

K-12 Teachers' Attitude Towards Online Learning Platforms During COVID-19 Epidemic in China

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Abstract—In order to systematically evaluate the use of online learning platforms for K-12 education during the COVID-19 epidemic, this study adopted the methods of survey and case study to examine teachers' attitude towards the functionality and implementation of various learning platforms. The study results showed that teachers were generally satisfied with the mainstream online learning platforms and agreed that they could support large-scale online learning and fulfill the basic instructional and management functions. Positive evaluation was given on platform functions such as resource delivery, instructional management, assignment collection and grading, multi-terminal accessibility, and ease of use. In-depth qualitative data from selected cases of online classes were also analyzed to verify and explicate the quantified survey results. Based on the study results, recommendations were made on the sustainable use and improvement of online learning platforms for K-12 settings.

I. INTRODUCTION

Since the spread of COVID-19 virus around the world in Spring 2020, 153 countries have suspended face-to-face classes nationwide as of May 8th, which has affected 119 million students, accounting for 68.5% of student population worldwide [1]. Specifically in China, in order to prevent the spread of COVID-19, an initiative named "Disrupted Classes, Undisrupted Learning" was launched to provide online learning to hundreds of millions of students at home by the Ministry of Education [2]. To ensure that the teaching activities of the primary and secondary schools would not be disrupted, many online learning platforms were adopted by the schools in China to provide technical support for online learning, connecting teachers and students remotely with its various functions.

The theoretical research of online learning platform has mainly focused on the construction of theoretical dimensions, including the discussion of its definition, function, structure, elements, but lacked large-scale practice of online learning as empirical research materials. The empirical research of online learning platform mostly came from the newsletter published by the enterprise itself, which lacked objective and fair third-party evaluation, especially the evaluation and improvement suggestions from teachers as target users. The pandemic provides an opportunity for empirical research on online learning platforms [3]. In China, online education is not popular in primary and secondary schools, and this pandemic provides an opportunity to redefine "future education" and

offer valuable lessons for online teaching and learning in K-12 context, including the use of online learning platforms.

This study objectively evaluated the use of online learning platform and Chinese teachers' attitude towards the online teaching practice in primary and secondary school settings during COVID-19 epidemic, and put forward suggestions on teachers' instructional strategies and modes in online learning environment. The study results can inform the development and optimization of online learning platforms and their adoption in mainstream K-12 education system in the post-pandemic world.

II. RESEARCH METHOD

Both quantitative and qualitative data were collected from different sources to answer the research questions raised in this study.

In order to investigate the user experience with online learning platforms, we designed a questionnaire based on a series of literature to collect teachers' attitude towards platform usage in terms of teaching management, resource services, social interaction, assignment management, and system performance. The questionnaire was distributed online through an online survey website. A total of 1450 questionnaires were collected from 28 provinces, with 35.1% of them from urban areas, 35.7% from township areas, and 29.2% from rural areas. The distribution based on locality is relatively equal. The internal consistency coefficient of the questionnaire is 0.839, demonstrating good reliability.

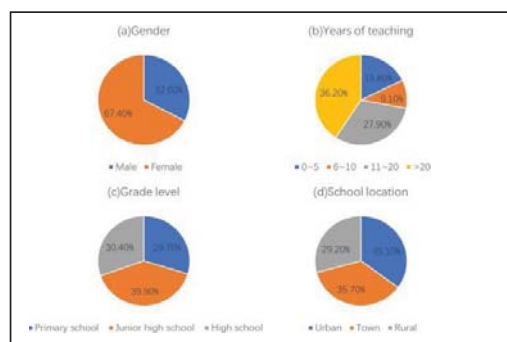


Fig. 1. Basic information for teachers. (a) The gender of teachers; (b) Years of teaching; (c) The teaching grade level of teachers; (d) School location of teachers.

To properly interpret the survey results, we selected 34 online classrooms from 20 provinces as cases of online learning and used virtual observation and interviews to collect in-depth qualitative data regarding students' engagement with and perception of online learning. The selected cases were from 7 primary schools, 11 middle schools, and 13 high schools, and covered 9 subjects: mathematics (9), English (5), physics (5), geography (4), biology (4), Chinese (2), politics (2), chemistry (2), and music (1). The online learning platforms involved in this study include comprehensive management platforms that are qualified in teaching management, resource service and social interaction, such as CCTalk, DingTalk; and also involved some real-time communication tools, such as WeChat and QQ, that support live teaching and synchronous meeting, and some resource platforms such as National Cloud platform, and bilibili that provide massive digital learning resources for free. The online case studies lasted for 2-3 weeks during March 2020 and resulted in a collection of virtual ethnographic fieldnotes (130,000 words) as the main data source for qualitative analysis. The qualitative data provided in-depth descriptions of how different online learning platforms were used to support online teaching and learning processes, and was also used to explicate and interpret the quantitative survey results.

III. RESULTS

According to the survey results, more than 60% of teachers gave a positive attitude in the operation of the platform, and more than 70% of teachers believed that the platform was convenient for teachers to manage resources, upload resources, and present courseware. About 60% of teachers believed that the platform provided good interactive functions to help teachers maintain classroom order. Overall, 77% of teachers were satisfied with the platform's functionality.

TABLE I. THE DIMENSIONS AND QUESTION ITEMS OF THE QUESTIONNAIRE USED IN THIS STUDY

Dimension	Question Item
Teaching management	• This platform can help me maintain the classroom order while teaching.
	• This platform can help me easily obtain the data of students' learning situation.
	• This platform can help me conveniently monitor the students' learning process in class.
Resources service	• The platform supports uploading varying types of learning resources.
	• The platform can present all kinds of courseware.
	• The platform can help me manage learning resources.
Social interaction	• The platform can achieve good teacher-student interaction during the teaching process.
Assignment management	• The platform can help me grade students' assignments and record scores online.
	• The platform can help me to feedback homework evaluation to students.
System performance	• I think the platform has a beautiful interface.
	• I think the platform is fully functional.
	• I think the platform is stable.
	• I think the platform is simple and convenient to operate.
	• I am already familiar with the operation of this platform.

A. Teaching management

The role of online learning platform in teaching management is divided into organizational structure, course management, academic performance and teaching aids. After investigation and study, it was found that teachers were satisfied with the teaching management tools and academic performance of teaching management on the online learning platform. More than 70% of teachers believed that the platform can manage learning resources and meet the requirements of home teaching, easily obtain students' learning data, and provide students' login time and online duration for teachers and students to view the learning situation.

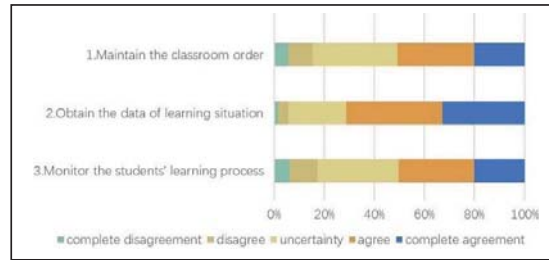


Fig.2.1. Teacher ratings of the platform in supporting teaching management.

However, 17.3% of teachers believed that the platform cannot achieve the purpose of monitoring the learning process of students. Due to the technical problems of the current online learning platform, there is hardly any support for teachers and students to achieve "face-to-face" communication, so teachers cannot master the students' learning in real time like traditional classrooms. A teacher said, "there is rarely any communication between teachers and students in class. Sometimes I asked a question in class, and the students typed their answers in the chat space. In fact, the platform has the function of voice-call, but people seldom used it."

B. Resource service

The questionnaire surveyed the specific situation of the platform in terms of resource services. The results showed that 75.7% of teachers believed that the platform supported uploading multiple types of learning resources. A variety of learning resources not only changed the disadvantage of teaching media being limited to slides and words in face-to-face teaching, but also allowed students to make personalized choices in autonomous learning. More than 70% of teachers agreed that the platform can present various courseware and manage learning resources. This shows that the platform provided the basic functions for distributing teaching resources and managing instructional process.

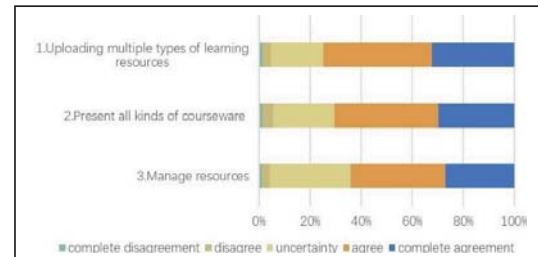


Fig.2.2. Teacher ratings of the platform in supporting resource service.

At the same time, teachers expressed satisfaction of the video playback function. A teacher stated that through online teaching and real-time viewing, the teaching ability of teachers can be further improved, and the teaching problems have been improved.

C. Social interaction

The main functions provided by the platform in social interaction are asynchronous interaction, synchronous interaction, group collaboration and knowledge sharing. According to the survey, more than half of the teachers agreed that teachers and students can achieve good interaction in the online learning process, but 11.4% of teachers disagreed.

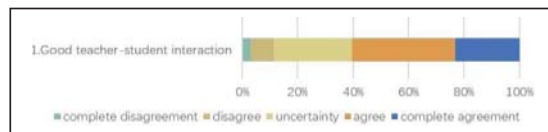


Fig.2.3. Teacher ratings of the platform in supporting social interaction

The teacher said that the voice-call function is hardly used, because it may be noisy to make voice calls in the whole class. The interaction between the teacher and the students not only depends on the way of utterance, but it can be used in connection with other functions of the platform, such as instant messaging, typing in the chat area, etc. In addition, the group cooperation is not good enough, teachers mentioned that students just answer the questions in the discussion board one by one. There was little interaction between students in class. On the one hand, the platform lacks the function of providing interaction between students. On the other hand, it is difficult to carry out group cooperation among students online, especially in primary and middle schools, where a class lasts only 40 minutes.

D. Assignment management

The functions of the online learning platform in assignment management mainly included assignment delivery and collection, online assessment, assignment type support, self-assessment and peer assessment. More than 70% of teachers gave a positive attitude on assignment management functions. They believed that the platform can help teachers grade assignments online, record scores and provide feedback to students on assignment quality. A teacher liked the online correction function, which provided pre-specified comments such as “Your work is very well done” or “I believe you can do better”. “In most cases, I can directly provide feedback on students’ work using fixed comments, which improves the speed of assignment correction”, said the teacher.

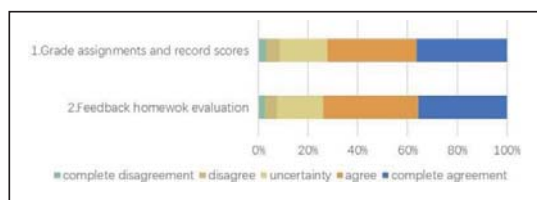


Fig.2.4. Teacher ratings of the platform in supporting assignment management.

However, 8.4% of teachers expressed dissatisfaction with the function of correcting assignment. Some teachers thought

that the submitted assignment was unclear, and the operation interface displayed on the platform was too small to mark for correction. There are some platforms support less types of assignment submission, only supporting pictures, video and audio submission, but not other file types. such as videos, mind maps, or application. Meanwhile, there is no time limit for assignment submission, so the supervision effect for students to complete their homework is poor.

E. System performance

In terms of system performance, the online learning platforms included open resources, easy-to-use functional design, smart resource recommendation, personalized adaptive learning, and universal access on multiple terminals. The questionnaire data showed that more than 80% of teachers believed that the platform was stable and easy to operate, and they had mastered the operation of the platform. More than 70% of teachers believed that the platform was fully functional and beautiful.

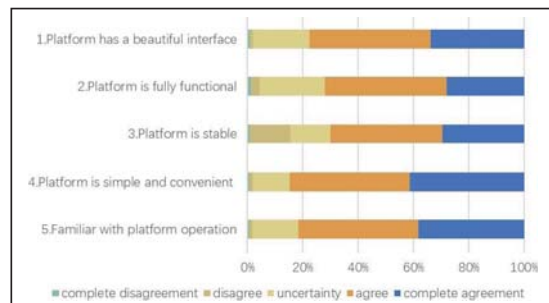


Fig.2.5. Teacher ratings of the platform in supporting system performance.

Although the overall evaluation was high, there were a few teachers who raised expectations and suggestions for the application of artificial intelligence in online platforms in the future. Some teachers said that if the grading system of the platform can recommend relevant learning materials based on the types of students’ errors, students would benefit more from online assessment and acquire more personalized learning experience. The discussion area in the mobile platform system sometimes blocked PowerPoint slides when displayed on a computer, and teachers needed to adjust its position constantly during the lecture for computer users, resulting in disruptive experience for both teacher and students. So, some platforms can also use better adaptive display on multiple device terminals. At the same time, the stability of the platform needs to be strengthened, the issues such as lagging, delay, desynchrony, and bluescreen need be fixed.

IV. CONCLUSIONS AND RECOMMENDATIONS

The survey results show that the overall teachers were satisfied with the application of online learning platform, and 77.9% of teachers expressed their willingness to continue using the current online learning platform to assist classroom teaching in the future. However, the development of educational informatization should not be limited to the development of technology. We must start from the development of teachers’ digital literacy, and apply online technologies to teaching practice on a daily basis. We put forward several suggestions based on the research results.

A. Suggestions on online teaching for teachers

Use online platforms flexibly to support various online instructional modes. Due to the change of learning environment, the traditional teaching modes is no longer suitable for online instruction. The Hubei ministry of education provided the following five typical teaching modes including online live broadcast teaching, online on-demand teaching, students' independent learning, TV video teaching, and centralized tutoring and Q&A. From the case, we can see that the current primary and secondary school teachers generally used live broadcast and screen sharing, and the teaching mode was relatively simple, utilizing only a few main platform functions. In fact, teachers can make full use of the functions of the online platform, and flexibly choose the corresponding instructional mode based on their learning style and instructional content.

Further the educational philosophy of student-centered learning. Student-centered learning has always been a philosophical concept that is highly respected in modern education. The instructional focus is on developing students' higher-order thinking skills through constructive learning practices. In this learning paradigm, the role of teachers is shifted to building a suitable scaffolding for students, and become a mentor to guide students to reach personal learning objectives within Zone of Proximal Development [4]. So, teachers should make full use of the social interaction function of the online learning platforms to communicate with students promptly, give timely feedback, and guide students to develop self-learning awareness and habits.

Integrate online learning platforms into face-to-face teaching to achieve personalized instruction. The prevention and control of the COVID-19 epidemic in China has achieved initial success, schools are opening in some provinces. However, we must prepare for the worst scenario that COVID-19 may exist for a long time, and normal instruction might be affected and disrupted in the future. Therefore, teachers should continue to make use of the useful functions of the online learning platforms (e.g., resource service, asynchronous interaction, and online assessment) to allow students to benefit from the useful features of both face-to-face and online instruction, and help them adapt to both modes of instruction to make online switch seamless in the future when normal education is disrupted by COVID-19 or other public health events once again.

B. Suggestions for improving online learning platforms

Improve platform the functions of organization and management, and optimize online classroom supervision strategies. In the online environment, the classroom management might be severely affected due to the fact that teachers and students are separated by time and space. As a result, management is largely relying on online learning platforms [5]. When developing an online learning platform, the computer skills and digital efficacy of the teachers should be taken into consideration, and the organizational structure of the platform should be improved. Data mining technologies should be properly utilized to document student online learning behaviors and provide diagnosis of and interventions for students lagging behind. The visualization of learning analytics can also inform teachers, administrators and even the students the process of the overall learning and individual learning performance. The great potential of online learning platforms for enhanced and personalized management should

not be neglected, and certain functions of management can be further improved for usefulness and ease of use.

Take full advantages of online learning and improve the efficiency of resource delivery. Online courses are largely based on resource delivery [6]. Whether it is a large-scale open online course with no restrictions on learners' participation, or a class online teaching with a "threshold" in online teaching during the COVID-19 epidemic, the transfer of resources provides the possibility for online teaching. In the development of online learning platform, the types of platform resource delivery should be enriched, the quality of learning resources should be improved, learning resources in multiple disciplines should be provided. In addition, a platform should allow for live broadcast playback or resource viewing of the platform. The resources viewing analytics, combined with the online learning duration records, can assist the supervision of the students' learning process.

Support meaningful social interactions during online learning process. In the development of online learning platform, the social interaction functions in the existing platforms should be optimized to provide users with a good social and collaborative learning environment, enhancing the social presence during the interaction process. Audio/video-based interaction is as important as text interaction. Online collaborative tools such as discussion forums or real-time bullet comments should be included and emphasized in the online learning platforms, to expand the ways of online interactions both synchronously and asynchronously. Social interaction is also known to enhance student engagement, which is essential for the effectiveness of and continuous participation in online learning [7].

Build an automatic assessment mode and improve assignment management functions. The development of online learning platform should employ educational big data and learning analytics to provide a reference for the decision-making regarding the design, implementation, and evaluation of the online learning process, providing various services to students to accurately meet their learning needs. In terms of assignment management, platform development should improve the support for submitting assignment in various formats and increase the capacity for assignment submission. Based on the convenient acceptance and sending, at the same time set reminders such as assignment submission, review, feedback, deadline. The platform can be used for self-assessment of assignment and peer assessment, creating a positive and favorable learning atmosphere for learners.

Improve technology and system stability. Due to the spread of COVID-19 virus around the world, the world's first large-scale online teaching and learning practice has been introduced (involuntarily), which also brings great challenges to teachers and students both pedagogically and technically. Technical issues such system collapse and network delays seriously affect the online teaching and learning experience. At the same time, because of poor digital literacy of certain teachers and learners, there were also many cases of confusion and disruptions in online classes. The development of the online learning platform should face these difficulties squarely and provide both pedagogical and technical solutions to the situation. Enhancing technical affordances to improve usability and stability of the system, and allow easy access from multiple device terminals to enable flexible teaching and learning.

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