

The Challenge of Online Mathematics Teaching under the Impact of Covid-19 Pandemic

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Abstract

At the beginning of 2020, the COVID-19 outbreak caused K-12 schools in China to close for the spring semester. Unplanned and unprecedented educational interruptions have changed the normal teaching routine of math teachers. In order to follow the slogan of 'Disrupted classes, Undisrupted learning' from the Ministry of Education of the People's Republic of China, mathematics teachers had to change their teaching methods and provide students with remote online education. After the epidemic in China stabilized, elementary school mathematics teachers returned to the campus for normal face-to-face classes. This case study is to investigate what were Chinese elementary mathematics teachers thinking under the influence of the COVID-19 pandemic and how to deal with the challenge and how did they evolve when they came out of COVID-19 crisis. Qualitative data sources including semi-structured interviews and reviews of mathematics teacher lesson plans.

Keywords

Elementary mathematics teacher; Remote online mathematics teaching; Arithmetic teaching; COVID-19.

1. Introduction

1.1. Background to the Study

In China, in order to avoid the spread of COVID-19 pandemic, the Chinese government banned most of the face-to-face activities including teaching, they closed most school whether it was located in the countryside or in the city. The Ministry of Education of the People's Republic of China has launched an initiative called " Disrupted classes, Undisrupted learning", which aimed to provide hundreds of millions of students with flexible online learning at home (Huang et al., 2020).

In terms of elementary school teachers, especially math teachers, teaching mathematics remotely has always been a challenge to math teachers (Sullivan et al., 2020). It is arduous for math teachers to provide explanations and targeted exercises that meet the needs of students as well as how to guide them to calculate step by step (Sullivan et al., 2020). Even with these difficulties above, driven by the COVID-19 crisis, elementary school mathematics teachers have to start remote teaching for their students in the spring semester of 2020 and adapt to online teaching methods as soon as possible in China (Huang et al., 2020).

After September 2020, elementary school teachers and students in China have completely returned to campus and continued face-to-face courses. When they returned to the normal teaching in physical classrooms, if their teaching method has been improved?

Based on the background above, the researcher would like to do an in-depth investigation of how mathematics teacher carried on remote teaching in primary school during the COVID-19 and after COVID-19.

1.2. Statement of the Problem

In order to conduct online mathematics teaching, mathematics teacher have to make adaption to deal with the difficulties which the researcher mentioned above. Although online teaching has already overlapped a certain part in the field of education, mathematics teachers in elementary schools still prefer face-to-face teaching (Yang, 2020), because the teacher can understand the real problems of the students and guide the students to develop good observation habits in the calculation process to lead to master the basic ideas and methods of the students (Yang, 2020).

After they reverted back to face-to-face classes, they should have more have new inspirations about teaching after experiencing this period of distance online teaching. Therefore, for arithmetic teaching, the challenge and the comparison of teaching methods in three periods are worthy of in-depth exploration by the researcher.

1.3. Research Questions

1.What are the transformation you had to take to their teaching and content to make learning seamless during the implementation of the COVID-19 “emergency” online arithmetic instructional?

2.How much of this transformation would teachers like to retain as their new normal?

2. Methodology

Because the purpose of this research is to understand how more individuals experience a phenomenon (the limitations on remote teaching of elementary school math teachers under COVID-19 pandemic), the researcher need to understand the different situations of each primary school mathematics teacher and solve the research questions.

2.1. The Reasons for Research Objects Selection

As for the reason why the researcher decided to use these two teachers as the research objects to investigate, it is mainly because that they are current primary mathematics teachers with over 3 years experience. To be more specific, they have not only experience in the face-to-face classrooms, but also experiences for online teaching during the Covid-19 pandemic.

2.2. Research Instrument

2.2.1. Interview

As for the reason why the researcher chose the semi-structure interview in this study, it was mainly because that the unstructured part of the semi-structured interview provided more space for the researcher and the teachers (the research object). To be more specific, the researcher divided the interview into three parts: the previous teaching methods in the normal life, the online teaching experience during the Coivd-19 pandemic, the current teaching methods when coming back to campus again. From the above three parts, the researcher learned more about these primary mathematics teachers experiences before and after the COVID-19 crisis and how they implemented emergency teaching measures for COVID-19 crisis in China.

2.2.2. Document Review

In terms of this study, the researcher would like to review the lesson plans or teaching diary which math teachers made during the teaching remotely period. Because checking lesson plans or teaching diary will help me focus on the questions that may be asked in the interview, for instance, how to design new online mathematics teaching activities.

Likewise, document review method also will help the researcher understand the issues to pay attention to when observing participants, for instance, whether the math teachers implement

online mathematics according to the teaching plan teaching. The document provides specific and stable data, which means that readers and researchers can read and review them multiple times, and are not affected by the researchers or the research process (Bowen, 2009). Meanwhile, the researcher compared their lesson documents before and during COVID-19 pandemic to analyze whether the teaching methods have changed after experiencing remote teaching.

3. Analysis of Data

3.1. What Are the Transformation Teachers Had to Take to Their Teaching and Content to Make Learning Seamless?

In fact, a load of students had already taken the online class in their leisure time for extracurricular tuition, but their daily classes in their school were in the physical classroom all the time before COVID-19 pandemic. Hence, most of students can not adapt to daily online classes. When mathematics teachers in school conducted the online teaching in the end of February, they had to come up with more teaching methods to make students to learn seamlessly.

“Played the animation ahead of time to introduce the lesson” ---Ms.Y

“Because of the special nature of online education, teachers cannot see students and cannot monitor their learning. The assignment list is made so that they can complete their learning tasks according to the above content.” ----Ms. Y

First of all, from the above words from Ms.Y, the researcher noticed that she showed the animation in relation to the division content for attracting the attention from the students, and then she also made the assignment list called ‘Learning Contact’ to make up for the lack of on-site supervision from mathematics teachers (The Chinese version of Learning Contact is put in Appendix F). Actually, Ms.Y also used the ‘Learning Contact’ in the face-to-face classroom, every student has a contract that meets the learning progress, and each learning stage needs to record their own learning progress in order to make self-feedback and evaluation. Hence, students could not feel strange to make their learning seamless when they received the online contract. They could learn the knowledge about ‘Division’ and did the tasks from Monday to Friday.

Dalton Grade 2 contract of ‘Disrupted classes, Undisrupted learning’					
Class: _____ Name: _____ Due date: Feb. 24th to Mar. 1st Description: Level1 and Level2 task must do, Level3 not must do. After finishing the tasks, you can obtain corresponding scores as the basis for the start of school award.					
Student commitment: I promise that I will choose the learning task that suits me and complete it on time. This is my learning responsibility. I will try my best to complete the learning tasks by self-learning and consulting teachers and parents.					
Promiser:					
	Monday	Tuesday	Wednesday	Thursday	Friday
Level 1 (30 points)	Synchronous online class (Reflection and planning)		Synchronous online class (Multiplication Picture Book)	Synchronous online class (Division Picture Book)	
Level 2 (50 points)	Math Workbook				
Level 3 (10 points)	1. Game Choose a family member, and you two will play a game: prepare 21 pieces (or 21 pieces) Cards), each player takes 1 or 2 each time, whoever takes the last one wins. Can you find Is there a way to win every time? Record a game video and share your winning method. (Upload small blackboard)		2. Schulte Grid : Draw 25 squares of the same size on a square card, and fill in 25 numbers from 1 to 25 in the squares. Claim: Please use your finger to point out 1 ~ 25 in turn, and read it out at the same time. Parents will note Time taken for recording. The less time it takes to count 25 numbers, the higher the level of attention! Choose your fastest speed to upload the small blackboard! 23 6 10 25 17 12 15 1 5 24 18 19 11 7 8 22 3 2 14 9 13 20 16 4 21		
Reflective evaluation(10 point)	Looking back on the week of study, where is my performance? Where is it not good enough? How to improve? (Shared in the live class next Monday)				

Figure 1. The English version of Learning contract from MS.Y

"I asked the students to buy the counter.....if we need a dot map, we will make it by ourselves.....Assign homework, and organize exams with an APP called "Do Homework Together....." ---Ms.B

Moreover, Ms.B told the researcher that she asked students to buy the counter for learning the knowledge about 'addition and subtraction within ten thousand', because the students can play the counters in person at home which can make them understand more deeply. In research from JinY-Li (2003), in mathematics teaching, teachers not only need to train students' logical reasoning, spatial meaning and calculation ability, but also need to cultivate students' mathematical modeling, data exploration and analysis ability. Although Ms.B taught them remotely, the students could also use counter at home to know how to operate the arithmetic questions.



Figure 2. The counter which Ms.B asked students to buy

Furthermore, Ms.B asked students to assign the homework and do the exams via a phone application. Likewise, Ms.B could check her students' correct rate remotely, which could make students and teachers connect online and do the teaching and learning effectively.

3.2. How Much of This Transformation Would Teachers Like to Retain as Their New Normal?

Before the Covid-19 Pandemic, Ms.Y claimed that online education would have a bright future. Likewise, Ms. B supposed that online education would be on the trend, because that she learned that online education has been developing for a long time in the United States. Some American high schools specialize in online education and do not require students to attend school.

As far as Ms.Y goes, she believed that online teaching has both its advantages and its disadvantages. In detail, the advantage is that mathematics teachers can find teaching resources more conveniently on the Internet to teach. Moreover, students and teachers could teach and learn without going out to school. Ms. B also agreed with this advantage. However, online education can affect the eyesight of students, and elementary school students cannot concentrate on learning for a long time.

In addition, after returning to the real campus, Ms.Y believed that the best way to integrate online teaching and offline teaching is that the part that students can study independently can be done online, such as previewing the knowledge of division. Then students need to study cooperatively in the physical class, because it allows students to communicate and interact for learning more effectively, for example, the second day after the previewing, the group discussion in the face-to-face classroom is needed to study the meaning of division.

With regard to Ms. B, she is different from Ms. Y in that she had a deeper and earlier understanding of online teaching before the Covid-19 pandemic than Ms. Y. Before, she believed that online teaching is completely a future trend, but when she personally experienced online teaching, she deeply claimed that online teaching cannot replace face-to-face teaching, because education is spiritual communication between students and teachers, online education cannot be a bridge between two minds.

However, Ms.B also thought about how to integrate the advantages of online education into face-to-face mathematics teaching, so as to more effectively and effectively improve the mathematical thinking and logic ability of primary school students. For instance, Ms. B would like to do some mathematical thinking expansion for students, such as recording some mathematical thinking videos in advance about arithmetic. Later, in the face-to-face class, students would show their completed tasks and the math teacher would check if her students master knowledge about arithmetic.

4. Conclusion and Recommendations

In conclusion, the massive COVID-19 online learning experiments have brought new insights and warning stories about what works in education.

For the first research question, teachers did some innovations for make students learning seamless. For instance, Ms.Y made the online assignment list for students with in one week, students knew what they should do every day at home. In order to attract the attention of students, they also played cartoons in relation to arithmetic as the introduction of online classes. Furthermore, Ms.B asked students to buy the counter, so that to ask students to how to deal with the arithmetic questions via playing counter. In terms of assessment, Ms.B used an application to assess online if her students mastered the knowledge.

With regard to the second research question, teachers believed that online mathematics teaching has its advantages and disadvantages. After they had experienced online, they still preferred face-to-face teaching because they believed that face-to-face teaching could build a bridge of communication between teachers and students (Abernathy et al., 2001). However, they also had some new ideas for the integration of online mathematics teaching and face-to-face mathematics teaching for making mathematics teaching more effective and more interesting. For example, the part of independent learning could be taught online, and the part of cooperative learning should be taught face-to-face on campus. Overall, this this pandemic has utterly disrupted the education system. The sudden move to online teaching may be the catalyst to create a new, more effective method of educating our students (Kaden, 2020, p. 165).

Since this research is only exploration and analysis of two elementary school mathematics teachers in a private school and a public school, some limitations cannot be ignored. The researchers suggest that in the future, it is necessary to conduct in-depth research on the significant impact of online education on primary school mathematics teachers. More primary school mathematics teachers and education stakeholders must actively participate in future research design and discussions.

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