



# The Impact of Digital Technology on Primary Mathematics Teaching in China

## —A Qualitative Study

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**Abstract.** The development of the digital age has revolutionized every aspect of human life, including the field of education. This qualitative study examines the impact of integrating digital technologies into primary school mathematics teaching in China. Through interviews with different primary school mathematics teachers, the study reveals the advantages and challenges of using digital technologies in primary school mathematics classroom teaching. The study highlighted the advantages of digital technologies in stimulating primary school students' interest in mathematics learning, optimizing classroom organization and updating teaching methods. It also mentions the potential pitfalls associated with the use of digital technologies. When digital technologies are not used wisely in primary math lessons, students not only ignore the original content of the classroom, but also lack of effective communication between teachers and students. Overall, the content of this study will provide assistance for the application of digital technology in Chinese primary mathematics teaching and further promote the modernization of teaching mathematics in Chinese primary school.

**Keywords:** Digital Technology, Primary Mathematics, Teaching

## 1 Introduction

The rapid advancement of a new wave of scientific and technological revolution, alongside the digital revolution, has propelled the world into the digital era<sup>[1]</sup>. Mobile payment, virtual world learning experience, driverless, 3D printing and other emerging digital technology revolution has deeply penetrated all aspects of human life. So digital literacy is the 21st-century citizen's life-long learning and survival and development of an important component. The collision between digital technology and education will certainly reconstruct students' learning experiences and promote the development of high-quality education. In 2018, China stressed the need to vigorously promote digital literacy among primary and secondary school teachers<sup>[2]</sup>. In addition, the 2020 European Commission Document Digital Education Action Plan 2021-2027 states that educators are knowledgeable and skilled professionals. They need the confidence to use digital technology effectively and creatively to guide and motivate learners, and to learn

and develop professionally according to their own needs<sup>[3]</sup>. Hence, enhancing the integration of digital technology in primary and secondary schools has emerged as a crucial imperative in China's educational reform efforts.

Digital technology develops and utilizes pictures, text, audio, video, animation, colors and many other factors in an integrated way. This has changed the traditional teaching mode to a great extent. In the trend of rapid development of digital technology, it has become increasingly common to carry out digital technology-assisted classroom teaching at the compulsory education level in China. Primary school mathematics teachers use modern digital technology to create teaching situations, which can go beyond the traditional meaning of the mathematical language teaching expression, and then deepen students' learning experience. At present, the use of digital technology in primary school mathematics teaching classrooms has been widely promoted. However, it should be noted that there are two sides to the development of things. We need to consider the possible negative impacts of the development of things while producing positive impacts. Therefore, although digital teaching and learning resources have brought a lot of convenience to mathematics teaching and learning, they also have shortcomings. Based on this, this study analyzes the advantages and disadvantages of using digital technology in primary mathematics teaching. By exploring the favorable factors to promote the smooth implementation of primary mathematics teaching and enhance the internal motivation of students' learning.

## 2 Literature Review

Digital change and a sustainable future for education is the consensus vision of global education reform<sup>[4]</sup>. Countries around the world have largely integrated the implementation of this vision into their mathematics curriculum standards. Although the expressions in the mathematics curriculum standards vary from country to country, the concepts and values pursued have commonality. Pepin and Gueudet mentioned the mathematics curriculum in France requires students to acquire the necessary digital skills and knowledge as an essential skill for lifelong learning<sup>[5]</sup>. Whereas, Chinese mathematics curriculum standards propose to promote the integration of digital technology into the mathematics curriculum<sup>[6]</sup>. As a necessary subject in Chinese basic education, primary school mathematics is an inevitable trend to utilize digital technology for classroom teaching. Yao and Zhao concluded through theoretical analysis that digital technology can be used as a context creation tool, an exploration tool, an interaction tool and an evaluation tool in primary school mathematics classrooms<sup>[7]</sup>. Deng et al., found that the cognitive ability, learning satisfaction, and teaching interaction frequency of students are better than those in the traditional classroom when primary school mathematics classroom is conducted under the teaching environment of digital technology<sup>[8]</sup>. Therefore, teachers should try to make full use of digital technology to design reasonable teaching strategies. This will help create a positive learning environment.

### 3 Research Design

#### 3.1 Theoretical Foundations

The theoretical framework of this qualitative study is based on Grounded Theory (GT). The remarkable characteristic of GT is its induction. It emphasizes the direct derivation of theories from the collected data. Rather than deriving theories from preconceived ideas or theoretical frameworks<sup>[9]</sup>. The inductive nature of GT is well suited to the study of new social phenomena, such as the integration of digital tools in education. This approach allows researchers to derive theories directly from empirical data. This helps ensure relevance to the real-world context. The purpose of this study is to explore the role of digital technology in primary school mathematics teaching practice by using GT. The emphasis is on highlighting strengths and limitations. The data collected from teacher interviews provide practical suggestions for improving the use of digital technology in primary mathematics teaching.

#### 3.2 Research Subjects

The interviews were conducted in a semi-structured manner through an offline format. Considering that primary mathematics teachers with different years of teaching experience may have different perspectives on these questions. In order to improve the scientific validity of the study, interviews were conducted with six primary school mathematics teachers. They are from two primary school. Two school named Y and Z are located in Qingdao City, Shandong Province, China. The geographical location and distribution of the schools are shown in the table 1.

**Table 1.** Interview Teacher Information Sheet

Teacher	Sex	School Location	Teaching Stage	Teaching experience
W	Female	Countryside	Primary 2	4 years
Y	Female	Countryside	Primary 3	1 year
G	Male	City	Primary 2	3 years
Z	Female	City	Primary 6	3 years
J	Female	City	Primary 3	5 years
L	Male	Countryside	Primary 6	18 years

#### 3.3 Research Methodology: Qualitative Study

Method: Semi-structured interviews

The main interview questions are listed below:

Outline of an Interview Regarding the Impact of Digital Technology on Primary School Mathematics Teaching and Learning

- (1) Please provide a brief description of your academic work experience and the grade level and subject you currently teach.
- (2) How much do teachers know about the use of digital technology?

(3) Are teachers willing to use digital technology to teach primary school mathematics? What are the main areas of application (content delivery, assessment of student learning, organization of teaching)?

(4) Are the students interested in accepting the teaching content and teaching methods integrated with digital technology during classroom teaching?

(5) What are the effects of the use of digital technologies on teaching and learning in primary mathematics classrooms (advantages and disadvantages)?

(6) What difficulties have teachers encountered in using digital technology to teach the primary mathematics curriculum? What do you think are the reasons for this?

(7) Is it necessary to train teachers in the use of digital technology? Does your school often organize such training? How effective is the training?

## 4 Findings

Out of the six teachers interviewed, five expressed confidence in their knowledge of digital technology, while one acknowledged feeling less proficient in this area. Despite this, all six teachers utilized digital technology in their primary mathematics classrooms to enhance teaching and learning. Moreover, all six teachers exhibited a positive and supportive attitude towards the educational outcomes facilitated by the integration of digital technology. However, it is important to highlight that two teachers cautioned against potential issues that may arise if digital technology is used inappropriately by teachers.

### 4.1 Digital Technology can Stimulate Primary School Students' Interest in Learning Mathematics

As a basic subject, math not only occupies an important position in the academic field but also is the key to cultivating students' logical thinking and problem-solving ability. However, for many primary school students, math may be a subject that is both boring and difficult to understand. With the development of educational technology, the application of various math teaching tools and techniques has stimulated primary school students' interest in learning math. First, digital technology makes math learning more intuitive and interactive. Traditional math teaching often relies on paper-and-pencil exercises and blackboard explanations. This method may pose challenges for numerous students, particularly those who grasp concepts visually or through hands-on experience. In contrast, math teaching software and apps offer a user-friendly approach. It concretizes abstract mathematical ideas through animations, videos and simulation experiments. This will provide great convenience for students to understand things. For example, dynamic geometry software allows students to interactively manipulate graphs and see the effects of transformations on the properties of the graphs. This direct engagement enhances their grasp of mathematical principles and ignites their curiosity to tackle more mathematical challenges.

#### **4.2 Digital Technology can Enhance the Organisation of Primary School Mathematics Classrooms**

Digital technology plays a crucial role in optimizing the organization of primary school mathematics classrooms. First, digital technology greatly enriches the pedagogical tools and content of the classroom by providing a wealth of interactive tools and resources<sup>[10]</sup>. Traditionally, primary school mathematics teaching relies more on teaching aids and textbooks. On the contrary, digital technology can vividly present complex mathematical concepts through animation, video, simulation and other forms to improve students' comprehension and memory. Furthermore, the use of digital technology also helps primary school teachers' professional development and classroom management. Teachers can improve their teaching skills and ability to use digital tools through online courses, workshops and communities. Meanwhile, the diverse teaching resources and management tools provided by digital technologies, such as online exams and homework submission systems, greatly reduce teachers' daily teaching load.

#### **4.3 Digital Technology can Promote the Renewal of Teaching Methods in Primary School Mathematics Classrooms**

Digital technology has had a profound impact on the renewal of teaching methods in primary mathematics classrooms. This is because it provides new teaching tools, resources and platforms, thus promoting the diversification and personalization of teaching methods. A psychological study shows that thinking dilemmas arise because students do not find the right direction of thinking. As long as the right direction of thinking is found, students will burst out with infinite inspiration and great enthusiasm for inquiry. Traditional teaching methods in this regard can only rely on the teacher's didactic and can not reproduce the knowledge of the reasoning situation. There are two reasons for this: the first is because students' interest is low. The second point is because it is not suitable for primary school students to specific image-based thinking characteristics. Modern digital technology virtual scenarios just solve this problem. primary school mathematics teachers can make full use of modern digital technology to display virtual knowledge scenarios, guide students to carry out multi-diffuse thinking, help students out of the thinking dilemma<sup>[11]</sup>. This will be conducive to igniting students' passion for inquiry, and guiding them to explore, discover and even create new knowledge.

#### **4.4 Potential Drawbacks Arising From the Application of Digital Technology**

However, the development of things has two sides. Although digital technology provides unprecedented opportunities for primary school mathematics teaching, its application is also accompanied by a series of potential drawbacks. Students are the main actors in the whole classroom learning and cognitive activities. The whole process of classroom teaching is a communication process between students and teachers, and teachers and students can influence each other. However, if the primary school math

teacher in order to stimulate students' interest in learning, the classroom focuses on the innovation and novelty of the teaching form. Teachers will show too many embellished pictures and animations with strong colors and other digital technology platforms in the classroom. Such a classroom looks very lively on the surface, but the students really learn very little. Because this is only in the classroom form on the role of attracting students, but in fact caused a lot of interference and mislead the students. Students' attention is completely on the diverse multimedia platform. This leads to students not only ignore the original content of the classroom, but also lack of effective communication between teachers and students<sup>[12]</sup>.

## 5 Conclusion

This study provides an in-depth analysis of the positive and negative impacts of digital technology on primary school mathematics teaching and learning in China. Our study was based on Grounded Theory and semi-structured interviews to collect the actual feelings and experiences of frontline teachers and This will help to ensure the authenticity and reliability of the research results.

While the rapidly developing digital technology has become an important force driving educational change. This has also pushed countries around the world to explore and realize new digital technology teaching and talent training models. When students use digital technology resources to carry out the process of knowledge construction, they are practicing their future way of work and life. So future research needs to explore more deeply how to balance the advantages and disadvantages of digital technology, and promote the progress of digital technology to truly serve the high-quality development of education.

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