching model extensively.

According to the notice of Closing Classes and Non-stop Learning, for ensuring the smooth progression of online courses and reduce the burden of teachers preparing lessons, the government has provided two online teaching resource platforms for primary and secondary school students across the country, namely the National Primary and Secondary School Network Cloud Platform and the Air Classroom (China Ministry of Education & Ministry of Industry and Information Technology, 2020). Although online courses are an emergency measure taken during the COVID-19 pandemic, teachers and students also realize that online teaching is the best choice under the COVID-19 pandemic, so teachers are obliged to study online courses (Dai, Tang et al., 2020). There are certain discrepancies between face-to-face teaching and online teaching, and the latter has its own characteristics (Guo, 2016). In addition, it was not common to use the Internet for online teaching in rural areas, and there was little experience that could be used for reference.For teachers in primary schools in remote regions, adjusting to the change from conventional instruction to online instruction takes time. It is certain that different inappropriate circumstances and challenges would

arise during the adaption process.

Due to the promotion of the COVID-19, the already booming Internet online market has ushered in new development opportunities (Wang, 2020). People are more aware of the future development prospects of the Internet, and so is online teaching. More and more nations are starting to concentrate on online education development. For successfully completing their teaching tasks and work, primary schools' teachers in rural areas must follow the trend and adapt to various changes. Therefore, it is necessary to understand the teachers' adaptation of online courses during the COVID-19 pandemic in primary schools focusing on rural district. This has a strong reference value for teachers who teaching in rural primary school when they are in a similar situation like the COVID-19 pandemic.

1.3 Problem statement

For guaranteeing the teaching and learning activities of primary and secondary schools in the whole China during the COVID-19 pandemic, the General Office of the Ministry of Education and the General Office of the Ministry of Industry and Information Technology published a notice regarding the work arrangements for Closing Classes and Non-stop Learning in the period of the postponement of primary and secondary schools, calling on all these schools to conduct teaching activities through the

implementation of online courses during the COVID-19 pandemic (China Ministry of Education & Ministry of Industry and Information Technology, 2020). Under the call of Closing Classes and Non-stop Learning, all schools in China had started online teaching. In order to successfully complete teaching tasks and work, teachers must follow the trend and adapt to various changes (Li, 2020). This study mainly focuses on understanding the teachers' adaptation of online courses during the COVID-19 pandemic in primary schools focusing on rural district. Therefore, in the current educational situation, there are several issues that need to be addressed.

Online teaching is conducive to ensuring education fairness (Geng, 2022). The Education Informatization 2.0 Action Plan suggests continuing to support the development of educational informatization in severely underdeveloped areas in 2018 (Ministry of Education of China, 2018). The Guiding Opinions of the Central Committee of the Communist Party of China and the State Council on the Three-Year Action to Win the Battle of Poverty Alleviation proposes to give priority to the implementation of the Education Informatization 2.0 Action Plan in poverty-stricken areas, to improve the design of online learning environments in classrooms, and to share high-quality educational resources (State Council of China, 2018). The Notice of the General Office of the Ministry of Education and the General Office of the Ministry of Industry and Information Technology on Carrying out School Networking Tackling Actions also clearly requires promoting the optical fiber network coverage of unconnected schools in remote areas. Which is aimed to provide basic network

guarantee for conducting information-based education. Under the support of these national policies based on networking, especially the construction of the educational network environment, the network environment of rural schools has been rapidly improved (China Ministry of Education & Ministry of Industry and Information Technology, 2018). However, in 2019, there are nearly 70,000 rural teaching sites in China, and 57,800 rural teaching sites have information infrastructure in place. It means that there are still some rural teaching sites in China that do not have access to the network and lack information equipment (Li & Fu, 2019). Li and Fu (2020) found in their research that during the COVID-19 pandemic, the poverty-stricken areas in western China and poverty-stricken areas in central China showed serious educational shortcomings. In remote rural areas, many families did not have network equipment, and the mobile phone signal was weak. Therefore, in some places where network equipment cannot support online courses, it is still doubtful whether online teaching is really implemented. Therefore, this study would like to understand the transition of teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic.

In 2019, eleven departments including the Ministry of Education in China released the Guiding Opinions on Promoting the Healthy Development of Online Education to encourage the use of contemporary information technology to deliver online education services (Eleven departments including the Ministry of Education of China, 2019). Chu (2020), a researcher at the Chinese Academy of Education, said that during the

epidemic, online education was accepted and applied by more people in a wider range. With the entrance of the age of artificial intelligence, online teaching will become an important development trend of future education (Xu, 2021). Online courses are an important complement to educational formats (Cai, 2020). However, little progress has been made in rural areas before (Gao & Shen, 2022). Teachers need time to adapt to the new teaching mode. In the process of adaptation, teachers will encounter many problems. Wang et al. (2020) mentioned in their research that during the implementation of online courses, there are many situations, teachers are not proficient in operating software, and some operations on the student side cannot be supervised, etc., which affect the teaching effect of teachers. Li and Fu (2020) also mentioned in their research that rural teachers have low informatization literacy and insufficient adaptability to online teaching. Therefore, there are deviations in the adaptability of rural primary schools teachers to online teaching. Given the importance of teachers' teaching adaptation to online teaching, this research intends to analyze the teaching adaptability of rural primary schools' teachers in Qianling Township to implement online courses during the COVID-19 pandemic.

In order to conduct online courses smoothly, the Ministry of Education of China launched the national elementary and middle schools online cloud platform to offer resource support for teachers and students to teach and study at home (Ministry of Education of China, 2020). Geng (2022) stated in his research that online teaching helps to share high-quality resources to make up for the shortage of teacher structure in rural

schools. However, facing massive educational resources, finding what teachers need is a very time-consuming task. Fu and Zhou (2020) pointed out in their research that teachers are a little overwhelmed in the face of massive educational resources. They said that in addition to a batch of superior educational resources offered by the Chinese Ministry of Education, other online educational resources still have problems of mixed quality and mixed results. Therefore, one of the problems in the adaptation of online teaching is how to obtain and utilize high-quality online teaching resources. Online teaching has altered the traditional method of learning and can study anytime, anywhere (He, 2020). However, since the teaching change from traditional method to online method, teaching and learning supervision has become difficult (Zhao et al., 2020). Liu and Xu (2018) surveyed the study satisfaction factors of learners who chose the "Erya" online general education platform in a Chinese university in the second half of 2016 and found that online education cannot directly restrict students. Many people are really motivated when they first start studying online, but they are easily distracted by other new things. This is also a typical occurrence when most individuals study online (He, 2020). Li (2020) pointed out in her research that most teachers say that teaching supervision is difficult to control during online teaching. Therefore, one of the problems in the adaptation of online teaching is how to supervise students better. So this study would like to determine the difficulties of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic.

1.4 Purpose of study

The purpose of this study is to comprehend how teachers in primary schools, with a concentration on rural districts, adapted to online courses during the COVID-19 pandemic.

1.5 Research objectives

For answering the research questions, several research objectives are developed and stated clearly. There are three main objectives in this research. The objectives of this research are as follow:

1. To understand the transition of teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic.

2. To analyze the teaching adaptability of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic.

3. To determine the difficulties of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic.

1.6 Research questions

1. What is the transition of teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic?

2. What is the teaching adaptability of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic?

3. What are the difficulties of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic?

1.7 Research hypothesis

1.H0: Rural primary schools teachers in Qianling Township don't have transition when conducting teaching activities during the pandemic of COVID-19.

H1: Rural primary schools teachers in Qianling Township have transition when conducting teaching activities during the pandemic of COVID-19.

2.H0: Rural primary schools teachers in Qianling Township don't have significant teaching adaptability when implementing online teaching during the pandemic of COVID-19.

H1: Rural primary schools teachers in Qianling Township have significant teaching adaptability when implementing online teaching during the pandemic of COVID-19.

3.H0: Rural primary schools teachers in Qianling Township don't have difficulties when implementing online teaching during the pandemic of COVID-19.

H1: Rural primary school teachers in Qianling Township have some difficulties when implementing online teaching during the pandemic of COVID-19.

1.8 Significance of the research

In the midst of the COVID-19 pandemic, for preventing the infection of the COVID-19 and ensuring teachers' and students' health while completing teaching tasks, the Chinese Ministry of Education (2020) proposed "if face-to-face teaching is not possible, build cloud classrooms". Since online teaching entered China, it is the first time that it has been applied on such a large scale. As a brand-new teaching method, online teaching will provide more learners with the opportunity to receive a good education, which is conducive to the realization of equal educational opportunities (Li et al., 2020). Online teaching is a significant method, which using education to prepare students for the information society of the future, and developing high-caliber professionals (Yao, 2020). So far, online teaching has gradually become an important part of modern education, which has had a profound effect on study habits (Guo, 2015).

As a temporary emergency measure, online teaching under the COVID-19 pandemic has pulled in broad consideration from the whole Chinese society. If teachers want to successfully complete their teaching tasks, they must adapt to this new teaching model (Li, 2020). Therefore, the adaptability of online teaching during the COVID-19 pandemic among teachers in Qianling Township rural primary schools is obviously significant for other rural primary schools teachers who may encounter similar

COVID-19 outbreaks in the future, and are also critical to the online teaching in rural areas and developers of online teaching platforms.

The study provides a reference for future rural primary schools teachers conducting online courses during emergencies like COVID-19. The massive shutdowns of work and schools caused by the ravages of the COVID-19 in late 2019 are not the first in human history. The SARS pandemic in 2003 also led to the same situation. However, in 2003, China's network infrastructure was not perfect, so it was not yet ready to implement online courses nationwide. Taking the main primary schools in Qianling Township as an example, the model of letting students go home and study by themselves was generally adopted at that time. Self-study is difficult for young students. Especially in rural areas, parents' education level is generally low, and it is difficult to tutor and supervise students' learning. In the future, other emergencies similar to the COVID-19 pandemic may also occur. Studying the adaptability of rural primary school teachers' online teaching will help to increase rural primary schools teachers' understanding of conducting online teaching in similar emergencies. It will help rural primary schools teachers better adapt to online teaching.

The thesis serves as a reference for the growth of rural online education. Online teaching during the COVID-19 pandemic is an opportunity to develop online teaching in rural areas (Geng, 2022). Online teaching allows for the sharing of good teaching

resources and helps to narrow the gap in access to teaching resources between rural and urban schools (Xi, 2015). This time, the Chinese government requires schools at all levels to implement online teaching, which forces schools to overcome existing difficulties and successfully complete their teaching tasks. After the COVID-19 eased and schools resumed classes, the Chinese Ministry of Education issued a letter on the reply to the proposal No. 3933 (Education No. 359) of the Fourth Session of the 13th National Committee of the Chinese People's Political Consultative Conference to go on to encourage the development of online education (Ministry of Education of China, 2021). The research on the adaptability of online teaching during the COVID-19 pandemic of the primary school teachers in Qianling Township can also provide useful recommendations for advancing rural online education.

The study provides a reference for developers of online teaching platforms. The online teaching platforms are a program developed by program developers for online teaching. For example, Dingding, Hujiang Online School, etc. This study emphasizes the adaptability of rural primary schools teachers when conducting online teaching, and studies the challenges met by rural teachers in online teaching. It provides important knowledge and advice for online teaching platform developers. It helps platform creators learn what teachers need and what problems current online teaching platforms have, so that online teaching platform developers can create more convenient and efficient online teaching platforms.

Therefore, this study looks at how teachers in rural primary schools have adapted to teaching during the COVID-19 pandemic. It looks at the changes in teaching activities that these teachers have made and the difficulties they have faced with online teaching. The aim is to help more rural primary school teachers find better ways to adjust to online teaching.

1.9 Rationale of the research

With classes suspended and non-stop learning mandated by the Chinese Ministry of Education during the COVID-19 pandemic, online instruction has progressively taken over as the norm. Online teaching provides new opportunities for students to learn during home isolation. But after all, the implementation of online teaching has been rushed, so teachers, especially rural primary schools teachers, still have some difficulties in the process of adapting to it. Although teachers work hard to overcome and adapt early, there are still some challenges.

About theoretical significance, the research enriches the theoretical perspective of online teaching during the COVID-19 pandemic. At present, relevant researches on online teaching during the COVID-19 pandemic mainly concentrates on the construction of resource platforms and higher education or how to make better the

teaching effect of urban school districts. But, there are few studies on rural school districts and primary schools teachers, and there is no in-depth study on the adaptability of rural primary schools teachers to online teaching. Therefore, this study expands the research scope of online teaching during the COVID-19 pandemic and improves its shortcomings.

In terms of practical significance, by investigating the online teaching adaptation situation of rural primary schools teachers, we can more comprehensively explore the challenges met by teachers when adapting to online course. Therefore, this study can understand the current problems of online teaching adaptation of rural primary schools teachers, and provide a reference for other rural primary schools teachers to quickly adapt to online teaching in similar emergencies in the future. It also promotes online class platform designers to make more reasonable designs that will accommodate teachers of various skill levels and help teachers adapt to online teaching better and faster. Additionally, it advances the somewhat archaic educational status quo in rural places and encourages the growth of online education in these communities.

1.10 Limitations and delimitation of the problem being studied

In this research, there are several limitations and delimitation that limit the scope of the study.

1.10.1 Limitations

Limitations are potential weaknesses that is out of one's control in the study. One of the limitation here is is related to the data collection method. This study is a non-experimental study, and will use a questionnaire to investigate the adaptability of Qianling Township primary schools teachers' online teaching during the COVID-19 pandemic. The adaptability of the online teaching offered by the primary schools teachers in Qianling Township during the COVID-19 pandemic may therefore not be able to be evaluated thoroughly..

Secondly, there are many types of courses in online courses. Since it was introduced in China, online education has taken on a variety of forms and caters to a wide age range. In addition to the extra-curricular tutoring classes for the courses that students take in school, preschoolers can also learn interest courses on the Internet, such as English for young children. Even the continuing education of adults is developing very well, because adults do not have time to take offline courses, but they have the need to continue learning. In developed areas or middle schools and even universities, online teaching subjects will be more abundant during the COVID-19 pandemic. The three disciplines of Chinese, Math, and English that were offered online at primary schools in Qianling Township during the COVID-19 pandemic are the only online courses mentioned in this paper.

Thirdly, this study will conduct an online questionnaire to collect data. It is because after the infection of the COVID-19, schools in China began to limit the visitor to the campus. So this study can only take an online way to collect data.

1.10.2 Delimitation

Delimitation refers to the qualities that set a study's parameters and confine its scope. The first delimitation of this research is the scope of the resources. In this research, the resources are what teachers use to teach in their classes. The Internet provides a variety of resources for online teaching and learning. Not only teachers can get the resources they need for teaching on the Internet, but students can also get the resources they need for learning on the Internet. However in this research, the resources studied has two features: a) used for teaching. In this study, the resources means what teachers used for teaching. b) free. It is for fair because not every teacher can pay for purchase teaching resources.

Secondly, there are many rural areas in China can be the location for this research. Susong County is one of them. Susong County is a national poverty-stricken county. It meets the requirement of focusing on rural areas in this research topic. At the same time, the number of residents in its territory is large, and the number of primary schools and primary schools teachers is sufficient to obtain the samples needed for research. In order to facilitate the study, this study takes Qianling Township in Susong County as the

location. First of all, because the overall economic situation of Qianling Township is in the middle level in the whole county, the conclusions drawn from its research are closer to the actual situation of the whole county. Second, Qianling Township has enough primary schools and primary schools teachers, which can provide sufficient samples and data for the research. Therefore, in view of the principle of practicality, this research takes Qianling Township as the location for research.

Third, the TPACK model serves as the foundation for this research's framework model. In the TPACK model, there are eight elements in total, namely technological knowledge, pedagogical knowledge, content knowledge, technological pedagogical knowledge, technological content knowledge, pedagogical content knowledge, technological pedagogical content knowledge, context. However, since this study examines teachers' adaptability to online teaching, it only focuses on the technical aspects related to the Internet, namely technological knowledge, technological pedagogical knowledge, technological content knowledge, technological pedagogical content knowledge, respectively. For pedagogical knowledge, content knowledge and pedagogical content knowledge that already exist in traditional teaching, this study does not investigate.

1.11 Definition of terms

(Operational definitions are research variables that is measured in this study)

For the goal of research the following term was operationally defined.

1. Adaptability

Adaptability is a soft skill that shows you can easily change and adjust when things around you are different (Kaplan, 2023). In this research, the definition of adaptability is that the rural primary schools teachers in Qianling Township adjust to the new online teaching during the COVID-19 pandemic or not.

2. Online teaching

Online teaching means that teachers use Internet and related equipment to transmit teaching information to students. Online teaching possesses the features of timeliness, sharing, interactivity and individualization. Online teaching overcomes the impediments of time and space so that it can take put at whatever point and anyplace. Online teaching is the teaching method took during the COVID-19 pandemic in China. It mainly contains three subjects of Chinese, mathematics and English.

3. Online teaching adaptability

Teachers' teaching adaptation generally refers to the process of new teachers in the teaching team, using the theoretical knowledge and skills they have mastered to adjust to educational work, brand-new environments and interpersonal relationships (Li, 2020). In this study, the teaching adaptability refers to Qianling Township primary schools teachers' adaptability of online teaching during the COVID-19 pandemic only.

4. The COVID-19 Pandemic

Pandemic means an epidemic that spreads across regions. In this study, the online courses conducted from February to May in 2020. It is just during the pandemic period of COVID-19.

5. Rural primary schools

Rural primary schools refers to the primary schools opened within the rural district. In this study, these schools location is Qianling Township. Qianling Township is affiliated to Susong County, Anqing City, Anhui Province. According to data from the seventh census of Anqing City, Anhui Province in 2021, the total resident population of Susong County is 612,586, of which the rural population accounts for 59.95%. What's more, due to its low economic level, Susong County was listed as a poor county by the Anhui provincial government.

1.12 Summary

This chapter summarizes the problems of online teaching during the COVID-19 pandemic and proposes research objectives, namely to understand the teachers' adaptation of online courses during the COVID-19 pandemic in primary schools focusing in rural district. It discusses the importance of teachers' adaptation to online

teaching in rural primary schools, and explains why this study needs to study the adaptation of teachers' online teaching during the COVID-19 pandemic. Finally, definitions of research variables and terms are given. Literature review which includes related theories, related studies, theoretical framework and conceptual framework will be introduced in the next chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The purpose of a literature review is to find fresh research breakthroughs while objectively describing and commenting on the research topic's existing state. It requires the author not only to synthesize and state the main viewpoints of the reviewed materials, but also to conduct more professional, comprehensive, in-depth, and systematic discussions and corresponding evaluations of the synthesized literature. It can not only reflect the scientific nature, innovation and application of research, but also guide researchers to choose appropriate analysis methods.

This chapter consists of five parts. The first one is a review of related theories and models, describing the strengths and weaknesses of related theories, including constructivism and teacher professional development. The second part presents a theoretical framework based on the TPACK model, which aims to analyze the effect of teachers' online teaching adaptation based on the ability to study the integration of teachers' technology and pedagogy and content knowledge. The third part is a review of structure and concepts, briefly introducing the existing state of affairs of online teaching and the definition of teaching adaptability, as well as a further review and classification

of online teaching. The fourth part shows the previous research, finds out the insufficiency of the research, and finds the direction for the research on the adaptability of online teaching. The fifth part is the conceptual framework. The TPACK model's elements are used to online teaching adaptation based on the theoretical framework, the interaction between various variables is investigated, and the impact of teachers' online teaching adaptation is evaluated.

2.2 Related Theories and Models

For providing a basic theoretical guarantee for this study, the researchers put forward two theories and a model on the basis of reading relevant literature, in order to provide a strong position and academic goals for the study.

2.2.1 Constructivist Learning

The concept of constructivism was originally born in the field of philosophy, not a teaching theory. Psychologist Jean Piaget introduced constructivism in 1966. Later, the educational psychology domain absorbed the idea of constructivism, and scholars represented by Ernst von Glasersfeld gradually perfected constructivism, put forward the theory of constructivism, and gradually infiltrated it into the field of teaching, forming a constructivist learning theory (Dinter, 2009). Constructivist learning theory refers to the learning theory instructed by the basic idea of constructivism on the basis

of criticizing traditional teaching theories. It mainly describes the general laws of teaching under the concept of constructivism, and mainly solves the problem of how teachers teach (Xiu, 2022). Felder (2012), Gordon (2008), Neo et al.(2009) believe that constructivism is a useful theory for explaining how people learn about the world and acquire new knowledge. The hypothesis of constructivism is that knowledge isn't holding up to be found but or maybe it is built by people by interaction with the world and with each other. Learning is a social negotiation of knowledge as well as a building of knowledge (Xiao, 2020). Learner collaboration, interaction, and engagement are foundational in the constructivist theory of learning (Xu & Shi, 2018). Carini, Menchaca, Merril et al.   believe that working together and doing interactive activities are the best ways to help students understand things better (Butzler, 2014). The constructivist learning theory states that through consultation in the community, learning can be the process of construction and cognition of knowledge (Xu & Shi, 2018). The introduction of system of language and text has solved the communicative and objective validity of knowledge and made it possible to achieve the teaching and learning of knowledge. The largest community is mankind. As long as man exists, knowledge can be acquired. And at the meantime, knowledge can only be acquired under the condition of the existence of mankind (Ren, 2008).

Constructivist learning theory supports student-centered learning under the guidance of teachers (Xiu, 2022). In addition, constructivist learning environment includes four elements: situation, cooperation, conversation and meaning construction (Xu & Shi,

2018). The form of education adapted to the constructivist learning theory and the constructivist learning environment can therefore be summarized as follows: Teachers act as organizers, mentors, assistants and facilitators in the placement of students during the learning process. Situation, cooperation and conversation are used as learning environment elements to fully stimulate the initiative, enthusiasm and the pioneering spirit of students. Thus, it can finally achieve the goal of effectively realizing the meaning construction of the current knowledge (He, 1997). In this mode, students are active constructors of knowledge rather than passive recipients of external stimuli (Li, 2022); and the teacher is the facilitator of the instructional process, rather than the teacher of knowledge(Xiu, 2022). The knowledge provided by the textbook is no longer the content of the teacher's teaching, but the object of the students' active construction of meaning (Li, 2022). Media is no longer the means for helping teachers pass on knowledge, but to create a situation in collaborative learning (Xu & Shi, 2018). Conversation is used as one of the students' collaborative and exploratory learning tools (Xu & Shi, 2018).

The application of constructivism in teaching mainly has three modes: a) Scaffolding Instruction; b) Anchored Instruction; c) Random Access Instruction. Scaffolding Instruction refers to using the students' original knowledge as the intervention space, taking the doubts encountered by the students in the learning as the support point, using various methods to guide the students in the appropriate reality, and finally waiting for the students to accomplish the task independently Afterwards, the support is gradually

withdrawn, so that students can deal with related issues independently (Gao, 2012). Scaffolding Instruction is based on the theory of the zone of proximal development of the former Soviet famous psychologist Vygotsky. It incorporates constructivism's theories and serves as a crucial framework for teachers' teaching and students' active learning (Li, 2022). Anchored Instruction is also called situational teaching. This model focuses more on using very realistic situations to drive the learning atmosphere in the classroom under the conditions of actual events or problems (Cai, 2022). This teaching mode can enable students to learn to identify problems independently in daily life, and then be able to think about problems independently, and finally achieve the goal of solving problems independently (Li, 2022). Learners can learn the same teaching content through different channels and methods at will, so as to gain multi-faceted knowledge and understanding of the same thing or the same problem. This is Random Access Instruction (Liu & Zhang, 2021). By inputting the same content many times, learners will get the knowledge content more comprehensively and deeply.

The constructivist learning theory has gradually matured through continuous development and improvement. And adapted to the development of the times (Li, 2022). Constructivist learning theory stresses respecting the subject status of students, and teaching should keep "student-centered". Within the handle of executing online courses, teachers need to use learning elements such as scaffolding, scenarios, collaboration, and evaluation to encourage students to be active and creative, play the role of guides and facilitators, guide and support students while they learn independently (Xiu, 2022).

These are also the requirements of online teaching for teachers. Constructivist learning theory can guide teachers in online teaching and help teachers adapt to online teaching faster.

2.2.2 Theory of Deep Integration of Information Technology and Curriculum

Since the mid-1990s, information technology has entered the third stage of development, that is, the integration of information technology and various subject courses, and the application of information technology in the teaching process has become the dominant mode (Xu, 2022). The ultimate effect of educational informatization must embody in the obviously exaltation of subject teaching effect and students' comprehensive quality, which requires that when applying information technology in education, it is necessary to emphasize on using information technology to optimize the teaching process for promoting the maximization of teaching efficiency and effectiveness (He, 2008). Huang (2020) pointed out that after years of exploration and practice, the combination and advancement of curriculum education, information technology and multimedia means has become a consensus. Mass education and scientific research work flourished, and thus promoted the continuous growth of Chinese educational reform.

It is anticipated to develop a completely new sort of educational environment by effectively integrating information technology into the teaching of various disciplines, and realize a self-directed teaching environment that can both support teachers in their

leadership roles and accurately reflect the subjective status of students. To make students more active and creative, we can change the traditional way of teaching and focus on strategies that encourage learning, exploring, and working together. This will allow students' creative spirits and the development of practical ability to be effectively implemented (He, 2005). The aim of integrating information technology and curriculum is to fully display the initiative, enthusiasm and even creativity of pupils, so as to foster a wide number of inventive talents (He, 2008). The nature of the integration of information technology and curriculum is to build a vivid digital learning environment (He, 2008).

He (2008) put forward strategies of effective integration after analyzing and thinking about American information technology and curriculum integration theory: a) using advanced educational theories (especially constructivism theory) to guide; b) closely surrounding the creation of a subject-based teaching structure; c) It is necessary to use the teaching design theory that emphasizes both learning and teaching in teaching design; d) It is necessary to endeavor to construct information-based teaching resources; e) It is necessary to combine the characteristics of different disciplines to create a teaching model that can support a new teaching structure.

The advantages and traits of information technology are gradually being used to school education and teaching with the emergence of the information age, and

information-based teaching has gradually become the general trend. The integration of information technology and curriculum is a significant topic of common concern and research in the international education community and even the educational technology community (Wang & Wang, 2019). After the pandemic of the COVID-19, the application of information technology in teaching has become more common. All types of schools at all levels have begun to implement online courses. This requires teachers to master the theory of deep integration of information technology and specific courses (Xu, 2022). The incorporation of ICT develops an ICT-based learning environment and stimulates students' initiative. This also brings forward certain demands for teachers to understand and apply this theory. To increase the effectiveness of classroom instruction and better accommodate online instruction, teachers should adjust to the changing growth tendency of the age, particularly the tendency of modern educational technology development.

2.3 Theoretical Framework of the Study

Koehler and Mishra (2006) created a system to help teachers assess how well they integrate technology in the classroom. The system is called Technology Pedagogy and Content Knowledge (TPACK). It provides a framework to describe and target the use of technology to improve learning observed by three major components, Technological Knowledge (TK), Pedagogical Knowledge (PK) and Content Knowledge (CK) (Absari et al., 2020). It was proposed by American scholars Matthew Koehler and Punya Mishra

in 2005 as a result of Pedagogical Content Knowledge (PCK) proposed by Shulman (Cai, 2018). TPACK is a new definition of teachers' professional knowledge structure in the information technology era, and it is vital for teachers to make use of technology to assist effective teaching (Xu, 2014). Developing teachers' knowledge of TPACK is essential for teaching reform in the information age (Yang, 2020). Teachers' TPACK ability is a vital literacy for future teachers (Chen, 2015). The TPACK framework involves eight parts, including three core elements, technological knowledge (TK), content knowledge (CK) and pedagogical knowledge (PK); four composite elements, which are pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPCK); a peripheral factor, context (Koehler & Mishra, 2009). This study is dedicated to understanding the teachers' adaptation of online courses during the COVID-19 pandemic in primary schools focusing in rural district. Therefore, a theoretical framework suitable for this study was produced by combining adaptation and TPACK model in the research. As the Figure 2.1shows.

2.3.1 Technological Knowledge (TK)

Technological Knowledge is knowledge about information technology (both hardware and software) (Cox & Graham, 2009; Koehler & Mishra, 2009). For example, using the Internet, Wikipedia; making and uploading videos, etc.

2.3.2 Content Knowledge (CK)

Content Knowledge is knowledge about subject content (Cox & Graham, 2009; Koehler & Mishra, 2009). For example, Chinese, mathematics, English and other subject knowledge.

2.3.3 Pedagogical Knowledge (PK)

Pedagogical Knowledge is knowledge about student learning, teaching theories, teaching strategies, teaching evaluation, etc. (Cox & Graham, 2009; Koehler & Mishra, 2009). Such as the utilize of concepts to transform teaching models, problem-solving teaching models, and the zone of proximal development.

2.3.4 Technological Content Knowledge (TCK)

Technological Content Knowledge is knowledge about using appropriate information technology to present the content of a subject (Cox & Graham, 2009; Koehler & Mishra, 2009). Such as chemical experiments Flash animation.

2.3.5 Technological Pedagogical Knowledge (TPK)

Technological Pedagogical Knowledge is knowledge about using appropriate information technology to support a teaching strategy/method (Cox & Graham, 2009;

Koehler & Mishra, 2009). For example, use data collectors for scientific inquiry, use Webquest for online cooperative learning, etc.

2.3.6 Pedagogical Content Knowledge (PCK)

Pedagogical Content Knowledge is about the knowledge of using appropriate teaching strategies to teach the content of a subject (Cox & Graham, 2009; Koehler & Mishra, 2009). For example, use models to explain the structure of atoms; use analogy to explain the chemical properties of substances, etc.

2.3.7 Technological Pedagogical And Content Knowledge (TPACK)

Technological Pedagogical And Content Knowledge is about utilizing diverse information technologies to deliver subject content (Cox & Graham, 2009; Koehler & Mishra, 2009). For example, use the data collector to conduct inquiry learning on the content of "salt decomposition" in the subject of chemistry. The mastery of TPACK knowledge is the basis for effective teaching and the prerequisite for teachers to become expert teachers (Xu, 2014).

Figure 2.1

The Theoretical Framework
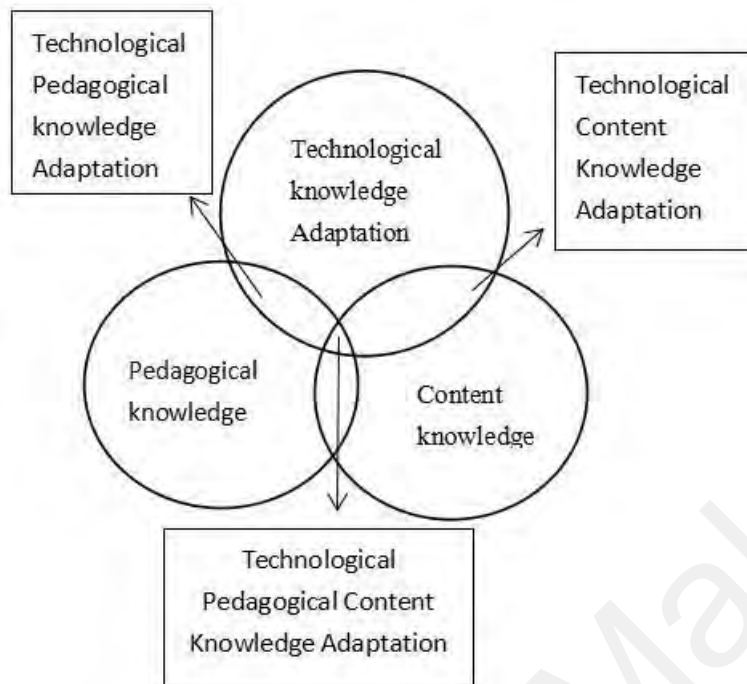
In the future after COVID-19, online education will become even more important. Online education and traditional education will both exist together to offer more choices for learning, promote fairness in education, and encourage new ways of learning with the help of artificial intelligence and mobile education (Xie & Siau et al., 2020). Therefore, teachers' adaptation to online teaching is crucial. In the research, analyzing the online teaching adaptability of rural primary schools teachers during the COVID-19 pandemic is actually equivalent to analyzing whether teachers have the ability to implement online teaching, that is, the ability to perfectly integrate technology, pedagogy and content knowledge. These issues relate to the framework of knowledge that a 21st century teacher must acquire is Technological Pedagogical Content Knowledge (TPACK) (Hwee & Koh, 2011). TPACK is utilizing multiple information technologies to deliver the knowledge of a subject. It is the highest knowledge requirement of information teaching. Therefore, the explicit manifestation of this type

of knowledge is the teacher's capacity to conduct information-based teaching (Yin, 2019). Technological Pedagogical Content Knowledge (TPACK) is a popular model that helps teachers understand how to use technology in education (Petko, 2020). Therefore, this study focuses on the adaptability in the TPACK model as a theoretical framework to study the adaptability of rural primary schools teachers to online teaching.

2.4 Review of Concepts Involved

The worldwide COVID-19 outbreak increases opportunities for people to learn online (Xin Xie & Siau et al., 2020). The advent of online courses has transformed education. Education can now happen anytime and anywhere. The types of online courses are becoming more and more abundant. Extracurricular tutoring suitable for students, professional skills courses suitable for adults, etc. Online courses have also changed the inequity of traditional education. Through the network, students in rural areas can also learn from outstanding teachers in cities. Online courses have gradually became the first choice for adults who want to improve themselves, and it is also a significant direction for the development of national education. However, owing to the different economic levels, there is an imbalance in the growth of online education in urban and rural districts (Zhu, 2020). The "China Statistical Yearbook-2019" shows that there are significant differences in urban and rural education, which are reflected in the allocation of teachers, allocation of educational infrastructure resources, and allocation of education finance (National Bureau of Statistics of China, 2019). At the beginning of

the COVID-19 pandemic, for ensuring teachers' and students' health and preventing the infection of the COVID-19, all campuses in China began to conduct online courses under the encouragement of the Ministry of Education of China. This is the first time that online courses have been implemented on such a large scale in China. Although it is a last resort in special times, the teaching effect of online courses has attracted much attention from the society. This requires teachers to adapt to online teaching as soon as possible. Therefore, for further studing the adaptability of rural teachers' online teaching, this section will summarize the concepts of teaching adaptability and online courses.

2.4.1 Teaching Adaptability

When it comes to educational research, the "Dictionary of Education（1986）" pointed out that adaptation generally refers to the adaptation of the body to the environment, that is, the process of individuals actively adjusting, changing themselves, adapting to changes, and then achieving balance with the environment. Chen (2005) believes that teaching adaptation is the spontaneous adjustment of role positioning, teaching methods and classroom models by teachers to adapt to the educational environment and educational development. Zhao (2016) took digital teaching as the background and pointed out that teacher adaptation is the psychological-behavioral characteristic of teachers to keep a balance among themselves and the surrounding by adjusting their own psychological state and behavioral practice. From the perspective of pedagogy, teachers often emphasize self-regulation, exert their subjective initiative, and achieve a state of harmony between themselves and the external environment.

Some researchers focus on the adaptation of the teacher's role. Wu (2010) defines teaching adaptation as a process in which a teacher fully enters the role of a teacher, has a stable mood, and organizes teaching activities smoothly, but at the same time, it lacks flexibility and creativity.

Some researchers also focus on the teaching procedure of novice teachers from a micro perspective. Ren (2014) refined the teaching adaptation process to specific teaching tasks, that is, novice teachers can smoothly prepare lessons, attend classes, homework, tutoring, testing, and performance evaluation.

Teaching adaptation is mostly for novice teachers (Li, 2020). However, in this study, it is because of the change of teaching mode that teachers need to adapt to teaching. For teachers of online teaching, teaching adaptation is the process of using their existing knowledge and skills to teaching through the special teaching field of the network platform, gradually improving their personal teaching skills, and constantly adapting to online teaching.

2.4.2 Online Teaching

Online teaching, also known as online education or distance education. It is a new teaching way in the field of education and a new thing that is constantly developing in practice. When it is pivotal to hinder and regulate the dissemination of an epidemic, massive online learning is an important way to implement "suspend classes without stopping learning". It is both an emergency and a general trend (Li, 2021). Various domestic and international specialists and academics have expressed their opinions based on their cognition and understanding of online teaching. American educator Salman Khan (1997) proposed that online teaching uses the network as a medium to transfer knowledge and teach to students who are not in front of them. Felder. RM and Silverman. LK (1998) conducted an in-depth study on the composition of online teaching in the framework of technical support theory, they also believed that an effective online teaching system supports personalized teaching. Learners can independently choose or adjust the time and way of receiving information according to their own needs and characteristics. Ding (2005) believes that the fundamental feature of distance education is the relative separation of teachers and students, that is, the relative separation of teaching and learning. Ma (2019) made the observation that online education is a non-face-to-face educational activity that depends on Internet technology, employs knowledge learning as the foundation, and uses various means of contact like the Internet to separate teachers and students from learners.

In the current teaching activities, there are mainly two online teaching methods used by

teachers: one is to simply use network technology and network resources to transform the teaching content in paper textbooks to complete teaching tasks. The other introduces a network-based online teaching platform to realize the dual-effect combination of online and offline teaching, further enhance the learning environment, and accomplish the objective of enhancing the total teaching effect (You, 2023). With the aid of Internet connection technology and a teaching platform, online teaching can assist teachers and students in completing educational tasks more effectively than traditional teaching methods. In addition, teachers can also use multimedia means, like video and audio, images, text, PPT and other teaching information to achieve fast and effective dissemination of teaching resources, and at the same time enable students to come into contact with more intuitive and vivid teaching resources. The demand for feedback and information sharing between teachers and students during teaching is most importantly well-served by online teaching.

Online courses are different from traditional online education. Related research shows that there are some issues with the previous online education. For example, there is a lack of systematic teaching programs. Most online education courses still remain in fragmented teaching or focus on basic science (Zhou, Wang & Huang, 2018). As new media technology has advanced, the comparison between online courses and traditional classrooms and the educational reforms brought about by them have attracted people's attention. In the model developed by related scholars, they found that the lower the satisfaction of offline courses, the more students tend to use online courses to

supplement. The frequency of use also varies significantly across disciplines (Sun, Zhao, et al., 2015). In the background of the COVID-19, in recent years, the in-depth integration of the Internet has advanced significantly, particularly in the creation of curriculum resources, it has been able to offer a variety of high-quality online teaching resources that can be selected and cover various places. In the COVID-19, the wide-ranging online teaching is also a new try in the context, and it is an innovative practice in the field of education (Li, 2020).

Researchers report that the online course model has a positive impact on students' learning (Xing & Huang, 2018). The reason is it offers a space for easy communication and rich learning resources. In addition to this, it also provides a more diverse way of learning. At the same time, it offers interactive space for students (Yu & Duan, 2018). Online teaching also breaks the limitations of time and space. Teachers save time in classroom management and will not stop maintaining classroom discipline because students disrupt classroom order (Wang, 2020). Course playback can help students relearn the content they do not understand, so as to better grasp the learning content (Wang, 2020). Secondly, teachers' workload is significantly reduced because multiple classes in the same grade teach simultaneously. Reducing class hours will allow teachers to have more time to fully understand the students' academic performance, study the instructional design, so as to fully prepare lessons and present better teaching content for students (Wang, 2020). On the other hand, online courses have changed the traditional physical space, allowing every student to enjoy high-quality classroom

teaching. Ding (2020) stated that online courses can ensure that the information received by each student is objective and complete. It will not cause trouble in receiving information due to problems such as myopia, short stature, and insufficient light, and it will not affect the efficiency due to the long distance from the podium.

Many researchers do studies about the online courses. Sun (2021) looked at how junior high school teachers and students perceived and struggled with using online courses to teach or study Chinese. Questionnaires with 97 teachers and 308 students and interviews with 6 teachers and 6 students were conducted. Results indicated that as a new teaching method, online teaching has many limitations. At present, it cannot replace traditional teaching methods. This is particularly challenging when it comes to teaching languages. However, online teaching is the tendency of education development. The concepts of lifelong learning and self-directed learning have all promoted the development of online courses. The online educational environment will continue to advance with the advancement of technology.

According to Jin (2016), improvement of physics teaching effect in middle schools in minority areas were observed with the implementation of inline teaching. All the classes participated in the experimented. They were separated to online class and outline class. They were required to take an interview study and case study to determine the effect and feedback of using physics online teaching resources among online class and outline

class. From the findings, online teaching has a vital impact into the students' physics performance. Also further conclusion from the experiment were that online teaching further helps students in minority students to enjoy the quality educational resources in developed area.

Lu (2021) researched on the situations and reasons and improvements of online teaching to students' mathematics self-learning ability. Questionnaires were done to collect data for the research. The test group involved students that are currently active in the education field. From the questionnaires which deter mined the results, it came to the conclusion that students were not willing to repeatedly watch difficulties and important points. It points out that online atmosphere and family support and a complete learning process are elements that influencing students' self-learning ability when using online teaching in math learning. The study also provided many suggestions for teachers to improve students' mathematics self-learning ability when conducting online teaching.

In China, Yang (2020) held to the principle that university students prefer traditional face-to-face teaching methods to online teaching. In this survey, questionnaire was taken from 150 university students. In the survey, more than 75% of the students indicated that online teaching cannot replace traditional teaching, 64% of students prefer traditional face-to-face teaching, and more than half of the students are not optimistic about the development prospects of online courses. In contrast, students prefer and are

more comfortable with traditional face-to-face teaching, whether in classes or exams. The researchers emphasized that online courses cannot totally replace traditional classroom instruction; rather, they can only be used to augment it and make up for its flaws. It is important to note that the evolution of traditional classrooms and online education complement and impact one another. It is not commendable to categorically support or oppose both online learning and traditional classroom settings. The mutual promotion of the two will bring about a better classroom experience for students.

2.5 Review of Past Studies

Due to the advent of the information age, online teaching has become popular. Teachers and students must adjust to online teaching if we want it to have a major effect. Regarding the adaptation of online teaching, some scholars have conducted research on it.

Zhang and Zhang (2010) directly pointed out that teachers' information literacy is the basic quality to adapt to online teaching in their qualitative research "Research on the Countermeasures of Improving Teachers' Information Quality to Adapt to Network Teaching". The paper contends that the teaching staff's overall information quality must be continuously improved. This is not only a top priority, but also a need for the chronic development of online teaching. Teachers should actively integrate into the environment.

Prepare teachers for informatization. At the same time, schools should help to create a good network resource environment and provide teachers with help in preparing lessons. In addition, the society should also participate in the construction of online teaching community.

Guo (2015) also put forward similar suggestions in the article "On how teachers adapt to online teaching". He carried out a qualitative study and noted how the educational model has subtly changed with the rise of the Internet age. More and more traditional teaching is transformed into online teaching, which brings forward higher demands for teachers. In the future, teachers will need to have more education and better teaching skills to adjust to changes in education and teaching methods.

Hu (2015) conducted a qualitative research and pointed out in "Transformation and Adaptation of Teachers' Role in Online Teaching" that with the advancement of network technology and the leap-forward progress of distance teaching, the teaching mode has quietly changed, and the role of teachers in online teaching has also changed. Unlike the conventional face-to-face classrooms, teachers should actively change their teaching roles when carrying out online teaching, adapt to the new teaching environment, and provide better online teaching content based on students.

These three studies all point out that with the advent of the Internet age, teachers should improve their own information literacy to adapt to online teaching. These studies all recognize the importance of adapting to online teaching, but they do not go deep into it. Previously, research on the adaptability of teachers' online teaching was still a relatively new topic. Research on the adaptability of online instruction has steadily gained attention due to the COVID-19 and its popularity.

A previous quantitative study done by Dai, Tang, Chen and Li, Yang (2020) proved that teachers teaching by online course faces many challenges. Three different questionnaires were distributed to 3253 teachers, 13244 students and 12899 parents. The research points out that teachers generally encounter challenges in online teaching, such as teaching incompatibility, insufficient external support, students' adaptation barriers, and uneven levels of online teaching effects. Among them, the main factors affecting teachers' online teaching are teachers' cognitive concept, online teaching ability, teaching method transformation and the degree of external support. The study proposes that for better adapting to online teaching, teachers should change their inherent concepts, and recognize the new role of teachers in online teaching, then improve information technology skills, and select high-quality online teaching resource materials. Meanwhile, it is prerequisite to construct a three-dimensional support system for online teaching to improve online teaching effect.

Kyungmee Lee, Mik Funguy, Bertt Bligh, and Xuefei Sophie Lu conducted a qualitative case study aims to better understand the nature of the rapid institutional transition and its impact on academics' pedagogical experiences during this period, which named "Adoption of online teaching during the COVID-19 Pandemic: a systematic analysis of changes in university teaching activity". In addition to providing helpful explanations of the changes that happened in the university's interconnected instructional activity systems after the introduction of online teaching, this essay highlights the many factors that underpin the experiences of certain academics. The dramatic change in institutional instructional activities and contexts presented a number of tensions and challenges for academics, the major subject of the activity systems. The findings show that beginner online teachers and experienced online teachers, two categories of university faculty, faced various problems and difficulties. An important takeaway from this analysis that might assist educational institutions in the future in adapting to similar catastrophes is the requirement for a more thorough, considerate, and realistic approach to emergency teaching circumstances.

Sri, Tiara and Della (2021) conducted a quantitative research on 758 kindergarten teachers and 500 parents and summarized the conduction of online learning in early childhood education in Indonesia in their article "Online learning for early childhood (case study in Indonesia)". The findings demonstrated how challenging it is to integrate online learning into early childhood education. Early childhood behavior while learning is negatively impacted by the forced usage of online learning, which really generates

several barriers. However, as it is the only choice during a pandemic, early childhood online learning must still be implemented. Involving parents is one way to improve teachers' planning and implementation abilities and capabilities for online learning. Teachers, parents, and early childhood education providers can use the study's findings as a guide to adopt effective online learning in early childhood education in a playful manner while paying attention to early childhood features.

In the light of Yang et al 's (2020) quantitative research on 354 medical teachers on the online teaching status of medical teachers, more than 60% of teachers said that they had not conducted online teaching before the COVID-19, and more than one-third of teachers said that they had never took part in online teaching training, and online teaching cannot achieve its expected teaching effect. Yang and Zhang (2020) conducted a quantitative study of primary and middle school teachers in 23 provinces and collected 15438 effective questionnaires. The study showed that most teachers believed that it was difficult to carry out online teaching in the early stages of epidemic prevention and control, and 13% of teachers did not support online teaching. In a particular sense, these data show that some teachers can adapt well to the new online teaching model, and also prompt us to think about how to actively adapt to and better carry out online teaching.

Yang Haijun et al. (2020) pointed out in a qualitative research of online teaching in colleges and universities during the COVID-19 pandemic that there is resistance and

fear of online teaching, and some teachers are forced to use the Internet. After experiencing the advantages of online teaching, they have gradually adapted to online teaching methods and tools. Wang (2020) conducted a qualitative research and pointed out that in the future era full of changes, teachers must learn to take the initiative to iterate in a crisis, and constantly update their literacy structure with a "growth mindset" to improve their "adaptability" to future educational changes.

During the COVID-19 pandemic, for implementing "Suspend classes without stopping school", time is tight, tasks are heavy, and mistakes occur from time to time. Most of the teachers didn't change the traditional teaching concept, but only moved the teaching form of physical space to cyberspace. Wang et al (2020) conducted a quantitative research on the online teaching of 100,000 elementary and middle school teachers in Sichuan Province and discovered that the teaching effect was not satisfactory. It is essential to strengthen instructors' information literacy training and progress their online teaching capacity.

In the research on the adaptability of online teaching during the COVID-19 pandemic, we can find that most teachers will feel fear and disgust when they first come into contact with online teaching. However, with the implementation of online teaching, some teachers can adapt well to online teaching. However, adapting to online teaching is not easy for some teachers, as well as those teaching younger students. Next, this

researcher searched Google Scholar and CNKI for research on the adaptability of rural primary schools teachers to online teaching during the COVID-19 pandemic, but found nothing. Then, the researcher searched the rural online teaching, and there are two categories for the search results.

The first type of research focuses on the online teaching effect in rural schools. The research respondents are students. Zhao, Wu, and Chen (2020) published a quantitative research on the state of online learning for students in rural districts and research on development strategies--Taking elementary and middle schools in Qian'an City as an example to analyze the state of online education for 110 rural primary and secondary schools students through questionnaire surveys, and found that rural students' adaptation of online teaching is poor, and the teaching effect is not as good as that of urban students. Aiming at this situation, the author puts forward a series of countermeasures.

Another type of research focuses on the challenges and coping strategies faced by rural online teaching. Cai (2020) conducted a qualitative research and put out some enhancement suggestions for the reasons why online teaching affects the teaching effect in his research on the improvement steps of the effect of online teaching in rural schools. First of all, teachers should strengthen information technology training. Secondly, improving the lesson preparation mode and clarifying the teaching objectives. Third,

diversifying the teaching forms. Fourth, reasonably arranging the class schedule to improve the validity of students. Fifth, focusing on feedback and timely testing. Sixth, focusing on cultivating students' independent learning ability. Seventh, carrying out moral education related to the COVID-19 and strengthening home-school communication.

We can see that research on the adaptability of rural primary school teachers to online teaching is relatively rare. To sum up, it can be seen that there are three issues in the study of online teaching adaptability. First of all, research on the adaptability of online teaching had been unpopular before the COVID-19, not systematic and comprehensive enough. Additionally, the study of how well teachers can adjust to teaching online during the COVID-19 pandemic mainly looks at their teaching situation and how effective they are at teaching. Teachers' teaching adaptation in the actual classroom has not received enough scholarly attention. How to strengthen teachers' online teaching capacity and resilience is not only an expedient measure under the epidemic prevention and control, but also should become the direction of thinking for the long-term advancement of educational technology. Finally, most of the research objects are concentrated in urban areas, students or college groups, and there are few studies on rural primary schools teachers.

2.6 Conceptual Framework

This study builds a conceptual framework based on the TPACK model that focusing on adaptation more to guide the researcher to study the transition of teaching activities, teachers' adaptability of online courses and difficulties of online courses implementation. These three are the research objectives of this research. The research analyzes these three research objectives from the independent variables, the dependent variable and moderating variables on the foundation of TPACK model.

This research has 4 independent variables. It aims to understand the teachers' adaptation of online courses during the COVID-19 pandemic in primary schools focusing in rural district. Teachers' adaptation of online teaching, namely if teachers can use technology to teach successfully. Therefore, it uses TPACK model to test if teachers have the ability of teaching well under the technical environment. This study choose four elements in TPACK model to investigate teachers' adaptation of online teaching, including technological knowledge, technological pedagogical knowledge, technological content knowledge and technological pedagogical content knowledge. The research use TPACK model but focusing on adaptation more. So this four elements change to technological knowledge adaptation, technological pedagogical knowledge adaptation, technological content knowledge adaptation and technological pedagogical content knowledge adaptation.

In this study, the dependent variable is teachers' adaptation of online teaching in rural primary schools in Qianling Township. The overall mean value of the four independent variables represent teachers' overall adaptation. It can be used to demonstrate how teachers have adapted to online instruction. Therefore, the teachers' adaptation to online teaching in rural primary schools in Qianling Township is the dependent variable of this research.

In terms of the moderating variables, teaching age and degree level in this study are used as the moderating variables. The research will use this two variables to investigate if different teaching age or degree level has influence to teachers' adaptation of online teaching.

Therefore, the conceptual framework use technological knowledge adaptation, technological pedagogical knowledge adaptation, technological content knowledge adaptation and technological pedagogical content knowledge adaptation as the independent variables to investigate the dependent variable that teachers' adaptation of online teaching in rural primary schools in Qianling Township. Teaching age and degree level as the moderating variables act on every elements. This research will use empirical research methods to explore the influence of independent variables and moderating variables on dependent variables, and finally verify the research hypothesis.

Figure 2.2

The Conceptual Framework
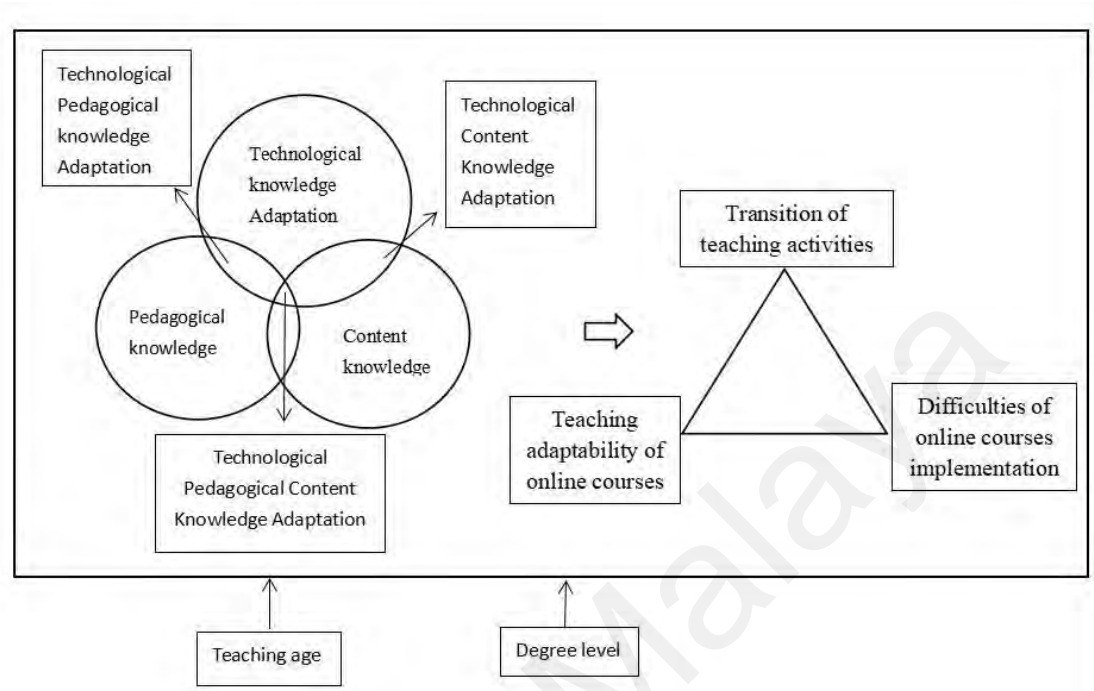
2.7 Summary

This chapter had explained the literature review which related to the title of the research, the theoretical framework and the conceptual framework for having a better comprehension towards the research. Chapter 3 will provide an introduction to research methodology, which comprises study design, research instrument, processes for data collecting and analysis.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Research methodology is a way to find systematic ways to solve research problems. It is caught on as the science of procuring information, how investigate is put into hone in a methodical and systematic way (Kapur, 2018). It can moreover be caught on as a science of considering how inquire about is conducted methodiclly. In this field the researcher clarifies himself with the diverse steps taken to study a research problem for the most part (Mishra & Alok, 2022). Research methodology is the necessary part that researchers should study their research. It indicates the process through which these researchers set up their problem and objective and show their consequences from the data getting form the study period (Sileyew, 2019).

This chapter describes the research methods in detail. The subject of study is teachers who teach in rural primary schools, and the sample is primary schools teachers in Qianling Township. The research conducts online owing to the COVID-19, and data is collected through online questionnaire surveys. The application that will be used is Questionnaire Star. The questionnaire is to survey the teachers' adaptation of online courses during the COVID-19 pandemic in primary schools focusing in rural district.

In this chapter, it outlines the research methodology used in this research. The research design and sampling method where the study was conducted will be first described. The study's instrument, methods and techniques for gathering data, data analysis, and the pilot study that was took to keep the instrument's validity and reliability are then reviewed.

3.2 The research methodology that was been used

The study's research methodology was quantitative data analysis which was conducted to investigate how teachers adapted online courses during the COVID-19 pandemic. What's more, the researcher used online questionnaire, which gives initial ideas that the teacher already known to use Internet. Watson and Roger stated that quantitative research may be considered as a way of thinking about the world. It is defined as a series of methods, techniques and assumptions to explore psychological, social and economic procedures in the numeral ways (Ahmad, 2019). In quantitative studies, the researcher collect numeric data by standardized questionnaires or experiments (Rutberg, 2018). Questionnaires give an useful way to gather data and are valuable for collecting data on delicate things (Patten, 2016). Adequate questionnaire construction is critical to the success of a survey (Roopa, 2012). The questionnaires used in this study were selected from other studies, but some adjustments were made to suit the objectives of

this study (Please refer to 3.3 subtopic). A low cost of the online questionnaire is the most significant benefit of web-based research (Dewaele, 2018). Additionally, the World Health Organization (WHO) has declared that COVID-19 has become a health and critical situation around the world since January 30, 2020, and a pandemic on March 11, 2020 (Cucinotta, 2020) . For preventing the spread of the COVID-19 in schools, the Joint Prevention and Control Mechanism of the State Council of China published a notice on the scientific and accurate prevention and control of the COVID-19 in line with the legislation. Under this requirement, primary schools in Qianling Township prohibited outsiders from entering the campus. However, all primary school teachers in Qianling Township could be reached through a WeChat chat group. Therefore, this study conducted an online questionnaire to collect data.

3.3 Review of the research design

The research has three research objectives. To reach these objectives, the researcher designed a questionnaire. The questionnaire will be distributed to primary schools teachers in Qianling Township primary schools teachers Wechat group. The research's purpose is to address the research questions, not just to examine how well teachers in rural primary schools in Qianling Township were able to deploy online courses during the COVID-19 pandemic. The study also intends to identify the difficulties that teachers in rural primary schools in Qianling Township faced when implementing online courses during the COVID-19 pandemic.

Research Objective 1:

To understand the transition of teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic.

Based on this objective, the researcher designed the second construct of the questionnaire. This construct came from Li Shunyi's research (Li, 2020) on the online teaching adaptability of volunteer Chinese teachers at the Confucius Institute in Korea. There was no such research objective in her research, so when designing this construct of the questionnaire, the researcher only selected some questions in the reference questionnaire and made adjustments. In addition, the researcher also asked questions about the situation before the COVID-19 and during the COVID-19 pandemic in response to the teaching activities. This completes the first research objective. This construct aims to understand the transition in the teaching method used by Qianling Township Primary Schools teachers during the COVID-19 pandemic. The data that was gathered in this construct will be analyzed by using descriptive statistics. Descriptive analysis is a method used to objectively describe the nature and magnitude of sensory characteristics (Kemp, Hollowood et al., 2018). It is as a rule utilized to analyze the fundamental cognitive circumstance of research scale data, and utilize the mean to specific the overall attitude of the sample to the scale data (SPSS, 2022). It is finally determined whether the online teaching methods of teachers in Qianling Township Primary Schools will change during the COVID-19 pandemic.

Research Objective 2:

To analyze the teaching adaptability of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic.

Based on this objective, the researcher designed the third construct of the questionnaire. The items of this construct came from Li Shuyi's research (Li, 2020) on the online teaching adaptability of volunteer Chinese teachers at the Confucius Institute in Korea and Li Huizhen's research (Li, 2021) on the adaptation of novice teachers of Chinese international education to online course during the COVID-19 pandemic——Taking the Sino-Thai cooperative "Internet" Chinese learning project as an example. However, the researcher made some changes to the items to make them simpler for the respondents to understand. To align with the TPACK model framework utilized in the research, the researcher also modified the names of the analytical dimensions simultaneously. For matching the analysis dimensions with the items, the researcher adjusted the order of items in the questionnaire studied by Li Shuyi. These items could be used to analyze the overall situation of teachers' teaching adaptation using descriptive analysis methods. In addition, an variance analysis could be performed using the demographic factors collected in the first part of the questionnaire. Analysis of variance (ANOVA) is a statistical method that examines the variations in group means in a sample using a set of statistical models and the related estimation techniques (such as the "variation" among and between groups) (Dai, 2018). A one-way ANOVA (analysis of variance) compares the means of two or more groups for one dependent variable. A one-way ANOVA is required when the study includes more than two groups (Ross & Willson, 2017). In

addition, the researcher would also analyze the correlation between the variables. A correlational study is a quantitative method which researchers use to measure the degree of correlation between two or more quantitative variables to find if there is there is a relationship between the variables (Chua, 2020; Creswell, 2012). Finally, the teaching adaptability of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic were analyzed.

Research Objective 3:

To determine the difficulties of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic.

Based on this objective, the researcher designed the fourth construct of the questionnaire. This construct came from Li Shuyi's research (Li, 2020) on the online teaching adaptability of volunteer Chinese teachers at the Confucius Institute in Korea and Li Huizhen's research (Li, 2021) on the adaptation of novice teachers of Chinese as a foreign language to online teaching during the COVID-19 pandemic——Taking the Sino-Thai cooperative "Internet" Chinese learning project as an example. However, for facilitating the data analysis, the researcher changed the multiple-choice questions in the reference questionnaire to the question type that selects the scores corresponding to the personal situation according to the Likert scale. This construct continued the analytical dimensions used in the previous construct and asked questions to identify items in each dimension that teachers find difficult. In addition, the researchers removed items from the reference questionnaire that were not relevant to this study. After these data are

collected, they would be analyzed by descriptive statistics. Finally, the difficulties of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic were determined.

3.4 Population & sample selection

The sample of the survey is teachers who teaching in primary schools in Qianling Township. This study used simple random sampling. One feature of simple random sampling (SRS) is that it is equally possible to choose every element in the target population for inclusion in the data collection.

During the COVID-19 pandemic, online courses were implemented across China, both in urban and rural areas. Qianling Township is one of the rural areas. Susong County is a small county in Anhui Province, China, located in southeastern China. According to data from the seventh census of Anqing City, Anhui Province in 2021, the total resident population of Susong County is 612,586, of which the rural population accounts for 59.95% and the population aged 0-14 accounts for 21.38% (Susong County Bureau of Statistics, 2021). Due to its low economic level, Susong County was listed as a poor county by the Anhui provincial government until 2019 (Anhui Provincial People's Government, 2019). There are 9 towns, 13 townships in Susong County. Qianling Township is affiliated to Susong County. According to Bureau of Education in Susong

County, there are 10 primary schools in Qianling Township with 155 primary schools teachers. The researcher selected the representative sample randomly. This study chose 113 teachers as the sample by random sampling. Teachers who took part in this research have had some experience in online teaching during the COVID-19 pandemic. They were prompted to indicate if they agreed or disagreed with each of the survey items.

3.5 The research instruments

The whole research mainly focuses on the understanding of the teachers' adaptation of online courses during the COVID-19 pandemic in primary schools focusing in rural district. This study is a quantitative study of primary schools teachers' teaching adaptability using an online questionnaire. This research aims to understand the teachers' adaptation of online courses during the COVID-19 pandemic in primary schools focusing in rural district by addressing these sub-questions: (a) What is the transition of teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic? (b) What is the teaching adaptability of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic? (c) What are the difficulties of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic? Sampling is a random sampling method. Therefore, the questionnaire will be sent to the Qianling Township primary schools teachers' WeChat group and individual WeChat to some teachers to collect data. Due to the COVID-19, all schools in China are restricting

visitor access to campus. Therefore, the suitable site of this study is online.

3.5.1 The questionnaire

The questionnaire is to survey Qianling Township primary schools teachers' adaptability of online courses during the COVID-19 pandemic. The questionnaire comprised of 4 constructs which has total of 52 questions, which was made on the basis of many prior studies, and needed about 10 minutes to finish it. The 4 constructs in this questionnaire are as follow:

Section A: Personal particulars

The first part is the personal information part, which mainly collects the personal information. The personal information part includes gender, age group, major, degree level, teaching ages, online teaching experience, location. This part is mainly to provide the information to analyze the moderating effects of different teaching ages and degree level in the research model. Gender is available in both male and female options and is a nominal scale. The age group mainly includes the following stages, 20-30 years old, 31-40 years old, 41-50 years old, and over 50 years old, which are ratio scales. Majors include primary school Chinese, primary school Mathematics, and primary school English, which are nominal scales. Degree levels include specialist, bachelor, master, other, and are nominal scales. The teaching age includes the following stages, within 2

years, 2 to 3 years, and more than 3 years. They are ratio scales. There are four stages of online teaching experience, less than half a year, six months to one year, more than one year, no experience, they are ratio scales. There are 22 teaching sites designed according to the administrative division of Susong County, and they are nominal scales. In this way, it is easy to limit the respondents to Qianling Township Primary Schools.

Section B: Teaching method transition

The second part is to investigate the situation of teachers' teaching method transition. This section is used to examine the first research question that is the transition in the teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic. The first item is the teaching method before the COVID-19 pandemic. The second is the teaching method during the COVID-19 pandemic. The third and four item are difficult items teachers have in teaching content aspect before and during the COVID-19 pandemic. The fifth and sixth item collect if there are transitions in weekly teaching time and student quantity. Item 7th collects teachers' attitudes towards if online teaching is very different from traditional teaching. Attitude levels are based on the Attitude level of the Likert Type Scale response anchor (Likert, 2006). Therefore, it is divided into strongly disagree, disagree, neutral, agree, strongly agree. When analyzing this question, the researcher will combine the strong disagree and disagree to represent the disagree, and combine strong agree and agree to represent agree. In this part, all the data are nominal scales.

Section C: The adaptation of online teaching

The third part is about teachers' online teaching adaptation. The online teaching adaptation among teachers is the main part of the questionnaire. In view of the TPACK model, the main questions of this questionnaire were set, and also referred to other researchers when investigating teachers' adaptation. Technological knowledge adaptation, technological content knowledge adaptation, technological pedagogical knowledge adaptation and technological pedagogical content knowledge adaptation are from Schmidt et al (2013). On the basis of the consequences of that previous study and the literature review, a refined questionnaire was set up for the research.

This part was on the basis of the actual situation. Four influences are determined factors, namely technological knowledge adaptation, technological content knowledge adaptation, technological pedagogical knowledge adaptation and technological pedagogical content knowledge adaptation. Each variable was designed with 2-7 items, a total of 20 items. The adaptability of online teaching is mainly affected by the four variables, so it is to design four dimensions to measure teachers' perception of their adaptation of online teaching. There are 20 items in the adaptation of online teaching. The questions are built on a five-point Likert (Vagias, 2006) scale with anchors ranging from 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), to 5 (strongly agree). In this part, all the data are interval scales.

1. Technological knowledge adaptation

Technological knowledge refers to various multimedia, software, hardware, tools, etc. that can be used to assist teaching in the information age (Cai, 2018). Here, technological knowledge adaptation refers to teachers' adaptation to the teaching technology. In this part, teachers directly deliver content knowledge to students. Therefore, technological knowledge adaptation measures that the extent teachers can adapt to online teaching technology.

Therefore, this study analyzes the related studies and summarizes the 7 reasonable items. The items are as follow.

Table 3.1

Technological Knowledge Adaptation Items

Dimension	Adapted Item
Technological Knowledge Adaptation	1. I have good hardware equipment.
	2. I have good software equipment.
	3. I have a stable internet connection.
	4. The online platform is easy to use.
	5. I am familiar with the various features of the online platform to teach.
	6. I think the the functions of the online platform makes the class more convenient.
	7. I have never been forced to interrupt classes due to poor internet.

2. Technological content knowledge adaptation

Technological content knowledge is formed by the interaction of technical knowledge

and subject content knowledge, that is, using corresponding technology to present the knowledge of a subject content. It is subject content knowledge that incorporates technology (Cai, 2018). Technological content knowledge adaptation is the adaptability of teachers to using technology to teach knowledge. According to relevant research, the items can be divided into three questions.

Table 3.2

Technological Content Knowledge Adaptation Items

Dimension	Adapted Item
Technological Content Knowledge Adaptation	1. I can use technology to explain content knowledge fluently.
	2. I can use technology to adjust the content knowledge flexibly.
	3. I can use multimedia for teaching.

3.Technological Pedagogical Knowledge Adaptation

Technological Pedagogical Knowledge is formed by the interaction of technical knowledge and pedagogical knowledge, that is, the knowledge of using corresponding technology to support pedagogy. It is a pedagogy that incorporates technology (Cai, 2018). Technological Pedagogical Knowledge Adaptation indicates whether teachers adapt to use technology to support pedagogical knowledge. This study designed 7 items to measure this variable.

Table 3.3

Technological Pedagogical Knowledge Adaptation Items

Dimension	Adapted Item
Technological Pedagogical Knowledge	1. I can use technology to organize interact with students

Adaptation	2. I can use technology to organize suitable games
	3. I can use technology to organize multi-person discussions
	4. I can use technology to make students cooperate with teaching activities
	5. I can use technology to make students follow online classroom discipline
	6. I can use technology to get feedback from students in time
	7. I can use technology to deal with emergencies calmly

4. Technological Pedagogical Content Knowledge Adaptation

Technological Pedagogical Content Knowledge is pedagogical and content knowledge that integrates technology. Technological Pedagogical Content Knowledge Adaptation is utilized to assess how well teachers can adjust to the utilize of innovation to make lesson plans that effectively transmit knowledge. This is a reflection of teachers adapting to online teaching. There are three questions in this part.

Table 3.4

Technological Pedagogical Content Knowledge Adaptation Items

Dimension	Adapted Item
Technological Pedagogical Content Knowledge Adaptation	1. I can design learning activities online that lead students to understand the content knowledge of the subject
	2. I can successfully complete online teaching tasks
	3. My lesson preparation doesn't take a lot of time

Section D: Difficulties in adapting to online teaching

The forth construct collects the information about the difficulties in adapting online

teaching. In view of the analysis dimensions in the foremost construct, this construct asks questions about teachers' specific adaptation difficulties in each analysis dimension. This construct has four items including difficulties of technological knowledge adaptation, technological content knowledge adaptation, technological pedagogical knowledge adaptation and technological pedagogical content knowledge adaptation. The questions are built on a five-point Likert (Vagias, 2006) scale with anchors ranging from 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), to 5 (strongly agree). In this part, all the data are interval scales.

1. What difficulties did you encounter in terms of **Technological Knowledge (TK) adaptation** when conduct online teaching?

There are 5 difficulties in this item.

Table 3.5

Technological Knowledge Adaptation Difficulties

Dimension	Adapted Difficulties
Technological Knowledge Adaptation	1. I didn't have sufficient hardware equipment
	2. I didn't have sufficient software equipment
	3. The network quality is bad
	4. The online platform is not easy to use
	5. The online platform' features are not enough to conduct online courses

2. What difficulties did you encounter in terms of **Technological Content Knowledge**

(TCK) adaptation when conduct online teaching?

There are 5 difficulties in this item.

Table 3.6

Technological Content Knowledge Adaptation Difficulties

Dimension	Adapted Difficulties
Technological Content Knowledge Adaptation	1. Explaining content knowledge with technology fluently is difficult
	2. Adjusting the content knowledge flexibly is difficult
	3. Using multimedia for teaching is difficult

3.What difficulties did you encounter in terms of **Technological Pedagogical Knowledge (TPK) adaptation** when conduct online teaching?

There are 7 difficulties in this item.

Table 3.7

Technological Pedagogical Knowledge Adaptation Difficulties

Dimension	Adapted Difficulties
Technological Pedagogical Knowledge Adaptation	1. I can't use technology to organize interact with students
	2. I can't use technology to organize suitable games
	3. I can't use technology to organize multi-person discussions
	4. I can't use technology to make students cooperate with teaching activities
	5. I can't use technology to make students follow online classroom discipline
	6. I can't use technology to get feedback from students in time
	7. I can't use technology to deal with

	emergencies calmly

4. What difficulties did you encounter in terms of **Technological Pedagogical Content Knowledge (TPACK) adaptation** when conduct online teaching?

There are 3 difficulties in this item.

Table 3.8

Technological Pedagogical Content Knowledge Adaptation Difficulties

Dimension	Adapted Difficulties
Technological Pedagogical Content Knowledge Adaptation	1. I can't design learning activities online that lead students to understand the content knowledge of the subject
	2. I can't successfully complete online teaching tasks
	3. Lesson preparation take a lot of time

3.6 Data collection

This section describes data collection procedures and data collection techniques.

3.6.1 Data collection procedures

This study aims at understanding the teachers' adaptation of online courses during the COVID-19 pandemic in primary schools focusing in rural district. It is not only to determine the the transition of teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic, to analyze the teaching adaptability of online courses implementation among teachers in rural primary schools in Qianling

Township during the COVID-19 pandemic, to determine the difficulties of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic. For satisfying the objectives of the research, it takes a quantitative method to test the hypotheses. The questionnaire was prepared to measure the research objectives covered questions. The research is to design a reasonable questionnaire, select the survey subjects, issue the online questionnaire and conduct data analysis, verify the hypothesis, and finally summarize the inadequacies of the survey results, and provide feedback for future research. The research procedure is in Figure 3.1 below.

Figure 3.1

Research Flow chart

```
┌─────────────────┐
│     Create      │
│  questionnaire  │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│   Pilot Test    │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│     Adjust      │
│  questionnaire  │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│     Conduct     │
│  questionnaire  │
│     survey      │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│  Analyze data   │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│    Findings     │
└─────────────────┘
```
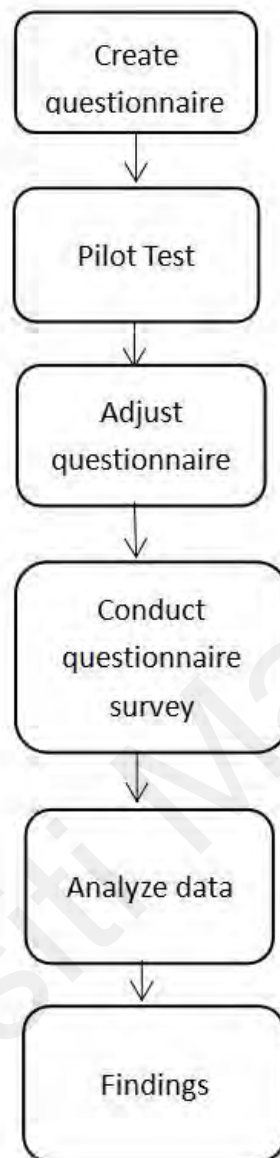
In a research, the data collection procedure is very important because the needed data will be collected and analyzed to make the research complete. In the survey, researcher has divided the process of conduct the survey into two stages. In the first stage, research discussed with the supervisor about the title and questionnaire according to the importance of the study. After completing the questionnaire, the translated content of the questionnaire will be revised and corrected by one expert in order to avoid the bias

between the Chinese version and English version. After that, researcher will distribute questionnaire to 10 teachers in primary schools in Qianling Township for pilot study. Then researcher will revise and get the final questionnaire.

In the second stage of the data collection procedure for the research, questionnaire will be distributed to teachers group who teaching in primary schools of Qianling Township by Wechat. This Wechat group includes all teachers who teaching in all ten primary schools of Qianling Township. The questionnaire will be sent to the total of 155 primary schools teachers of Qianling Township.

3.6.2 Data collection techniques

A proficient online questionnaire survey, examination, assessment, and voting stage from China called Questionnaire Star centers on advertising clients a extend like strong and user-friendly online questionnaire design, data collection, unique reports, and analysis of survey results. Questionnaire Star has the clear focal points of being speedy, straightforward to utilize, and cheap when compared to other survey websites or survey systems, and it has been extensively used by various businesses and individuals. Questionnaire has more than 2.6 million sample resources, which can help researchers quickly recover valid data. Questionnaire Star's paying customers cover more than 30,000 businesses in China and 90% of Chinese universities. It is a reputable online

platform for questionnaire surveys used by well-known brands across many industries.

The questionnaire was created by Questionnaire Star. It is an online survey tool in China, which aims at providing customers with the service of humanity and powerful features, for example, custom design of questionnaire, collecting data, analysis report.

3.7 Analysis of data from research instruments

It is a descriptive quantitative research. After collecting all data, the responses will be checked and ensure there are at least 113 responses and all questions are answered. It will then be organized and analyzed. A computer program named Statistical Product and Service Solutions (SPSS) was mostly utilized for data analysis. SPSS helps us do many different statistical analyses without too much difficulty (Hinton, McMurray et al., 2014). SPSS' syntax is usually simple, in the sense that commands, sub-commands, and keywords are always easily understood for users (Zou, 2020). SPSS is widely used by researchers around the world. It owns a great diversity of features, such as plotting the data in different ways, handling files in any way and modifying variables in your research (Arkkelin, 2014).

Descriptive statistics are utilized to summarize data in an organized way by portraying

the relationship between variables in a sample or population (Kaur, Stoltzfus et al., 2018). Descriptive analyses will give a summary of data and arrange in the tabular form to investigate the features of data distributions (Zou, 2020). The gender, age, major, degree level, teaching experience before and during the COVID-19 pandemic, fundamental adaptation situation of online teaching, and the difficulties of adapting online teaching in the questionnaire will be analyzed by the descriptive statistics.

The research adopted Table 3.9, which displays the mean value broken down into three levels, to evaluate the overall mean discovered through the data analysis.

Table 3.9

Categories of Overall Mean (Musliha Salma, 2010)

Scale	Level
3.68 to 5.00	High
2.34 to 3.67	Medium
1.00 to 2.33	Low

This study will choose one-way ANOVA to analyze the adaptation of online teaching among primary schools teachers. One-way ANOVA is applied to identify if there are obviously discrepancy between independent groups on one dependent variable (Longe, 2021). This study has the dependent variable teachers' adaptation, and four independent variables such as technological knowledge adaptation, technological content knowledge adaptation, technological pedagogical knowledge adaptation and technological pedagogical content knowledge adaptation. Thus in this study, it will analyze the data by Analysis of Variance (ANOVA). This study will conduct a one-way ANOVA in

SPSS to identify if there are substantial variations in technological knowledge adaptation, technological content knowledge adaptation, technological pedagogical knowledge adaptation, technological pedagogical content knowledge adaptation and overall teaching adaptation of teachers with different teaching ages and degree level.

If the ANOVA results table presented a p-value of 0.05 or less, later this study will conclude that different teaching ages or degree level have a positive effect for the technological knowledge adaptation, technological content knowledge adaptation, technological pedagogical knowledge adaptation, technological pedagogical content knowledge adaptation and overall teaching adaptation of teachers. If not, this study will summarize that the different teaching ages and degree level do not have a positive effect for the technological knowledge adaptation, technological content knowledge adaptation, technological pedagogical knowledge adaptation, technological pedagogical content knowledge adaptation and overall teaching adaptation of teachers.

It also will conduct correlation analysis in SPSS to find out whether there is strong correlation in technological knowledge adaptation, technological content knowledge adaptation, technological pedagogical knowledge adaptation, technological pedagogical content knowledge adaptation and overall teaching adaptation of teachers. If the results table presented a Sig-value of 0.05 or less, it means these two variables have a significant correlation.

3.8 Validity & reliability of the study

3.8.1 Pilot test

Pilot test is crucial in making sure that the respondents are capable of understanding all the questions given during the survey (Creswell, 2012). When a researcher conducts a pilot study, they can decide on the research question, figure out the best methods to use, and estimate how long it will take and what materials they will got to total the ultimate form of the inquire about (Ismail et al., 2018). To better understand the problems and find solutions, a careful examination of the pilot study's steps and outcomes is needed (Malmqvist, 2019). Therefore, after the draft of the questionnaire is completed, the pilot test will be took place. The pilot test should have about 10% of the sum number of respondents in the final study (Hertzog, 2008). The final respondent size is 113 primary schools' teachers who are teaching in Qianling Township. Therefore, this study chose 10 primary schools teachers who are teaching in Susong County to verify the reliability of the questionnaire. In the survey, it used the Cronbach' s alpha to represent the reliability and the findings are as in Table 3.10.

Table 3.10

Result of Reliability Test

Instrument	Cronbach's alpha
Questionnaire	0.953

3.8.2 Validity

There are two main issues revolving validity. Firstly, whether the instruments used for measurement are accurate. Secondly, whether they are actually measuring what they want to measure (Leedy & Ormrod, 2013). In this study, validity was achieved by conducting a questionnaire that included various questions about teachers' adaptation to online teaching.

The questionnaire is based on the questionnaires in other related studies, and then modified and adjusted by the researcher according to the actual situation of this study. In addition, The questionnaire content and construct was revised by one expert to ensure the validity. The expert who is an associate professor at Henan University of Science and Technology has a doctorate in TESL. She has five years of work experience in Chinese-English translation and is teaching English audio-visual and college English. She helped me to get the more appropriate sentences in construct B of my questionnaire. It is the best way to assess the validity by the "Experts" who are familiar with the construct (Alzatma, 2020).

3.8.3 Reliability

Drost (2011) refers to reliability as the degree of consistency with which an instrument measures the attribute it is designed to measure. The questionnaires, answered by 10 primary schools' teachers, showed the consistency in responses. Cronbach's alpha was used to show the internal reliability of the participants' responses. The Cronbach's alpha formula is shown in Figure 3.2.

Figure 3.2

Formula for the Cronbach's alpha (Bruin,2006)

$$\alpha = \frac{N\bar{c}}{\bar{v} + (N-1)\bar{c}}$$

The items in the questionnaire getting a high alpha value shows there is a high positive correlation, also indicates a high reliability. With the average inter-item correlation increasing, Cronbach's alpha increases too (Bruin,2006). Cronbach's alpha is between 0 and 1. If the alpha will not be more than 0.6, it is for the most part considered that the internal reliability is insufficient. If the alpha is between 0.7 and 0.8, it shows that the results have considerable reliability. If the alpha is 0.8-0.9, it indicates the reliability is high.

3.9 Ethics review

Apart from requiring diligence and expertise in conducting a research, honesty and integrity should never be neglected. In consideration of this study ethical, informed

consent, anonymity, confidentiality and honesty were observed.

Each subject gave their assent to require portion within the study. Before beginning to complete the questionnaire, participants in this survey will be given information about the purpose of the survey and the procedures that will be utilized to gather data. Besides that, anonymity and confidentiality were put into consideration in this study. No identifying information such as name was required in these questionnaires and test. Confidentiality is ensured by keeping the data gathered confidential and not revealing the identities of respondents when announcing or distributing research. The data obtained will be stored safely and will not be displayed publicly without permission.

Honesty plays an important ethical responsibility here. After the raw data was obtained, it was transferred into the SPSS computer software programme. Manipulation of data is avoided where the questions were analyzed by the researcher under the guidance of supervisor for confirmation of credibility.

3.10 Summary

In conclusion, this chapter introduces the research method. It discusses the complete research process, including the study design, the research samples, the research tools,

and the data collection techniques. In the survey, primary schools teachers in Qianling Township were selected as research samples, and data was collected through Questionnaires Star. It will acquire the data by sending an online questionnaire to the WeChat group of teachers in Qianling Township Primary Schools. The research data will be analyzed by SPSS, its validity will be tested by an expert, and its reliability will be tested by Cronbach's alpha. Results analysis is discussed in detail in Chapter 4.

CHAPTER 4

FINDINGS

4.1 Introduction

This chapter mainly uses SPSS to analyze and process the collected data for three research questions, and will introduce and describe the interpretation of the analyzed data and the formed research results. The questionnaire consisted of four sections, (1) personal particulars, (2) teaching method transition, (3) a survey of the adaptation of online teaching, and (4) difficulties in adapting to online teaching. For the first research question, this chapter will conduct descriptive statistics on the first two sections of the questionnaire, that is, personal particulars and transitions in teaching method. For the second research question, this chapter will use descriptive analysis on the third section of the questionnaire to analyze the adaptation of teachers to online teaching, and use one-way ANOVA to analyze the differences of different teaching ages or degree levels on the teachers' adaptability to online teaching. A correlation analysis will be used to analyze whether there was a significant correlation among teachers' technological knowledge adaptation, technological content knowledge adaptation, technological pedagogical knowledge adaptation, technological pedagogical content knowledge adaptation and overall teaching adaptation of teachers. For the final research question, this chapter will analyze the fourth section of the questionnaire through descriptive analysis, and find out the difficulties encountered by the primary schools teachers in Qianling Township when adapting to online teaching.

4.2 Reporting of Findings

This study mainly analyzes two aspects of the questionnaire, one is the basic characteristics of the sample, and the other is the descriptive statistics of the variables. The three research questions will lead the data analysis of the chapter:

1.What is the transition of teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic?

2. What is the teaching adaptability of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic?

3. What are the difficulties of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic?

The research data comes from different WeChat groups of Susong primary schools teachers. 142 questionnaires were collected, 29 of these were from teachers of other primary schools in Susong County, which were invalid samples, and the remaining 113 were from teachers of Qianling Township primary schools, which were valid samples. The questionnaire consisted of four sections, (1) personal particulars, (2) teaching method transition, (3) a survey of the adaptation of online teaching, and (4) difficulties in adapting to online teaching. Therefore, this chapter will conduct data analysis around three research questions.

4.2.1 Demographic information

The first section of the questionnaire is the personal particulars, which provides demographic information for researcher and readers about these teachers who participate in the research. It can help to know these teachers who participate in the research. The personal particulars in the questionnaire includes gender, age group, major, degree level, teaching age, online teaching experience, and teaching school location. The teaching age and degree level are used as moderating variables for the TPACK model for primary schools teachers in Qianling Township to adapt to online teaching.

Section A: Personal particulars

1. Gender

Table 4.1

The Gender Information of the Sample

Gender	Numbers	Percent(Total 100%)
Male	40	35.4%
Female	73	64.6%
Total	113	100.0%

The sample shown for this survey is 113. As can be seen from Table 4.1, there are 40 male participants, accounting for 35.4% of all participants, and 73 female participants, accounting for 64.6% of all participants. It was found that, in the sample of Qianling Township primary schools, there were significantly more female teachers than male

teachers.

2. Age group

Table 4.2

The Age Group Information of the Sample

Age Group	Numbers	Percent(Total 100%)
20-30	36	31.86%
31-40	46	40.71%
41-50	26	23.01%
More than 50	5	4.42%
Total	113	100%

Statistics show that among the 113 primary schools teachers in Qianling Township who participated in the survey, the largest proportion was among 31 and 40 years old, with 46 teachers, making up 40.71%. There are 36 teachers aged 20-30, accounting for 31.86% of the total. 26 samples were between 41-50 years old, accounting for 23.01% of the total. The least percentage of sample members over 50 is represented by 5 teachers, or 4.42% of the entire sample. It shows that among the primary schools teachers in Qianling Township participating in the survey, most of them are under 40 years old, far exceeding other age groups.

3. Major

Table 4.3

The Major Information of the Sample

Major	Numbers	Percent(Total 100%)
Primary Chinese	26	23.01%
Primary Mathematics	30	26.55%
Primary English	13	11.5%
Others	44	38.94%
Total	113	100%

It is indicated by Table 4.3 that among the teachers participating in the survey, the number of teachers from Primary English majors is the least, only 13, accounting for 11.5% of the entire sample. The sample size of Primary Chinese majors is 26, accounting for 23.01% of the total samples. There are 30 samples of Primary Mathematics majors, accounting for 26.55% of the total samples. The largest sample size was Others majors, with 44 people, accounting for 38.94% of all participants.

4. Degree Level

Table 4.4

The Degree Level Information of the Sample

Degree Level	Numbers	Percent(Total 100%)
Specialist	19	16.81%
Bachelor	93	82.30%
Master	1	0.88%
Total	113	100.0%

Table 4.4's statistical findings show that most of the teachers participating in this study have a bachelor degree level, and there are 93 teachers, accounting for 82.3% of the total sample. There are 19 people with specialist degree level, accounting for 16.81% of the total number. The least number is master degree level, only 1 person, accounting for 0.88% of the total sample.

5. Teaching Age

Table 4.5

The Teaching Age Information of the Sample

Teaching Age	Numbers	Percent(Total 100%)
Less than 2 year	9	7.96%
2 to 3 years	5	4.42%
More than 3 years	99	87.61%
Total	113	100.0%

From the statistical results in Table 4.5, it clearly indicates that most of the teachers participating in this survey have more than 3 years of teaching age, there are 99 teachers, accounting for 87.61% of the total sample. There are 9 teachers with less than 2 years of teaching age, making for 7.96% of the entire number. The least number are teachers with 2-3 years of teaching age, only 5, accounting for 4.42% of the total sample.

6. Online Teaching Experience

Table 4.6

The Online Teaching Experience Information of the Sample

Online Teaching Experience	Numbers	Percent(Total 100%)
Less than half a year	38	33.63%
Six months to one year	11	9.73%
More than one year	27	23.89%
No experience	37	32.74%
Total	113	100.0%

From the statistical results in Table 4.6, it clearly indicates that most of the respondents

had online teaching experience before the COVID-19 pandemic. Among them, there are at most 38 teachers with less than half a year of online teaching experience, accounting for 33.63% of the total sample. The amount of teachers with online teaching experience of six months to one year is the least, with 11 teachers, accounting for 9.73% of the total sample. There are 27 teachers with more than one year of online teaching experience, accounting for 23.89% of the total sample. Before the COVID-19 outbreak, 37 teachers, or 32.74% of the overall sample, had no online teaching experience.

7. Teaching School Location

Table 4.7

The Teaching School Location Information of the Sample

Teaching School Location	Numbers	Percent(Total 100%)
Qianling Township	113	100.00%
Total	113	100.0%

The survey concentrates on the adaptation of primary schools teachers in Qianling Township to online teaching. Therefore, when finally screening the returned questionnaires, the researcher excluded the rest of the questionnaires from Qianling Township. A total of 142 questionnaires were collected this time, excluding 29 questionnaires from teachers in teaching school location outside Qianling Township, and a total of 113 valid questionnaires were received. All 113 questionnaires will be used for this data analysis. This is consistent with the results shown in Table 4.7.

4.2.2 Findings Based on the Research Question 1

The first research question is to understand the transition of teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic. The second section is for answering this question. This section's major purpose is to look into the changes in teaching method, teaching difficulties, students numbers and weekly class hours, and attitudes towards online teaching and traditional teaching in Qianling Township primary schools teachers. The researcher used SPSS to perform descriptive statistics on this section.

Section B: Teaching method transition

4.2.2.1 Transition on teaching method before and during the COVID-19 Pandemic

1. Teaching Method before the COVID-19 Pandemic

Table 4.8

Descriptive analysis of Teaching Method before the COVID-19 Pandemic

Items	Numbers	Percent(Total 100%)
Online class	10	8.85%
Face-to-face class	74	65.49%
Mixed	23	20.35%
Others	6	5.31%
Total	113	100.0%

Table 4.8 is about teachers' teaching method before the COVID-19 pandemic. The statistical findings in Table 4.8 make it abundantly evident that the majority of the survey participants were engaged in face-to-face classroom instruction prior to the COVID-19 pandemic. 74 teachers made up the entire sample, or 65.49% of it. The

sample of teachers implementing other teaching methods is the least, only 6, accounting

for 5.31% of the total sample. There are 10 teachers who implement online courses,

accounting for 8.85% of the total sample. There are 23 teachers who implement mixed

teaching methods, accounting for 20.35% of the total sample.

2. Teaching Method during the COVID-19 Pandemic

Table 4.9

Descriptive analysis of Teaching Method during the COVID-19 Pandemic

Items	Numbers	Percent(Total 100%)
Online class	48	42.48%
Face-to-face class	19	16.81%
Mixed	40	35.40%
Others	6	5.31%
Total	113	100.0%

Table 4.9 is about teachers' teaching method during the COVID-19 pandemic. It

shows clearly from Table 4.9 that most of the teachers participating in this study

implemented online courses or mixed courses during the COVID-19 pandemic, 48

teachers and 40 teachers respectively, accounting for 42.48% and 35.4% of the total

sample. There are 19 teachers who implement face-to-face courses, accounting for

16.81% of the total sample. The sample of teachers implementing other teaching

methods is the least, only 6, accounting for 5.31% of the total sample.

4.2.2.2 Transition on teaching difficulties before and during the COVID-19 Pandemic

3. Teaching Difficulties before the COVID-19 Pandemic

Table 4.10

Descriptive analysis of Teaching Difficulties before the COVID-19 Pandemic

Items	Numbers	Percent(Total 100%)
English Pronunciation	12	10.62%
Chinese Characters	3	2.65%
Text Reading	31	27.43%
Calculation	3	2.65%
Word Problems	21	18.58%
Geometry	9	7.96%
English speaking	4	3.54%
English listening	5	4.42%
Pinyin	8	7.08%
Not related	17	15.04%
Total	113	100.0%

Table 4.10 is about teachers' teaching difficulties before the COVID-19 pandemic. Table 4.10's statistical findings make it quite evident that among the teachers participating in this study, the most difficult category to teach before the COVID-19 pandemic was Text Reading, with a total of 31 samples, accounting for 27.43% of the whole samples. There are 21 teachers who think that the most difficult category to teach is Word Problems, accounting for 18.58% of the total sample. There are 12 teachers who think English Pronunciation is the most difficult category to teach, accounting for 10.62% of the total sample. There are 9 teachers who think that the most difficult category to teach is Geometry, accounting for 7.96% of the total sample. There are 8 teachers who think that the most difficult category to teach is Pinyin, accounting for 7.08% of the total sample. There are 5 teachers who think English listening is the most

difficult category to teach, accounting for 4.42% of the total sample. There are 4 teachers who think English speaking is the most difficult category to teach, accounting for 3.54% of the total sample. The sample of teachers who think Chinese Characters is the most difficult category to teach is the same as the number of teachers who think Calculation is the most difficult category to teach. There are 3 teachers, each accounting for 2.65% of the total sample. Additionally, 17 instructors, or 15.04% of the sample, believe that there was no difficult subject to teach prior to the COVID-19 outbreak.

4. Teaching Difficulties during the COVID-19 Pandemic

Table 4.11

Descriptive analysis of Teaching Difficulties during the COVID-19 Pandemic

Items	Numbers	Percent(Total 100%)
English Pronunciation	16	14.16%
Chinese Characters	2	1.77%
Text Reading	30	26.55%
Calculation	6	5.31%
Word Problems	19	16.81%
Geometry	13	11.50%
English speaking	4	3.54%
English listening	5	4.42%
Pinyin	4	3.54%
Vocabulary	2	1.77%
Not related	12	10.62%
Items	113	100.0%

Table 4.11 is about teachers' teaching difficulties during the COVID-19 pandemic. Table 4.11's statistical findings make it quite evident that among the teachers taking part in the survey, with a total of 30 samples, or 26.55% of the total samples, Text Reading was the category that proved to be the most challenging to teach during the COVID-19

pandemic. There are 19 teachers who think that the most difficult category to teach is Word Problems, accounting for 16.81% of the total sample. There are 16 teachers who think English Pronunciation is the most difficult category to teach, accounting for 14.16% of the total sample. There are 13 teachers who think that the most difficult category to teach is Geometry, accounting for 11.5% of the total sample.There are 6 teachers who think that the most difficult category to teach is Calculation, accounting for 5.31% of the total sample. There are 5 teachers who think English listening is the most difficult category to teach, accounting for 4.42% of the total sample. The sample of teachers who think English speaking is the most difficult category to teach is the same as the number of teachers who think Pinyin is the most difficult category to teach. There are 4 teachers, each accounting for 3.54% of the total sample. The sample of teachers who think Chinese Characters is the most difficult category to teach is the same as the number of teachers who think Vocabulary is the most difficult category to teach. There are 2 teachers, each accounting for 1.77% of the total sample. And there are 12 teachers who think that there is no most difficult category to teach during the COVID-19 pandemic, accounting for 10.62% of the total sample.

4.2.2.3 Transition of the Weekly Class Hours

5. Transition of the Weekly Class Hours

Table 4.12

Descriptive analysis of Transition of the Weekly Class Hours

Items	Numbers	Percent(Total 100%)

YES	83	73.45%
NO	30	26.55%
Total	113	100.0%

Table 4.12 indicates whether the weekly class hours of teachers' online classes have changed. Table 4.12's statistical findings make it quite evident that among the teachers participating in this study, 83 of them had changes in the weekly hours of online courses, accounting for 73.45% of the total sample. There are 30 teachers who have not changed the weekly class hours of online courses, accounting for 26.55% of the total sample.

4.2.2.4 Transition of the Quantity of Students

6. Transition of the Quantity of Students

Table 4.13

Descriptive analysis of Transition of the Quantity of Students

Items	Numbers	Percent(Total 100%)
YES	82	72.57%
NO	31	27.43%
Total	113	100.0%

Table 4.13 indicates whether the quantity of students in online courses has changed. The statistical findings in Table 4.13 make it abundantly evident that, of the teachers who participated in this study, 82 of them had changes in the quantity of students during online classes, accounting for 72.57% of the total sample. There were 31 teachers whose quantity of students did not change during online classes, accounting for 27.43% of the total sample.

4.2.2.5 Attitudes towards Online Teaching

7. Attitudes towards Online Teaching

Table 4.14

The Attitude towards Online Teaching Among the Primary Schools Teachers

	Items	Numbers	Percents(Total 100%)	Total
Disagree	Strongly disagree	5	4.42%	9.73%
	Disagree	6	5.31%	
Neutral	Neither agree or disagree	17	15.04%	15.04%
Agree	Agree	70	61.95%	75.22%
	Strongly agree	15	13.27%	
	Total	113	100.0%	100.0%

Table 4.14 is about teachers' attitudes toward the notion that online courses differ significantly from traditional face-to-face courses. As can be seen from Table 4.14, 75.22% of the participants agree that online courses are very different from traditional face-to-face courses. There are 11 people in disagree attitude, accounting for 9.73% of total people who are surveyed. There are 17 people who hold a neutral attitude towards this view, accounting for 15.04% of the total number of participants. It indicates that over 70% of the participants in this study agree that online courses are very different from traditional face-to-face courses.

The second construct (Section B) contained 7 items is to understand the transition of

teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic. Respondents need to tick on the relevant questions. The result of the transitions in teaching method, students numbers and weekly class hours in this construct is analyzed in Table 4.8, Table 4.9, Table 4.12 and Table 4.13. From Tables 4.8 and 4.9, it is clear that, before to the COVID-19 pandemic, face-to-face class accounted for 65.49% of all samples. However, online class accounted for 42.48% during the COVID-19 pandemic. It is apparent from Tables 4.12 and 4.13 that during the COVID-19 pandemic, both the amount of students and the weekly class hour have changed. Tables 4.10 and 4.11 show that there are greater teaching difficulties now than there were prior to the COVID-19. According to Table 4.14, 75.22% of respondents concur that online instruction differs significantly from traditional teaching.

Research Hypothesis for Research Question 1:

H0: Rural primary schools teachers in Qianling Township don't have transition when conducting teaching activities during the pandemic of COVID-19.

H1: Rural primary schools teachers in Qianling Township have transition when conducting teaching activities during the pandemic of COVID-19.

These results demonstrated that the initial research hypothesis alternative, H1, is accepted that rural primary schools teachers in Qianling Township have transition when conducting teaching activities during the pandemic of COVID-19. that rural primary schools teachers in Qianling Township have transition when conducting teaching

activities during the pandemic of COVID-19. There are distinctions between traditional and online teaching that account for this outcome (You, 2023). Teachers at Qianling Township primary schools must make some transitions if they want to implement online teaching.

4.2.3 Findings Based on the Research Question 2

The second research question is about the adaptation of teachers in Qianling Township primary schools to online courses during the COVID-19 pandemic. The third section of the questionnaire is their adaptation to online courses.

Section C: A survey of the adaptation of online teaching

To investigate how teachers have adapted to online teaching, this study used descriptive analysis. Divided into overall adaptation and the basic adaptation situation of each dimension. The tables below clearly show the analysis results. According to Table 3.9: Categories of Overall Mean (Musliha Salma, 2010), the mean value between 3.68 and 5 is the High level, the mean value between 2.34 and 3.67 is the Medium level, and the mean value between 1 and 2.33 is the Low level. The part will measure the adaptation of the teachers in the sample to online teaching according to this standard.

4.2.3.1 Overall Status of Teachers' Adaptation to Online Teaching

Table 4.15

Descriptive analysis of teachers' online teaching adaptation to the overall status quo

Items	N	Min	Max	Mean
TK Adaptation	113	1.000	5.000	3.067
TCK Adaptation	113	1.000	5.000	2.979
TPK Adaptation	113	1.000	5.000	2.971
TPACK Adaptation	113	1.000	5.000	3.012
Overall	113	1.000	5.000	3.012

Note:

TK Adaptation-Technological Knowledge Adaptation

TCK Adaptation-Technological Content Knowledge Adaptation

TPK Adaptation-Technological Pedagogical Knowledge Adaptation

TPACK Adaptation-Technological Pedagogical Content Knowledge Adaptation

Table 4.15 clearly shows the overall situation of teachers adapting to online teaching.

Table 4.15 demonstrates that the range of the mean values for TK, TCK, TPK, and

TPACK adaptations is between 2.34 and 3.67, with the total mean value being 3.012. It

shows that the teachers adapt to the online teaching at a medium level.

Figure 4.1

The descriptive statistical results of teachers' online teaching adaptability
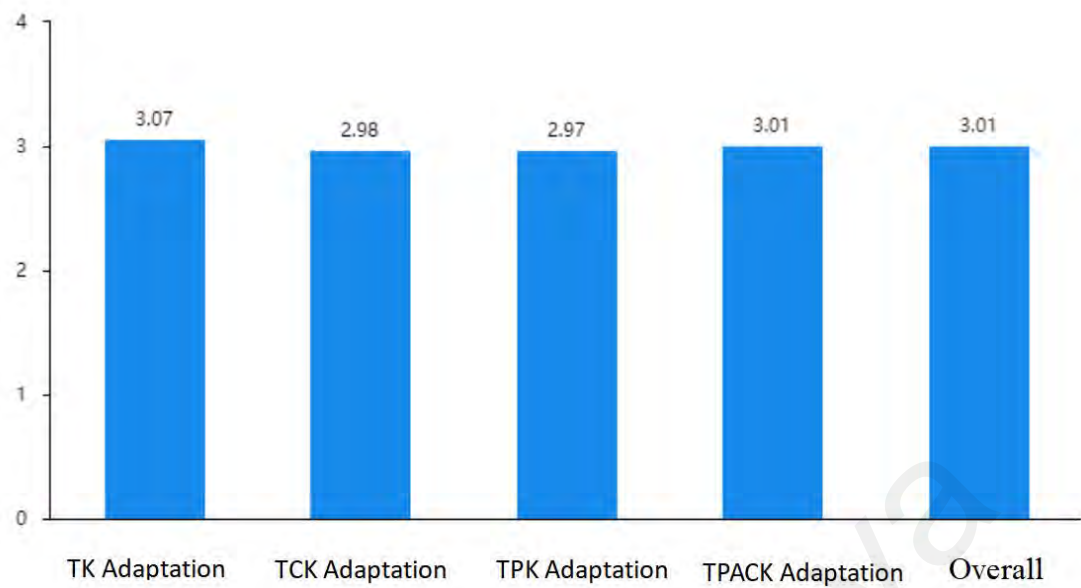
Note:

TK Adaptation-Technological Knowledge Adaptation

TCK Adaptation-Technological Content Knowledge Adaptation

TPK Adaptation-Technological Pedagogical Knowledge Adaptation

TPACK Adaptation-Technological Pedagogical Content Knowledge Adaptation

Figure 4.1 shows that each dimension's mean value is distributed from high to low in the following order: TK Adaptation > TPACK Adaptation > TCK Adaptation > TPK Adaptation. Technical Knowledge (TK) Adaptation had the highest mean value, 3.07, indicating that the interviewed teachers are most confident in TK Adaptation.

4.2.3.2 The status quo of each dimension of teachers' adaptation to online teaching

For further understanding the present circumstance of teachers' adaption to online courses in Qianling Township primary schools, it is vital to conduct a specific analysis of each item in the four dimensions in turn. Each dimension is analyzed below.

1. Technological Knowledge (TK) adaptation

Table 4.16

Descriptive analysis of Technological Knowledge (TK)adaptation

NO.	Items	Mean
C1	I have good hardware equipment.	3.142
C2	I have good software equipment.	3.195
C3	I have a stable internet connection.	2.920
C4	The online platform is easy to use.	3.000
C5	I am familiar with the various features of the online platform to teach.	3.080
C6	I think the the functions of the online platform makes the class more convenient.	3.071
C7	I have never been forced to interrupt classes due to poor internet.	3.062
	TK Adaptation	3.067

Note: TK Adaptation-Technological Knowledge Adaptation

Figure 4.2

The descriptive statistical results of Technological Knowledge (TK)adaptation

Note: TK Adaptation-Technological Knowledge Adaptation

In order to deeply explore the mean value of each item in this dimension, the researcher

drew Figure 4.2. According to Table 4.16 and Figure 4.2, the mean value of each item

of TK Adaptation is above 2.9, and the overall average value of the TK Adaptation part

is 3.067, which is higher than the Overall mean value of 3.012. Among them, the

highest score is "I have good software equipment", which is 3.195. The lowest score is

"I have a stable internet connection", which is 2.92. The mean value of other items is

above 3. This shows that teachers have reached a medium level in the adaptation of TK and have adapted well.

2. Technological Content Knowledge (TCK) adaptation

Table 4.17

Descriptive analysis of Technological Content Knowledge (TCK) adaptation

NO.	Items	Mean
C8	I can use technology to explain content knowledge fluently.	2.991
C9	I can use technology to adjust the content knowledge flexibly.	3.027
C10	I can use multimedia for teaching.	2.920
	TCK Adaptation	2.979

Note: TCK Adaptation-Technological Content Knowledge Adaptation

Figure 4.3

The descriptive statistical results of Technological Content Knowledge (TCK) adaptation
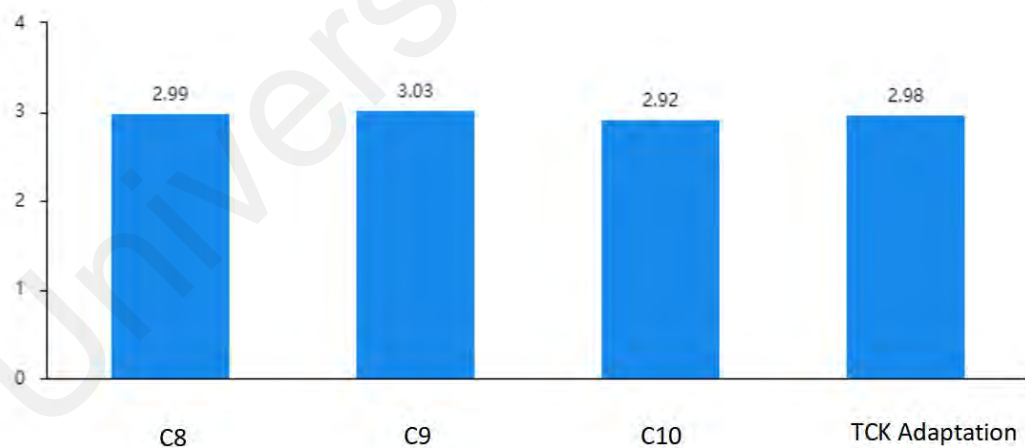
Note: TCK Adaptation-Technological Content Knowledge Adaptation

In order to deeply explore the mean value of each item in this dimension, the researcher drew Figure 4.3. Table 4.17 and Figure 4.3 show that each TCK Adaptation item's mean value is higher than 2.9, and the TCK Adaptation part's overall mean value is 2.979,

which is lower than the scale's overall mean value of 3.012. The highest score is "I can use technology to adjust the content knowledge flexibly", which is 3.027. The lowest score is "I can use multimedia for teaching", which is 2.92. The mean value of the remaining items is also below 3. Respondent teachers also achieved a moderate level of adaptability to TCK.

3. Technological Pedagogical Knowledge (TPK) adaptation

Table 4.18

Descriptive analysis of Technological Pedagogical Knowledge (TPK) adaptation

NO.	Items	Mean
C11	I can use technology to organize interact with students	2.920
C12	I can use technology to organize suitable games	2.973
C13	I can use technology to organize multi-person discussions	2.973
C14	I can use technology to make students cooperate with teaching activities	2.938
C15	I can use technology to make students follow online classroom discipline	2.965
C16	I can use technology to get feedback from students in time	2.991
C17	I can use technology to deal with emergencies calmly	3.035
	TPK Adaptation	2.971

Note: TPK Adaptation-Technological Pedagogical Knowledge Adaptation

Figure 4.4

The descriptive statistical results of Technological Pedagogical Knowledge (TPK)
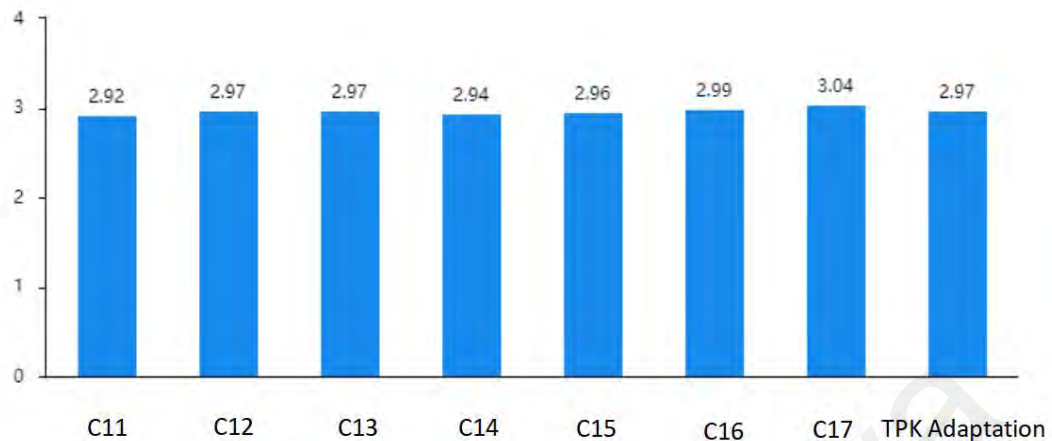
adaptation

Note: TPK Adaptation-Technological Pedagogical Knowledge Adaptation

For deeply exploring the mean value of each item in this dimension, the researcher drew

Figure 4.4. According to Table 4.18 and Figure 4.4, the mean value of each item of TPK

Adaptation is above 2.9, and the overall mean value of the TPK Adaptation part is 2.971,

which is lower than the overall mean value of the scale 3.012. Among them, the highest

score is "I can use technology to deal with emergencies calmly", which is 3.035. The

lowest score is "I can use technology to organize interact with students", which is 2.92.

The mean value of the remaining items is also below 3. Respondent teachers also

achieved a moderate level of adaptability to TPK.

4. Technological Pedagogical Content Knowledge (TPACK) adaptation

Table 4.19

Descriptive analysis of Technological Pedagogical Content Knowledge (TPACK)

adaptation

NO.	Items	Mean

NO.	Items	Mean
C18	I can design learning activities online that lead students to understand the content knowledge of the subject	3.018
C19	I can successfully complete online teaching tasks	2.929
C20	My lesson preparation doesn't take a lot of time	3.088
	TPACK Adaptation	3.012

Note: TPACK Adaptation-Technological Pedagogical Content Knowledge Adaptation

Figure 4.5

The descriptive statistical results of Technological Pedagogical Content Knowledge (TPACK) adaptation
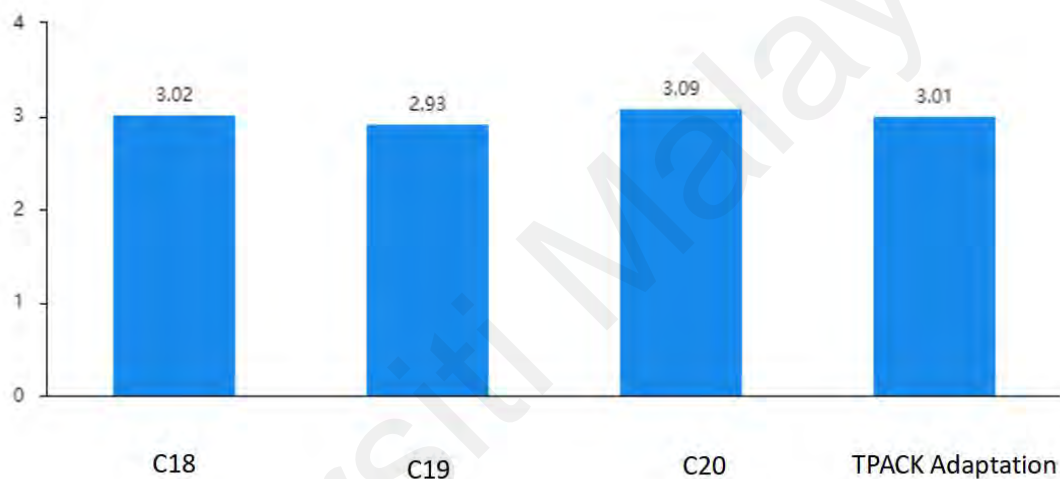
Note: TPACK Adaptation-Technological Pedagogical Content Knowledge Adaptation

In order to deeply explore the mean value of each item in this dimension, the researcher drew Figure 4.5. According to Table 4.19 and Figure 4.5, the mean value of each item of TPACK Adaptation is above 2.9, and the overall mean value of the TPACK Adaptation part is 3.012, which is equivalent to the Overall mean value of the scale. The highest score is "My lesson preparation doesn't take a lot of time", which is 3.088. The lowest score is "I can successfully complete online teaching tasks", which is 2.929. The mean value of the remaining items is 3.108. Teachers interviewed also achieved a moderate level of adaptability to TPACK.

4.2.3.3 Analysis of differences in demographic factors

The above analysis reflects the present circumstance of teachers' online teaching adaptation in Qianling Township primary schools. In order to further understand whether its TPACK Adaptation will be affected by relevant background factors, this study mainly conducts a detailed comparative analysis of the online teaching adaptability of primary schools teachers in Qianling Township from two aspects of teaching age and degree level. The results are shown in the tables below.

The teaching age of teachers participating in this research is divided into 3 groups, namely less than 2 years, 2 to 3 years and more than 3 years. The study uses one-way ANOVA to find out the influence of teaching age on the adaptability of online teaching of teachers in primary schools in Qianling Township.

Table 4. 20

The Result of One-way ANOVA of Teaching Age

	Teaching Age(mean±variance)			F	p
	Less than 2 year (n=9)	2 to 3 years (n=5)	More than 3 years(n=99)		
TK Adaptation	2.97±0.67	2.23±0.67	3.12±0.83	2.900	0.059
TCK Adaptation	3.19±0.67	2.20±0.84	3.00±0.97	1.922	0.151
TPK Adaptation	3.13±0.76	2.29±1.04	2.99±0.91	1.591	0.208
TPACK Adaptation	3.30±0.63	2.47±0.99	3.01±0.89	1.435	0.243

* p<0.05 ** p<0.01

According to the results in the table 4.20, it implies that using one-way ANOVA to identify the connection between teaching age and TK Adaptation, TCK Adaptation, TPK Adaptation, and TPACK Adaptation. The results can be observed from the above table 4.20: The significance of different teaching ages for the four dimensions of TK Adaptation, TCK Adaptation, TPK Adaptation and TPACK Adaptation is greater than 0.05, so teaching age does not show differences in the above dimensions. It is evident that different teaching ages have no significant impact on the adaptation of online teaching of primary schools teachers in Qianling Township.

Table 4.21

The Result of One-way ANOVA of Degree Level

	Degree Level(mean±variance)			F	p
	Specialist(n=19)	Bachelor(n=93)	Master(n=1)		
TK Adaptation	3.02±0.77	3.07±0.85	3.29±null	0.064	0.938
TCK Adaptation	2.54±0.96	3.06±0.94	3.67±null	2.640	0.076
TPK Adaptation	2.66±0.84	3.03±0.92	3.43±null	1.425	0.245
TPACK Adaptation	2.72±0.87	3.07±0.88	3.00±null	1.266	0.286

* $p<0.05$ ** $p<0.01$

Table 4.21 reflects the results of using one-way ANOVA to investigate the influence of the degree level on TK Adaptation, TCK Adaptation, TPK Adaptation, and TPACK Adaptation. It shows that degree level will not show significant effect on TK Adaptation,

TCK Adaptation, TPK Adaptation, and TPACK Adaptation (p>0.05), which means that degree level for TK Adaptation, TCK Adaptation, TPK Adaptation, and TPACK Adaptation all showed consistency and no difference.

4.2.3.4 Correlation analysis of each dimension of TPACK Adaptation

Given the above analysis of the variations in the adaptation status of primary schools teachers in Qianling Township and demographic background factors, the researcher get a preliminary comprehension of the current situation and factors affecting teachers' adaptation to online teaching in Qianling Township primary schools. In order to further systematically reflect the connection between the many dimensions of the TPACK Adaptation framework, the correlation verification analysis of the four dimensions in the framework is carried out through the Pearson correlation coefficient. On the other hand, it is to explore the factors most relevant to teachers' online teaching adaptation in the teacher's TPACK Adaptation framework. Combined with the analysis results, the entry point to strengthen the adaptability of online teaching of primary schools teachers in Qianling Township is explored, so as to provide reference for primary schools teachers who may encounter a situation similar to the COVID-19 in the future.

The value range of the Pearson correlation coefficient r is a negative value of 1 to a positive value of 1, and the value range with positive and negative values represents the direction of linear correlation between variables. A correlation coefficient of less than 0

represents a negative correlation, a coefficient of 0 represents no correlation between the two, and the closer the coefficient is to a negative value of 1, the stronger the negative correlation between the two. On the contrary, a Pearson correlation coefficient value greater than 0 indicates a positive correlation, and a coefficient close to a positive value of 1 indicates a strong positive correlation between the two factors, which is called a strong correlation. Through SPSS, the findings of the correlation analysis among the various dimensions of the online teaching adaptation of the primary schools teachers in Qianling Township are shown in Table 4.22.

Table 4.22

Correlation Coefficient of Teachers' Adaptation to Online Teaching

		TK Adaptation	TCK Adaptation	TPK Adaptation	TPACK Adaptation
TK Adaptation	Pearson Correlation	1			
	Sig. (2-tailed)				
TCK Adaptation	Pearson Correlation	0.744**	1		
	Sig. (2-tailed)	0.000			
TPK Adaptation	Pearson Correlation	0.731**	0.889**	1	
	Sig. (2-tailed)	0.000	0.000		
TPACK Adaptation	Pearson Correlation	0.722**	0.846**	0.852**	1
	Sig. (2-tailed)	0.000	0.000	0.000	

* $p<0.05$ ** $p<0.01$

Note:

TK Adaptation-Technological Knowledge Adaptation

TCK Adaptation-Technological Content Knowledge Adaptation

TPK Adaptation-Technological Pedagogical Knowledge Adaptation

TPACK Adaptation-Technological Pedagogical Content Knowledge Adaptation

As shown in Table 4.22, the Pearson correlation coefficients of TPACK Adaptation and

TK Adaptation, TCK Adaptation, and TPK Adaptation are all positive, indicating that there are correlations in all dimensions of the TPACK Adaptation framework of teachers in Qianling Township primary schools, and they all show positive correlations linear relationship. And from the significance (2-tailed) value, the significance level is p=0.00, and the significance level of each dimension and TPACK Adaptation is below 0.01, indicating that there is a very important correlation between each dimension and TPACK Adaptation.

According to Table 4.22's examination of the correlation between each dimension and TPACK Adaptation, the three dimensions TK Adaptation, TCK Adaptation, TPK Adaptation, and TPACK Adaptation have Pearson correlation coefficient values of 0.722, 0.846, and 0.852, respectively. The correlation coefficient values are all greater than 0, which means that it has a positive correlation between each dimension and TPACK Adaptation. The order of correlation between each dimension and TPACK Adaptation is: TPK Adaptation > TCK Adaptation > TK Adaptation. TPK Adaptation has the strongest correlation with TPACK Adaptation, which shows that the technological pedagogical knowledge (TPK) Adaptation is the most relevant to the technological pedagogical content knowledge (TPACK) Adaptation, and has the most important impact on it. The correlation between TPACK Adaptation and TK Adaptation is weaker than that of the other two dimensions. This shows that the degree of correlation between the technological knowledge (TK) Adaptation and the technological pedagogical content knowledge (TPACK) Adaptation among primary schools teachers

in Qianling Township is relatively low.

In Table 4.22, the correlation coefficient between TPK Adaptation and TCK Adaptation is 0.889, which is the highest correlation. This shows that the technological pedagogical knowledge (TPK) Adaptation and the technological content knowledge (TCK) Adaptation of the primary school teachers in Qianling Township are most related.

Therefore, enhancing the adaptability of online teaching of primary schools teachers in Qianling Township can be achieved by improving any dimension in the TPACK Adaptation framework, but because the technological pedagogical knowledge (TPK) Adaptation has the biggest impact on it. Therefore, the improvement of TPK Adaptation to Improve TPACK Adaptation, the effect is the most significant.

The third construct (Section C) contained 20 items is to analyze the teaching adaptability of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic. The result of the overall teaching adaptability in this construct is analyzed in Table 4.15. From Table 4.15, the teachers adapt to the online teaching at a medium level, the overall mean value is 3.012. It is clear from Tables 4.20 and 4.21 that teaching age and degree level have no appreciable impact on how well primary schools teachers in Qianling Township adjust

to online instruction. Table 4.22 makes it obvious that each dimension and TPACK Adaptation have a significant correlation.

Research Hypothesis for Research Question 2:

H0: Rural primary schools teachers in Qianling Township don't have significant teaching adaptability when implementing online teaching during the pandemic of COVID-19.

H1: Rural primary schools teachers in Qianling Township have significant teaching adaptability when implementing online teaching during the pandemic of COVID-19.

These results demonstrated that the alternate research hypothesis, H1, is accepted that rural primary schools teachers in Qianling Township have significant teaching adaptability when implementing online teaching during the pandemic of COVID-19. When compared to the respondents' actual circumstances, the younger age of the teacher group is the main contributor to this. According to the report of demographic information, the respondents who's age under 40 account for more than 70%. They learn technical knowledge faster, and have a higher degree of acceptance of new technologies. This is in line with Xu's research findings (2022). However, online teaching is not equal to technology learning. The core of online teaching is to better apply online technology to teaching.

4.2.4 Findings Based on the Research Question 3

The eighteen questions in the fourth section of the questionnaire surveyed teachers' difficulties in adapting to online teaching. The final research question is answered by the fourth section in the questionnaire.

Section D: Difficulties in adapting to online teaching

There are 18 questions in this construct, and it studies teachers' difficulties in adapting to online teaching. These 18 questions represent four dimensions, which are difficulties in technological knowledge adaptation, difficulties in technological content knowledge adaptation, difficulties in technological pedagogical knowledge adaptation, and difficulties in technological pedagogical content knowledge adaptation. The first dimension consists of 5 questions, the second dimension consists of 3 questions, the third dimension consists of 7 questions, and the fourth dimension consists of 3 questions. The study used descriptive statistics to obtain and tabulate the average of the scores for each question. The higher the mean value, the more teachers agree with this difficulty. The Table 4.23 is shown below.

Table 4.23

The Results of the teachers' difficulties in adapting to online teaching

NO.	Items	Mean

NO.	Items	Mean
D1	I didn't have sufficient hardware equipment	2.947
D2	I didn't have sufficient software equipment	2.965
D3	The network quality is bad	2.973
D4	The online platform is not easy to use	3.000
D5	The online platform' features are not enough to conduct online courses	3.053
D6	Explaining content knowledge with technology fluently is difficult	3.009
D7	Adjusting the content knowledge flexibly is difficult	3.044
D8	Using multimedia for teaching is difficult	3.018
D9	I can't use technology to organize interact with students	3.071
D10	I can't use technology to organize suitable games	3.062
D11	I can't use technology to organize multi-person discussions	3.018
D12	I can't use technology to make students cooperate with teaching activities	3.071
D13	I can't use technology to make students follow online classroom discipline	3.088
D14	I can't use technology to get feedback from students in time	3.204
D15	I can't use technology to deal with emergencies calmly	3.115
D16	I can't design learning activities online that lead students to understand the content knowledge of the subject	3.018
D17	I can't successfully complete online teaching tasks	3.186
D18	Lesson preparation take a lot of time	3.044

Note : D-Section D of questionnaire

The average value of each item in the scale is around 3, such as D14 "I can't use technology to get feedback from students in time", D15 "I can't use technology to deal with emergencies calmly", D17 "I can't successfully complete online teaching tasks", the mean values are 3.204, 3.115 and 3.186 respectively, which shows that teachers have encountered some common adaptation difficulties in online teaching. The average value of Table 4.23 is rearranged in descending order, starting with the highest score, and the 10 items with the highest score are listed. As shown in Table 4.24, these are aspects that are more difficult for teachers to adapt to.

Table 4.24

The results of the 10 most difficult items for teachers to adapt to online teaching

NO.	Items	Mean
D14	I can't use technology to get feedback from students in time	3.204
D17	I can't successfully complete online teaching tasks	3.186
D15	I can't use technology to deal with emergencies calmly	3.115
D13	I can't use technology to make students follow online classroom discipline	3.088
D9	I can't use technology to organize interact with students	3.071
D12	I can't use technology to make students cooperate with teaching activities	3.071
D10	I can't use technology to organize suitable games	3.062
D5	The online platform' features are not enough to conduct online courses	3.053
D7	Adjusting the content knowledge flexibly is difficult	3.044
D18	Lesson preparation take a lot of time	3.044

Note : D-Section D of questionnaire

It is indicated by Table 4.24 that most of the difficult aspects for teachers to adapt focus on the technological pedagogical knowledge adaptation and the technological pedagogical content knowledge adaptation. D14, D15, D13, D9, D12, and D10 are the difficulties in technological pedagogical knowledge adaptation. These are top 6 difficulties in the Table 4.24. It is very difficult for teachers to make students abide by classroom discipline, cooperate with teaching activities and give timely feedback in online classrooms. In addition, it is also very difficult for teachers to organize classroom games, discussion activities, and flexibly adjust teaching content knowledge in online classrooms.

Both D17 and D18 are related to the TPACK Adaptation. Teachers feel that it is very difficult to use network technology to deal with emergencies in online classrooms. The average value of this item ranks second, 3.186. It can be seen that this difficulty is very

common among teachers. "Designing online learning activities to guide students to understand the content knowledge of the subject" is also difficult for teachers. The average value of this item is 3.044, ranking tenth.

In terms of technological knowledge adaptation, teachers also have difficulties to adapt. For example, D5 "The online platform' features are not enough to conduct online courses". The average value of this item is 3.053, ranking eighth. During the COVID-19 pandemic, the online teaching platform used by teachers was not specially designed for online courses, so its functions are not enough for teachers to implement online teaching.

D7 "Adjusting the content knowledge flexibly is difficult" involves the adaptation of technological content knowledge. The average value of this item is 3.044, ranking ninth. This shows that it is difficult for teachers to flexibly adjust teaching content knowledge in online classrooms.

The fourth construct (Section D) contained 18 items is to determine the difficulties of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic. Table 4.24 analyzes the outcome of difficulties with this construct's adaptation to online teaching. The top 10 difficulties

with online teaching adaptation are shown in Table 4.24.

Research Hypothesis for Research Question 3:

H0: Rural primary schools teachers in Qianling Township don't have difficulties when implementing online teaching during the pandemic of COVID-19.

H1: Rural primary school teachers in Qianling Township have some difficulties when implementing online teaching during the pandemic of COVID-19.

These results demonstrated that the alternate research hypothesis, H1, is accepted that rural primary school teachers in Qianling Township have some difficulties when implementing online teaching during the pandemic of COVID-19.

4.3 Conclusion

In this chapter, researcher has explained the analysis of results of the study in details. It uses descriptive statistics to study the adaptability of online teaching among primary schools teachers in Qianling Township during the COVID-19 pandemic. The results show that the mean value of teachers' online teaching adaptation is 3.012, which shows that the teachers' online teaching adaptation is at a medium level. Correlation analysis was utilized in the survey to look at the relationships between the elements of teachers' online teaching adaptability. The results showed that TK Adaptation (p=0.00, r=0.722), TCK Adaptation (p=0.00, r=0.846), TPK Adaptation (p=0.00, r=0.852) were

significantly positively correlated with TPACK Adaptation.

It uses one-way ANOVA to study the impact of teaching age and degree level on each dimension of online teaching adaptation. The findings demonstrate that it has no statistically significant difference between teaching age and degree level in any aspect of teachers' online teaching adaption. This study adapts descriptive statistics to study the difficulties of teachers in adapting to online course. The results indicated that the most difficult adaptation for the teachers was technological pedagogical knowledge (TPK) adaptation. The findings of the survey will be covered in further depth in Chapter 5.

CHAPTER 5

DISCUSSION, SUGGESTION AND CONCLUSION

5.1 Introduction

This chapter includes a summary of the research, a discussion of the findings, implications for future research, and a study conclusion. This chapter first answers and discusses the research questions raised in previous chapters. Secondly, this chapter indicates the insufficiency and prospect of this study for improving the study on the adaptation of online teaching for primary schools teachers in rural areas and make some contributions to it.

5.2 Summary of Findings

As seen from previous chapters, the purpose of the research was to understand the teachers' adaptation of online courses during the COVID-19 pandemic in primary schools focusing in rural district. This section provides the summary findings associated with the three research questions.

5.2.1 Research Question 1

What is the transition of teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic?

The second construct of the questionnaire is about the transition of teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic. From the study, it shows that in the teaching of the participants in this study, there were some transitions in teaching activities, weekly class hours, and the number of students before and during the COVID-19 pandemic.

Secondly, the research results show that teachers of Qianling Township primary schools in online courses think that teaching difficulties have increased. From the perspective of English Pronunciation, Geometry and Vocabulary, the proportion of teachers who think these knowledge are difficult in online teaching has increased.

Thirdly, from the point of view of participants' agreement or disagreement that online courses are very different from traditional face-to-face courses, most participants agree that.

5.2.2 Research Question 2

What is the teaching adaptability of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic?

5.2.2.1 The Adaptation of Teachers to Online Teaching

This study indicates that during the COVID-19 pandemic, the teachers of Qianling Township primary schools were qualified to adapt to online courses and were at a moderate level. It is said that the teachers participating in the research did not adapt to the online teaching to a very good level. The teachers' adaptation to online courses still has a lot of space for growth.

The findings show that the teachers participating in the research have the most confidence in TK Adaptation. However, it can be seen that the unstable network is a very common problem for the teachers participating in the research when conducting online teaching.

According to the research results, it can be seen that another problem is that the teachers participating in the research did not think deeply about what technology should be used to address problems in online instruction. Research results also show that teachers have

certain difficulties in how to combine technology and teaching methods in the teaching process. And teachers lack confidence in using technology to conduct teaching activities smoothly.

5.2.2.2 The Effects of Teaching Age , Degree Level in the Adaptation of Online Teaching

This study found that different teaching age and degree level have no influence on teachers' adaptation to online teaching.

5.2.2.3 The Connection between TK Adaptation, TCK Adaptation, TPK Adaptation and TPACK Adaptation

According to the data analysis results, it has a positive correlation between the four dimensions of TPACK Adaptation, and each dimension influences each other. Among the dimensions of TPACK Adaptation, technological pedagogical knowledge (TPK) Adaptation has the strongest correlation with TPACK Adaptation, and technological knowledge (TK) Adaptation has the weakest correlation with TPACK Adaptation.

5.2.3 Research Question 3

What are the difficulties of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic?

The fourth construct of the questionnaire examines the difficulties teachers encounter in adapting to online teaching. The results show that the teachers participating in the research think that the degree of difficulty in adapting to online teaching is moderate.

This study found that the teachers participating in the study thought it was very difficult to organize classroom games and discussion activities. Similarly, it is very difficult to require students to abide by classroom discipline, cooperate with classroom activities, and give timely feedback on teaching effects in online courses. In addition, preparing lessons is time-consuming. This study found that teachers participating in the study have difficulty to successfully accomplish the teaching tasks. Insufficient functions of the online teaching platform is another difficulty.

For concise and clear, there is a table to show the summary of findings.

Table 5.1

Summary of findings

Category	Finding
Research Question 1	There were some transitions before and during the COVID-19 pandemic.
	Respondents think that teaching difficulties have increased.
	Most participants agree that online courses are very different from traditional face-to-face courses
Research Question 2	During the COVID-19 pandemic, the teachers of Qianling Township primary schools were qualified to adapt to online courses and were at a moderate level.
	Respondents have the most confidence in TK Adaptation.
	Unstable network is a very common problem for respondents
	Respondents did not think deeply about what technology should be used to address problems in online instruction
	Teachers have certain difficulties in how to combine technology and teaching methods in the teaching process
	Teachers lack confidence in using technology to conduct teaching activities.
	Different teaching age and degree level have no effect on teachers' adaptation to online teaching.
	It has a positive correlation between the four dimensions of TPACK Adaptation, and each dimension influences each other.
	Technological pedagogical knowledge (TPK) Adaptation has the strongest correlation with TPACK Adaptation.
	Technological knowledge (TK) Adaptation has the weakest correlation with TPACK Adaptation
Research Question 3	Respondents think that the degree of difficulty in adapting to online teaching is moderate.
	Respondents thought it was very difficult to organize classroom games and discussion activities.
	It is very difficult to require students to abide by classroom discipline, cooperate with classroom activities, and give timely feedback on teaching effects in online courses.
	Preparing lessons is time-consuming.
	It is difficult for respondents to successfully accomplish the teaching tasks
	Insufficient functions of the online teaching platform is another difficulty

5.3 Discussion of Findings

According to the research questions, the findings from the survey would be discussed in this section.

5.3.1 Research Question 1

What is the transition of teaching activities in rural primary schools in Qianling Township during the COVID-19 pandemic?

Findings of this study discovered that in the teaching of the participants in this study, there were some transitions in teaching activities, weekly class hours, and the number of students before and during the COVID-19 pandemic. It is consistent with Dai et al. (2020) that most teachers switched from face-to-face to online or mixed classes during the COVID-19 pandemic. Li Jing (2020) also mentioned this in her study "Investigation on the Adaptability of Online Course Teaching for Music Majors in Xinjiang Universities".

In addition, the research results show that teachers of Qianling Township primary schools in online courses think that teaching difficulties have increased. From the perspective of English Pronunciation, Geometry and Vocabulary, the proportion of

teachers who think these knowledge are difficult in online teaching has increased. The results are same as Li (2020)' findings in Investigation on the Adaptation of Chinese teachers' volunteer network teaching in Confucius institute of South Korea. Online teaching increases the difficulty of teaching. Dai et al.,(2020) also pointed out in "Learning without stopping classes, challenges encountered by online teaching" that in online teaching, teaching becomes more difficult, which ultimately leads to imbalance in teaching.

Judging from if the participants agree with or disagree with the view that it has a great discrepancy between traditional teaching and online teaching, most participants agree that there is a great discrepancy between traditional education and online teaching. According to the questionnaire data, more than 70% of the interviewed teachers believe that traditional teaching is very different from online teaching. Sun, Lv, Guo & Liu. (2022) also held the same results as this study in The connection and difference between online teaching and traditional teaching. It shows that most participants agree that traditional teaching is very different from online teaching. Du and Ding (2020) pointed out in their study "Comparative Analysis of the Advantages and Disadvantages of Online Course Teaching and Traditional Teaching in Colleges and Universities" that online course teaching, as a new teaching method, can shape students' ability to learn independently. This is not easy to achieve with traditional teaching methods.

5.3.2 Research Question 2

What is the teaching adaptability of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic?

5.3.2.1 The Adaptation of Teachers to Online Teaching

Findings of this research discovered that during the COVID-19 pandemic, the teachers of Qianling Township primary schools were qualified to adapt to online courses and were at a moderate level. It is said that the teachers participating in the research did not adapt to the online teaching to a very good level. The degree to which teachers have adapted to online courses still has a lot of room for growth. This is consistent with Zhao, Wu & Chen's (2020) point of view in the Investigation on the state of online education for rural students and research on development restraints: Taking elementary and middle schools in Qian'an City as an example. Zhang's (2020) study "A Brief Discussion on Measures to Improve the Effectiveness of Online Classes for College Students" found that college teachers did not have mature adaptation to online teaching during the epidemic, which resulted in teachers and students having a low experience of online classes. However, Li (2020) found in her study Investigation on the Adaptation of Chinese teachers' volunteer network teaching in Confucius institute of South Korea that Chinese teacher volunteers in South Korea adapted well to online teaching.

The findings showed that the item with the lowest score is "I have a stable internet connection". It can be seen that the unstable network is a very common problem for the teachers participating in the research when conducting online teaching. This is consistent with Zhang, Li & Zhang (2021)'s point of view. Therefore, from this, for improving the adaptability of teachers in Qianling Township primary schools to online teaching, it is necessary to improve network quality. Zhao, Jiang, Tang, and Zhen (2021) reported in their study Online Education: Digital Divide or Digital Opportunity? ---Based on the Analysis of Urban-rural Differences in Online Learning During the Pandemic points out: Good network conditions, adapted platforms and equipment are the prerequisite and foundation for online education.

This research found that the teachers participating in the research did not think deeply about what technology should be used to solve problems in online teaching. Teachers are lacking in this aspect. Cai (2018) in the Investigation and research on TPACK status of primary school mathematics teachers also agrees with this point of view in her research. Therefore, from this perspective, for improving the adaptability of teachers in Qianling Township primary schools to online teaching, it is vital to improve teachers' technical literacy. Only by understanding and proficiently mastering multimedia can teachers choose the most suitable multimedia to solve corresponding teaching problems. Zhao, Jiang, Tang, and Zhen (2021) pointed out in their research　Online Education: Digital Divide or Digital Opportunity? ---Based on the Analysis of Urban-rural Differences in Online Learning During the Pandemic that the practical application

ability of online education tools among teachers in my country, especially those in remote areas, is still insufficient.

Findings show that teachers have certain difficulties in how to combine technology and teaching methods in the teaching process. Zhang & Wang (2022) also agrees with this point of view in their research Research on TPACK classroom observation and diagnosis of teachers based on teaching section-A case study of elementary mathematics. The lowest scoring item on this dimension was "I can use technology to organize interact with students". It indicates that the teachers participating in the research feel very difficult about how to interact with students in online teaching. Wang Jixin et al. (2020) also found in their research Current status, problems and reflections of online teaching for primary and secondary school teachers during the epidemic——Survey and analysis based on Hubei Province's "suspension of classes without suspension of learning"that teachers are lacking in online teaching strategies and teaching activity design during the online teaching process. From this perspective, for improving the adaptability of teachers in Qianling Township primary schools to online teaching, it is vital to strengthen student-teacher interaction in online teaching. Students actively interact with teachers, devote themselves to the classroom, narrow the difference between online classrooms and traditional classrooms, and improve teachers' adaptability to online teaching.

Findings show that teachers in Qianling Township primary schools have qualified adaptability to online teaching. Combined with the topic, the item with the lowest score is "I can successfully complete online teaching tasks". This shows that teachers lack confidence in using technology to carry out teaching activities smoothly. This is consistent with Xu's (2022) findings in his study. From this opinion, to improve the online teaching adaptability of primary schools teachers in Qianling Township, not only teachers must consciously adapt to the online teaching environment, but also through the accumulation of practical experience. Teachers should learn to adapt to the rational use of technical instruments in teaching activities in the actual classroom teaching environment for better presenting the discipline content. Only in this way can we better realize the in-depth online teaching adaptation.

5.3.2.2 The Effects of Teaching Age , Degree Level in the Adaptation of Online Teaching

This study discovered that teachers' ability to adjust to online teaching is unaffected by their teaching age or degree level. Cai (2018) in the Investigation and research on TPACK status of primary school mathematics teachers also hold the same results with this study. However, Wang, Wang, Han, and Li (2023) have different views on the Investigation and research on the current situation of English teachers' information-based teaching ability in Chinese colleges and universities. Their research results show different education levels have a significant impact on teachers' TPACK

dimensions. Different teaching ages have no significant impact on teachers' TPK, but have significant impact on the remaining dimensions.

5.3.2.3 The Connection between TK Adaptation, TCK Adaptation, TPK Adaptation and TPACK Adaptation

This research discovered that it has a positive correlation among the four dimensions of TPACK Adaptation, and each dimension influences each other. This also verifies the view of TPACK integration proposed by Mishra and Koehler (2009). It agrees with what many professors have found in their research. Xu (2022) in the Research on the current situation of TPACK levels of volunteer Chinese teachers in Thailand and their improvement strategies also holds the same view. Meanwhile, Wang et al. (2023) also agree with it in their research.

Among the dimensions of TPACK Adaptation, technological pedagogical knowledge (TPK) Adaptation has the strongest correlation with TPACK Adaptation, and technological knowledge (TK) Adaptation has the weakest correlation with TPACK Adaptation. This research result is basically consistent with Cao's (2019) research of in-service Chinese teachers in South Asia. Therefore, from this perspective, improving teachers' TPK Adaptation can maximize teachers' adaptation to online teaching. The

technological knowledge (TK) adaptation is relatively independent in the TPACK Adaptation framework. So targeted improvement strategies can be adopted.

5.3.3 Research Question 3

What are the difficulties of online courses implementation among teachers in rural primary schools in Qianling Township during the COVID-19 pandemic?

Findings of this study show that the teachers participating in the research think that the degree of difficulty in adapting to online teaching is moderate. The most difficult of these is the Technological Pedagogical Knowledge (TPK) Adaptation section. Six of the top ten difficult items came from this section. This study found that the teachers participating in the study thought it was very difficult to organize classroom games and discussion activities. Similarly, it is very difficult to require students to abide by classroom discipline, cooperate with classroom activities, and give timely feedback on teaching effects in online courses. In addition, preparing lessons is time-consuming. Li (2020) also got the same research results. Luo Ziling (2021) pointed out in her study "A Preliminary Study on the Digital Divide in Online Education in the Post-Epidemic Era" that in urban schools, teachers help students create knowledge through the Internet and electronic devices. But in rural schools, teachers can only use the Internet and electronic devices as simple teaching aids. This study found that it is difficult for the teachers participating in the study to successfully complete the teaching tasks. Hu (2015) agree

with it in The transformation and adaptation of teacher's role in online teaching. Insufficient functions of the online teaching platform is another difficulty. The results of Li (2020) are consistent with the results of this study.

5.4 Implication of the Study

The purpose of the research was to understand the teachers' adaptation of online courses during the COVID-19 pandemic in primary schools focusing in rural district. This means that it exists lots of space for improvement in the adaptability of online teaching of primary schools teachers in Qianling Township.

According to the survey's correlation analysis results, it has a significant positive correlation between teachers' online teaching adaptation dimensions, with TPK Adaptation having the highest correlation with teachers' online teaching adaptability. This study's findings can help teachers in rural primary schools better adapt to online teaching. Therefore, for teachers, it is necessary to strengthen technical teaching practice and learn to use technical tools to design specific teaching activities in the actual teaching process of the classroom. And if we want to enhance the online teaching adaptability of teachers in a rural area, we also need to take measures to improve TK Adaptation, TCK Adaptation, TPK Adaptation and TPACK Adaptation.

The research results also show that when teachers adapt to online teaching, most of the difficulties they encounter are concentrated in the dimension of TPK Adaptation. The main difficulties are related to classroom interaction and maintenance of classroom discipline. In addition, teachers participating in the study also expressed that the online teaching platform is not functional enough. These difficulties have increased the difficulty for teachers to adapt to online teaching. Therefore, it is crucial for research and development organizations of online platforms to continuously improve the system's features and offer new ones appropriate for online classrooms. Secondly, teachers need tools that make it easier for them to interact with students in the classroom. These tools should also help grab students' attention, get them interested in participating in online classes, and help teachers keep the class under control.

This is indeed a significant finding in this study. Because online courses are widely used in modern society. It is an effective teaching tool that can be carried out in a special situation similar to the COVID-19 pandemic, and it should be implemented in classrooms in rural areas.

5.5 Recommendations for Future Research

Owing to the limitations and demarcation of this research, there are some recommendations from two different perspective.

About the academic recommendations, there are 3 points. First, the sample of participants should be enlarged. This study is limited to Qianling Township, therefore, future researches can expand the scope to the entire Susong County and even surrounding counties. This further enhances and generalizes to better results.

Second, this study exclusively collects and analyzes data using quantitative approaches. The degree of teachers adaptability to online courses cannot be accurately reflected in the outcomes. Therefore, future researches can add qualitative data by combining classroom observations and interviews. Classroom observations can provide details about what a teacher is teaching online. Interviews also allowed researchers to better understand teachers' personal experiences teaching online.

Finally, similar use of this study can be done on different groups in the field of education too. This study targets primary schools teachers in Qianling Township. However, future researches could focus on other groups. For example, future researches could investigate middle school teachers in Qianling Township.

About the practical recommendations, it is that future study could conduct under other policy. In this study, it conducts in the call of "online teaching" during the COVID-19 pandemic. Now the COVID-19 becomes the passed thing, so the policy during the COVID-19 pandemic is not approriate to future policy.

5.6 Conclusion

This chapter first indicated the summary and discussion of the findings. It then followed by the implication and recommendation, also the suggestion for future research. This chapter closed with a conclusion of the study.

It presents summary results related to three research questions. It summarized the transitions in the teaching activities of primary schools teachers in Qianling Township during the COVID-19 pandemic, the adaptation of teachers in Qianling Township primary schools to online teaching during the COVID-19 pandemic, and the difficulties faced by teachers in Qianling Township primary schools in adapting to online teaching during the COVID-19 pandemic. Second is the revelation of the study. Through the research, the researcher found that through the improvement of various dimensions of network teaching adaptation and the further development of the network teaching

platform, it is helpful to improve the network teaching adaptability of rural primary school teachers. Finally, based on limitations and delimitation, some suggestions for future research are put forward. This study recommends that future researchers use the qualitative methods in the study, investigate different groups in the field of education and expand the sample size to primary schools teachers in other rural areas of China.

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