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RESEARCH ARTICLE

Exploration of the "3 + 5" Model in Elementary Mathematics Teaching in Smart Classrooms Against a Digital Background—A Case Study

Qinfeng Xu[a,b], **Yanling Li**[b]

[a] School of Computer Science, Shaanxi Normal University, Xi'an 710062, China

[b] Jinshan Elementary School, Chongqing 401122, China

Abstract Education digitalization is an inevitable trend of technological development. Based on the theories related to smart classrooms, this research constructs a "3 + 5" teaching model and implements a mixed methods research in Jinshan Elementary School in Chongqing. The "3" in the name refers to three stages of teaching, namely before, during, and after class. The "5" in the name refers to five links of teaching, namely prediction, fine-tuning, detailed explanation, intensive support, and extension. Through questionnaire and interview, it is found that most students and teachers are very satisfied with the "3 + 5" teaching model. The model based on the iFLYTEK smart classroom can accurately locate students' learning situation, improve classroom efficiency, develop personalized learning plans, and provide data support for the digital transformation of primary school mathematics.

Keywords digital education, smart classroom, "3 + 5" teaching model

1 Introduction

1.1 | Research Backgrounds

1.1.1 National Policy Supports

The *Key Priorities of the Ministry of Education in 2022* proposed to implement the strategic action of education digitalization. In 2023, the *Opinions on Building a High-Quality and Balanced Basic Public Education Service System* issued by the general offices of the Communist Party of China (CPC) Central Committee and a plan for the overall layout of the country's digital development released by the CPC Central Committee and the State Council, proposed to vigorously promote national strategic action. In July 2024, the *Resolution on Further Deepening Reform Comprehensively to Advance Chinese Modernization* passed by the third plenary session of the 20th Central Committee of the CPC, proposed to promote education digitalization (Editorial Board of *Primary and Secondary School Information Technology Education*, 2024). Digital transformation of education has become an important strategic objective in the broader framework of national digital reform, representing a significant opportunity to forge new paths for educational development and create competitive advantages (Zhang et al., 2024). In the global landscape of educational competition, Chinese students' digital literacy enables them to stay at the frontiers of information, cultivate global competence, and enhance their international competitiveness and academic advantages in the future. Chinese teachers, grasping this opportunity, participate in digital literacy training, share distinctive teaching experiences in international exchanges, and enhance their professional competencies. China's digital transformation in education is remarkable in both scale and speed. China, relying on its institutional advantages, can rapidly popularize new technologies, iterate and upgrade, and build a comprehensive digital ecosystem, covering preschool, elementary, higher, and vocational education. This showcases the vitality and resilience of the system, attracts international exchanges, and presents Chinese characteristics and wisdom.

1.1.2 New Curriculum Standards

The latest elementary school mathematics curriculum standards propose a clear requirement to focus on the

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Qinfeng Xu (✉)
E-mail: Xu41112097@outlook.com

integration of information technology with curriculum contents, prioritize outcomes, and fully consider the application and the impact of information technology in mathematics teaching (Li, 2024).

1.1.3 School Education Reforms

Founded in 2011, Jinshan School in Liangjiang New Area, Chongqing, is located in China's third state-level opening-up and development new area. Since its inception, the school has adhered to its philosophy of liberating minds and pursuing dreams, and its motto of pursuing utmost goodness. The school has consistently ranked among the top in the district's education quality assessments. The school has explored smart education using iFLYTEK's products to adapt to the evolving information technologies and educational reforms. These products include Changyan smart classroom platform, which creates a networked, data-driven, interactive, and intelligent learning environment supported by cloud computing architecture. The Changyan smart classroom platform integrates virtual reality, in-class and extracurricular activities, and online and offline scenarios (Liu, 2019). The school designated the fourth grade at its Qixia Road campus as the pilot program, focusing on mathematics and information technology teachers' collaborative exploration of tablet-based teaching in smart classrooms.

Although schools are well equipped with digital resources, personal observations reveal that mathematics teachers in smart classrooms often use technology in a rigid manner, failing to leverage its potential strengths. Digital education is both a policy-driven mandate and a technological inevitability. This research seeks to enhance learning outcomes and teaching efficiency, providing insights for elementary mathematics educators to update teaching models and methodologies. Furthermore, it offers data to support the digital transformation of elementary mathematics.

1.2 | Technological Supports

1.2.1 Education Digitalization

Education digitalization refers to the application of digital technology to reform the teaching process, emphasizing networking and intelligence. This approach leverages information technology to transform educational services, management, and teaching, with the aim of enhancing quality and efficiency of teaching and learning.

1.2.2 Smart Classroom

The smart classrooms aim at developing students' intellectual abilities through reformed teaching methods and information technologies. Liu et al. (2019) described smart classrooms as constructivist environments that harnessed next-generation technology to create efficient, data-driven, and innovative learning spaces. These classrooms utilize data analytics and mobile applications to revolutionize teaching processes, classroom structures, and contents, and establish appropriate information-based teaching models for the era of Big Data (Liu, 2019).

1.2.3 iFLYTEK Smart Classroom

The iFLYTEK's smart classroom is an intelligent product that is widely implemented across schools in multiple administrative regions in China. It believes that in the future, smart classrooms should effectively achieve intelligence, precision, ubiquity, subject-specialization, autonomy, and ecological friendliness. The regional pilot projects have driven innovation and provided training for numerous district and county teachers.

1.2.4 Integration Among Cloud, Edge, and Terminal

This framework integrates cloud computing and storage to manage teaching resources and data, platform-based hardware such as tablets for classroom interaction, and terminal software offering diverse learning and teaching tools. The iFLYTEK's smart classroom is based on integration among cloud, edge, and terminal, allowing teachers to prepare in the cloud, display with hardware, and interact through software. Learning data are uploaded to the cloud in real time for analysis and evaluation, fostering a convenient and efficient teaching environment that enhances the quality and efficiency of education.

1.3 | Theoretical Foundations

1.3.1 Constructivist Learning Theory

Constructivist learning theory posits that students connect with and activate relevant prior knowledge, analyzing and evaluating critically as they learn. Smart classroom, as a modern teaching model, leverages information technology to foster interactive and intelligent learning. This integration is evident in both teaching methodology and emphasis on respecting and stimulating learner agency. For example, constructivist methods utilize micro-lessons and other digital tools to organically integrate practical and theoretical coursework, creating a balanced and mutually reinforcing learning experience.

The development of the "3 + 5" teaching model

exemplifies this integration. Beginning with the smart classroom 1.0 model rooted in constructivist principles, it has advanced to the 2.0 phase, incorporating teachers' pedagogical expertise, and has reached the 3.0 stage now. This latest iteration integrates constructivist theory with personalized intellectual development, reflecting the ongoing synthesis of constructivist learning principles and smart classroom teaching innovations.

1.3.2 Cognitive Learning Theory

Cognitive learning theory categorizes the processes of human information acquisition into understanding, perception, memory, attention, and problem-solving. This theory emphasizes the learner's competence to autonomously focus on, process, and comprehend external information, with higher accuracy in these processes correlated with improved learning outcomes.

In smart classrooms, tools, like Changyan smart classroom data system, allow teachers to monitor students' learning progress and adjust their teaching methods and strategies based on real-time feedback. This function aligns with cognitive learning theory, promoting active student engagement while requiring educators to design lessons that coordinate with learners' cognitive characteristics.

1.3.3 Optimal Learning Theory

Proposed by Soviet educator Babanski (1973), optimal learning theory centers on the principle of optimization. Teachers must reflect on teaching tasks, principles, methods, modern teaching forms, internal and external conditions, and system characteristics to make deliberate and informed decisions that enhance instructional effectiveness (Li, 2024). The "3 + 5" teaching model embodies the principle by utilizing Big Data to assess students' academic performance and developmental needs. Teachers adapt their methods to guide students from surface-level learning to deeper cognitive engagement, ensuring that instructional strategies are informed by data and applied dynamically.

2 Research Methods

2.1 | Literature Review Method

The literature review conducted in this research involved consulting relevant studies to contextualize the research within existing knowledge. Platforms like VIP Information and CNKI, we searched for keywords such as "digital education", "smart classroom", and "elementary school mathematics." These searches yielded numerous articles that informed the study's framework and provided valuable references for subsequent analysis.

2.2 | Interview Survey Method

The interview survey method is a scientifically rigorous research approach in which relevant and effective information related to the study is gathered through in-depth communication with interviewees, guided by an interview outline. Fourth graders, representing a key developmental stage, are chosen as subjects due to their cognitive, learning, and feedback capabilities.

At the time of this research, other campuses are not mature, with some having few classes or lacking the fourth grade. Qixia Road campus, hence, is chosen as a pilot point. Stratified sampling has been employed to select 12 fourth-grade mathematics teachers across age groups—senior, middle-aged, and young groups. Fifty percent of the teachers in each category participated, including one district-level key teacher, one school-level key teacher, and four young teachers. Two classes per teacher are chosen by lot, with interviews conducted in two stages. The interviews consists of six questions, with answers recorded by hand at each stage.

To ensure privacy, participants' names are anonymized, with teachers identified by numbers and students and parents by letters. Insights from these interviews illuminate teachers' perceptions, suggestions, and actual application of the "3 + 5" smart classroom teaching model.

2.3 | Survey Questionnaire Method

The questionnaire survey method is a research method that uses questionnaires to gather direct data reflecting study conditions. At Qixia Road campus, there are six mathematics teachers for the fourth grade, with each overseeing two pilot classes. Midway through the research, considering the actual conditions at the school, each teacher selects one of their two classes through a lottery to serve as the pilot class. These six pilot classes, comprising 51% of the total fourth-grade students at Qixia Road campus, have a gender distribution of 53% boys and 47% girls. The average final exam mathematics scores of these classes are close to the grade-level average score, and the gender and academic performance distributions in the pilot classes are closely resembled those of the overall student. Therefore, this research involves students from the six pilot classes at Qixia Road campus as survey subjects. Through the questionnaire, students' views and feelings about the practical application of the "3 + 5" smart classroom teaching model are easy to be accurately captured.

3 Findings

3.1 | Multiple Explorations to Establish the "3 + 5" Digital Teaching Model for Elementary Mathematics

3.1.1 The First Stage: Grappling with Uncertainty and Anxiety

At the start of the research, digital teaching model 1.0, an initial version of the elementary mathematics digital teaching model, is developed by reviewing relevant domestic and international literature. This initial model is depicted in Figure 1.

This teaching model is divided into three stages, including before, during, and after class system, each of them with corresponding activities. Pre-class data collection enables accurate identification of students' current learning situations. As shown in Figure 2, teachers analyze learning situations, curriculum standards, and textbooks before class and pushing resource packs on the Changyan platform. Students then watch micro-lessons and complete guided assignments on the platform, facilitating to connect new and prior knowledge. Teachers adjust their instructional strategies based on the assessment data from the platform's guided learning exercises. This process supports students in deepening their understanding of knowledge construction by reflecting on differences, fostering critical thinking, and providing multiple perspectives for deeper learning.

In-class multidimensional interaction enhances growth through information. As shown in Figure 3, teachers emphasize key points in the classroom using guided learning data from the Changyan smart classroom platform. Students are encouraged to rethink, discuss, and engage in group work on designated topics, drawing from their prior experiences and engaging in multidimensional interactive activities. This method allows students to actively construct knowledge in the context and work toward achieving learning objectives collaborative idea exchange.

Post-class data analysis informs personalized tutoring. As shown in Figure 4, in Liangjiang New Area in Chongqing, 55 schools, 2,192 classes, 6,083 teachers, and 92,883 students are using iFLYTEK's Changyan smart classroom platform. The platform system utilizes Big Data to create student profiles, providing targeted supports based on individual differences during knowledge construction. Personalized learning plans and exercises are formulated for each student. Additionally, parents are allowed to log into the platform at any time to monitor students' learning progress, ensuring timely communication between home and school.

3.1.2 The Second Stage: Finding Inspiration amid Tension Through Interview

After initially determining a digital teaching model,

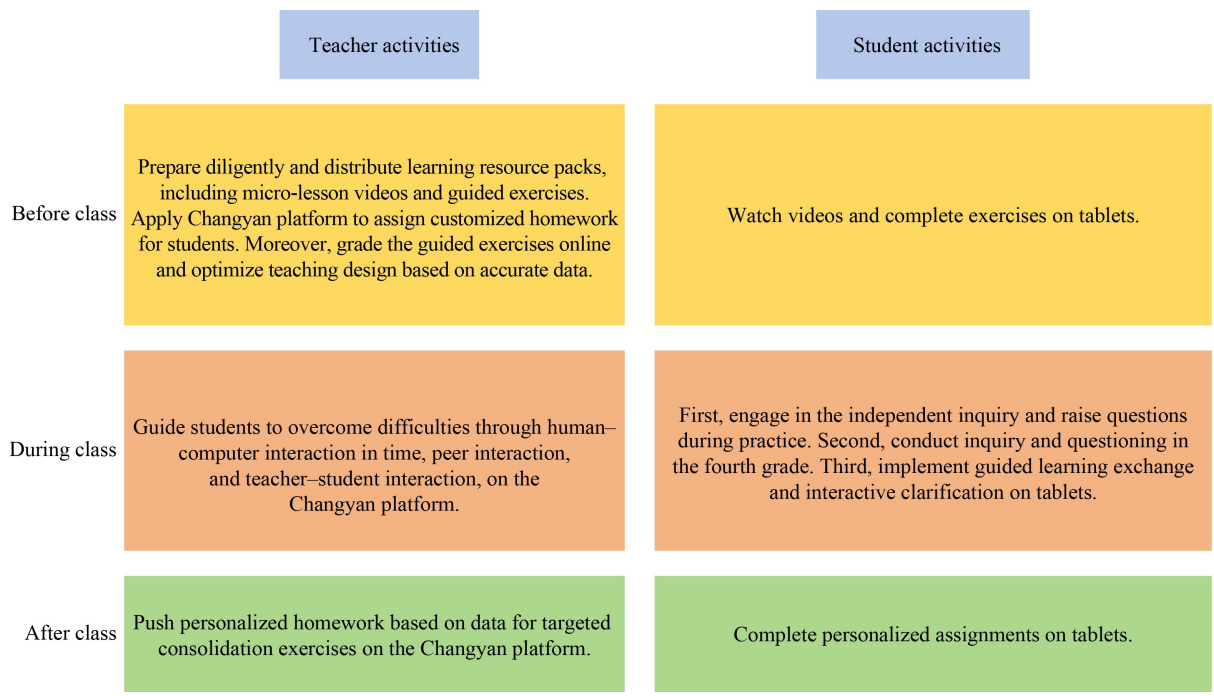

Figure 1 Elementary mathematics digital teaching model 1.0.

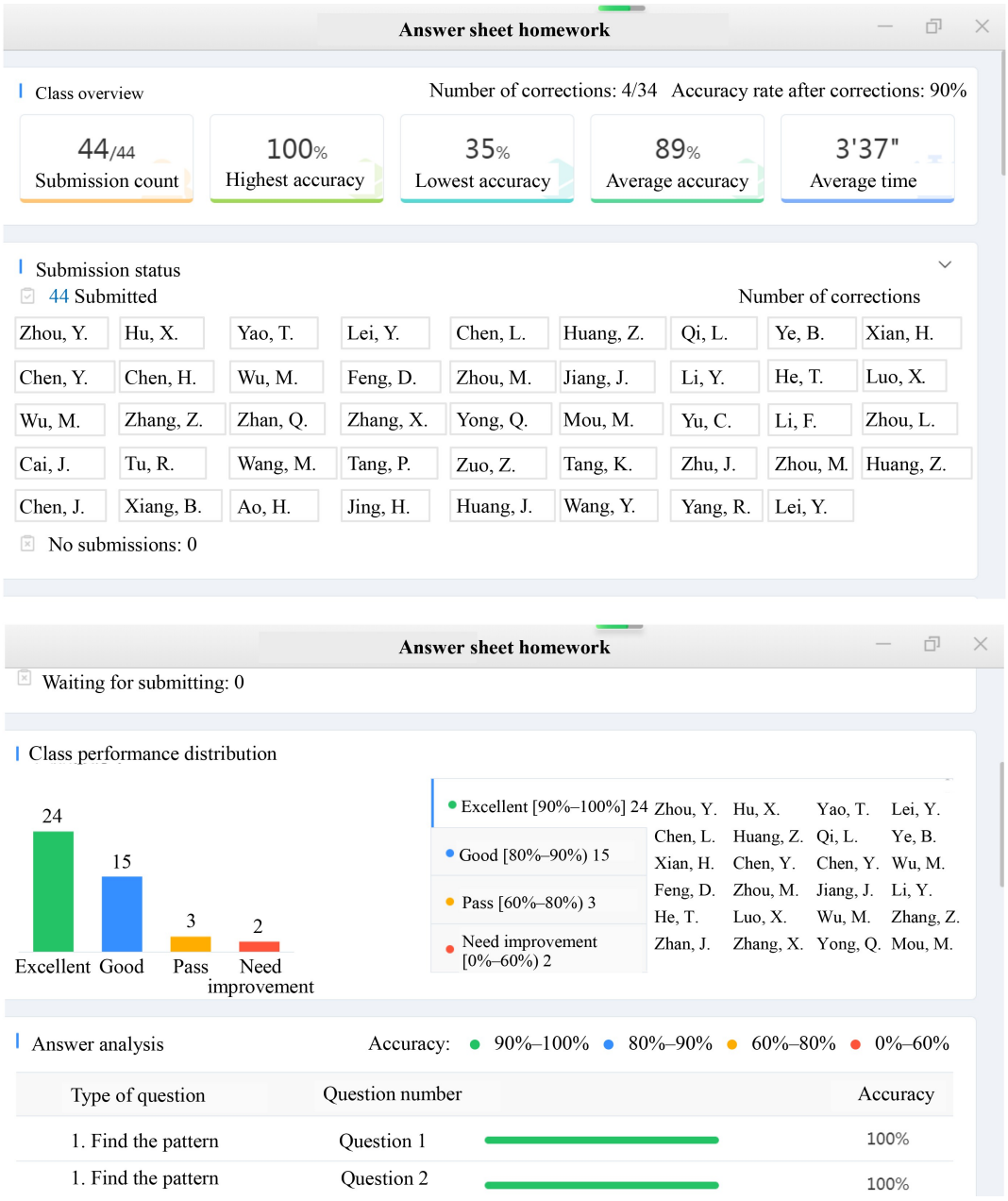

Figure 2 Pre-class data collection: targeting specific learning situations.

grade-level teachers trialed it in their respective classes but soon identified several issues with model 1.0 through interviews. One teacher answered the second question on the inquiry "What is the learning effect of the smart classroom teaching model on student?" The answer presents: I use it about four to ten times a month. Students are very engaged with interactive features like quick answers and voting. However, maintaining classroom discipline and pacing remains a challenge. Additionally, during group discussion sessions, only a few students actively participate, while others remain passive. (See Appendix D: Response of Teacher 4 to the Pre-test Interview Question 2, January 2022)

One teacher answered the fifth question on the inquiry "What difficulties have you encountered when using the smart classroom teaching model?" The answer presents: Some parents, such as those of students D, J, and Q do not support or cooperate with its use. They are concerned about the potential impact on students' eyesight, as the rate of myopia among primary school students is gradually increasing. (See Appendix D: Response of Teacher 2 to the Pre-test Interview Question 5, January 2022)

Based on teacher interviews, the use of electronic screens was detrimental to students' visual health, and certain teaching components were not effectively implemented. For parents, the need for

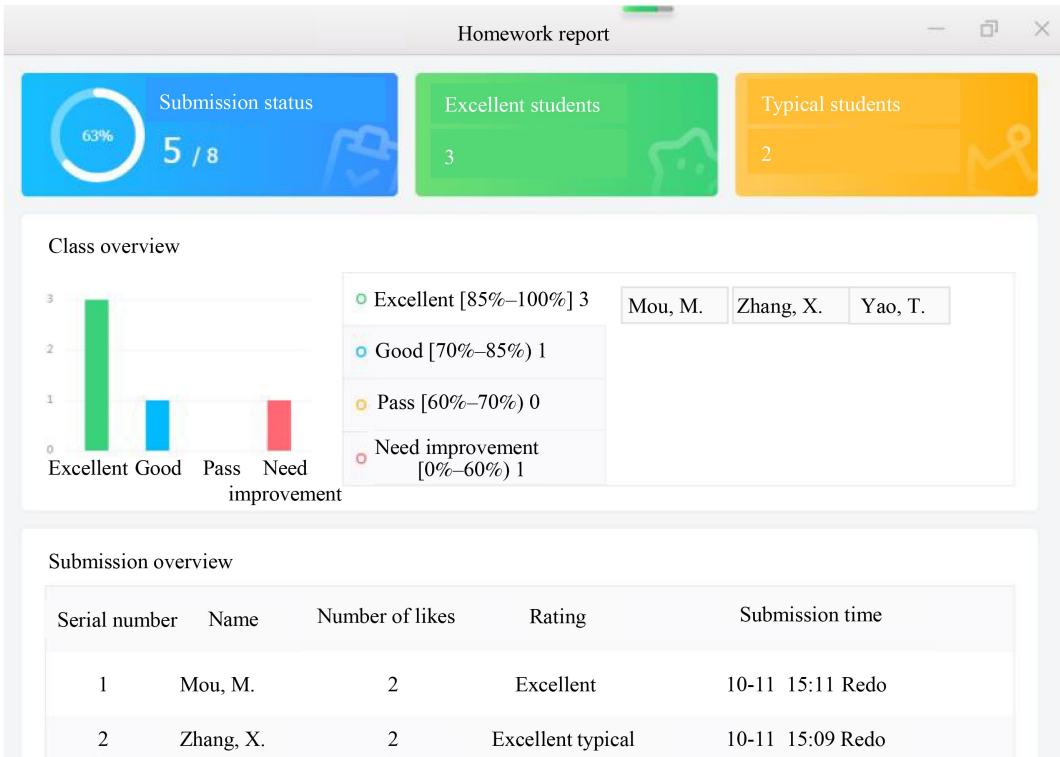

Figure 3 In-class multidimensional interaction: information fosters growth.

constant supervision added to their burden, leading to a formalized pre-class guided learning structure and polarized student outcomes. From the teacher's perspective, grading was burdensome. Some teachers, due to insufficient training, had an inadequate understanding of smart classroom, rendering teaching model superficial.

Digital classroom construction should align with the curriculum system and focus on supporting student comprehensive development, avoiding the blind pursuit of trends or technolatrialism. As shown in Figure 5, in response to these challenges, teachers and we participated in training and reviewed relevant literature to transform their educational concepts and methods, ultimately developing the elementary mathematics digital teaching model 2.0.

Before class, micro-lessons are set up with check-in tasks and guided exercises, featuring automatic grading of objective questions. This promotes independent learning and allows teachers to prepare lessons based on precise data while also experiencing the advantages of smart education. During class, diverse teaching methods, such as group presentation and collaborative learning, are used to engage students via smart classroom technologies. This helps teachers to understand and implement the advantages of smart classrooms in practical teaching and fosters an appreciation of constructivist learning theories that prioritize student-centered learning and emphasize process and interaction. After class, resources and differentiated exercises are tailored to individual learning needs, further enhancing the precision of personalized learning and teaching.

Adjustments have been made to the scope and approach of the pilot. After establishing the digital teaching model 2.0 and considering teachers' varying levels of familiarity with smart classrooms, the grade team now organizes smart classroom training sessions. Moreover, through a lottery system, one class from each teacher's two classes is selected as the pilot class, reducing the number of pilots from twelve to six classes in the overall grade. The frequency of smart classes has also shifted from daily to weekly. Teachers within the group are divided into two teams, including senior and young teachers. The senior teachers' team is responsible for overseeing the overall teaching process, including pre-class preparation, optimization of teaching designs, and formulation of post-class exercises. The young teachers' team, in collaboration with information technology teachers, is tasked with recording discussion contents, creating micro-lessons, exercises, and other resource packages, and continuing to experiment with digital teaching in their classrooms. This structure allows teachers to deepen their understanding of smart education principles through distinct roles and responsibilities.

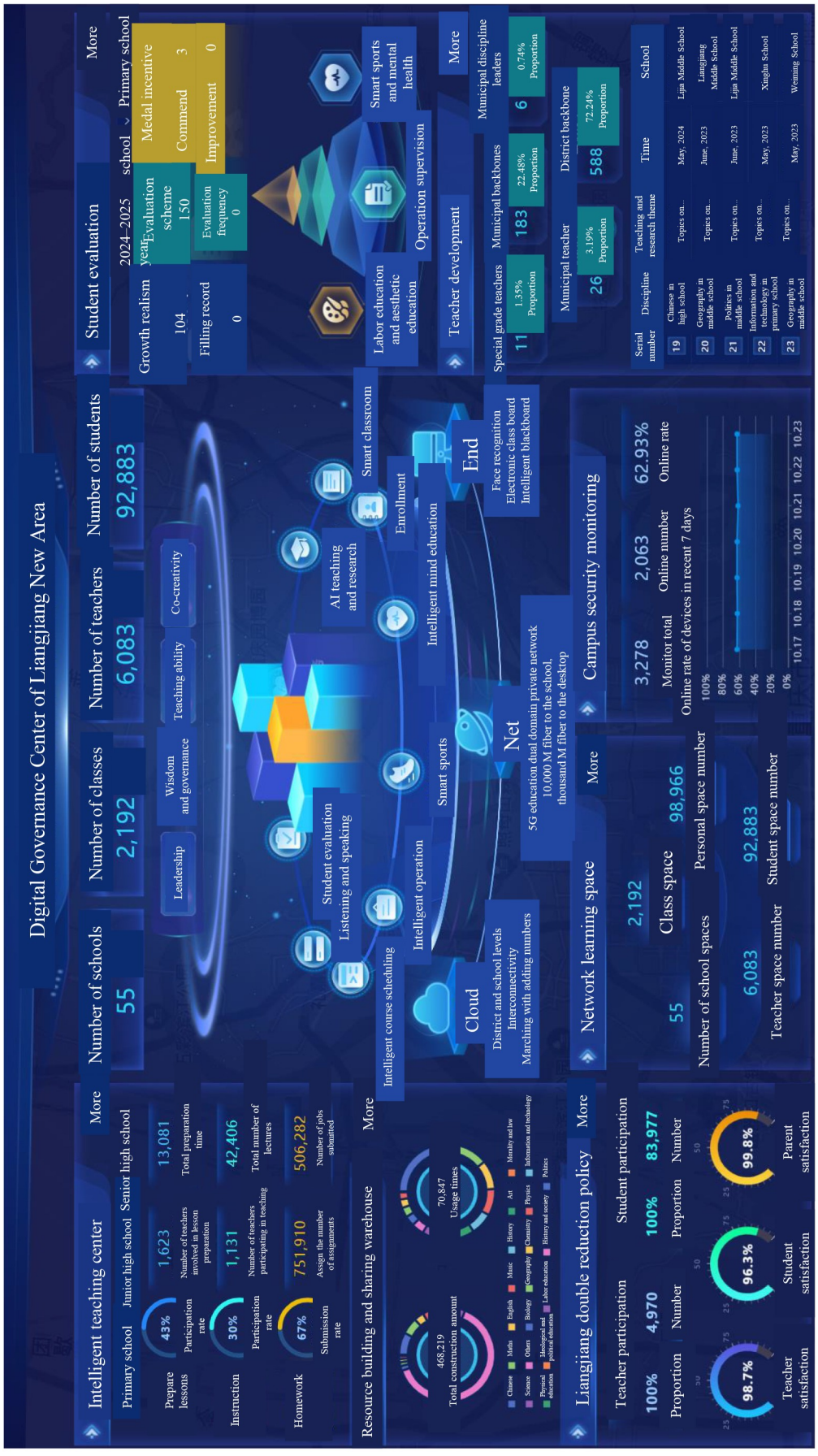

Figure 4 Digital education data of Liangjiang New Area, Chongqing.

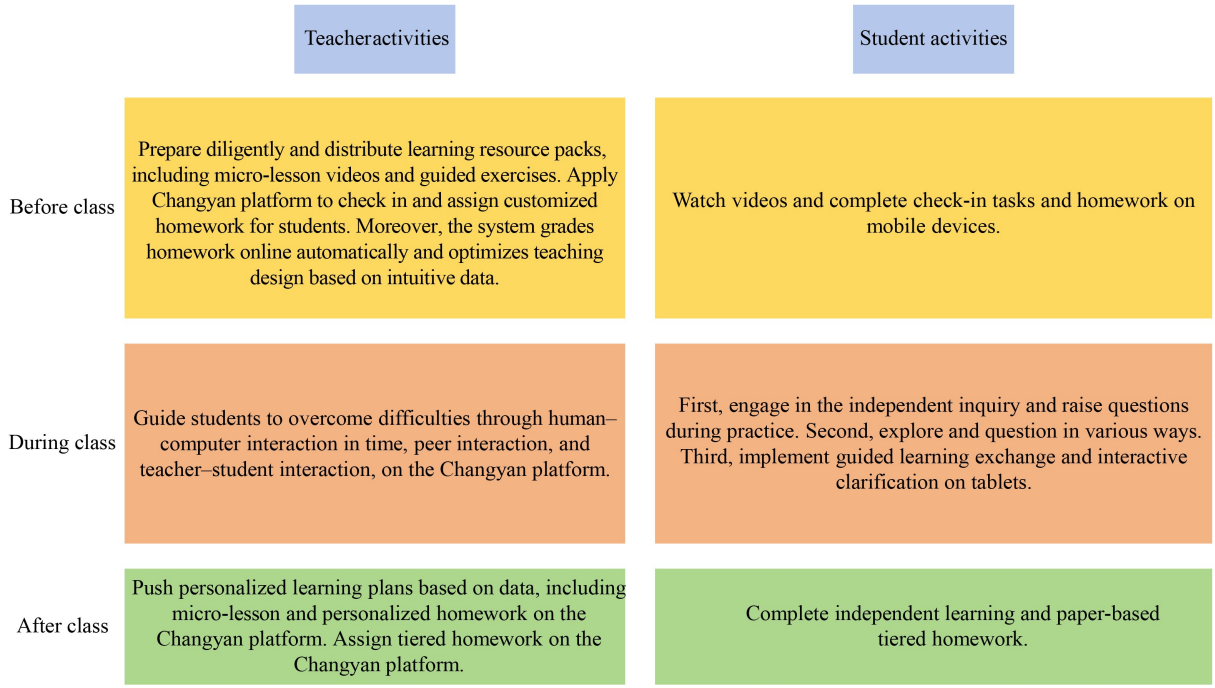

Figure 5 Elementary mathematics digital teaching model 2.0.

3.1.3 The Third Stage: Insights and Realizations

From the educational perspective, although the smart classroom is deeply integrated with information technology, technology is not a prerequisite. The core of smart education lies in nurturing individuals and transforming knowledge into wisdom. Three months of practice has shown that the digital teaching model 2.0 is maturing, with students, parents, and teachers working in harmony, although some issues persist.

At the student level, a minority of students procrastinate, skim through exercises without supervision, neglect personalized learning plans, and choose only the easiest questions from tiered exercises. At the parent level, some students are unable to complete guided learning content due to family reasons, such as busy parents or children with digital illiteracy being cared by elderly relatives who are not adept. This leads to inefficiency and time-consuming collaboration between family and school. At the teacher level, some have suggested reorganizing teaching components using systematic design. This approach coordinates and arranges teaching tasks and activities supported by technology at every stage, conducting in phases to construct comprehensive framework for smart classrooms and ensuring the implementation of all components.

To swiftly establish a digital educational teaching model, the grade team holds seminars weekly and organizes smart classroom sessions and trainings monthly. Based on practical teaching experiences, young teachers, veteran teachers, and information technology teachers have repeatedly revised and refined teaching segments. Based on the digital teaching model 2.0 and model 3.0, "3 + 5" teaching model is developed for elementary mathematics, guided by constructivist theories and integrating teachers' educational wisdom to promote personalized intellectual development among students as shown in the Figure 6.

In the model's name, "3" refers to three phases of instruction, including pre-class data collection for precise targeting of learning performance, multidimensional interaction during class, with information aiding growth, and post-class data analysis to support personalized tutoring. Moreover, "5" represents five steps of digital teaching, namely, prediction, fine-tuning, detailed explanation, intensive support, and extension.

The first step is prediction. Before class, teachers draw on their experience to anticipate students' performance and prepare lessons, distributing guided learning resource packs. After receiving the information and instructional resources, students compare new knowledge with their prior experiences, attempt to understand new concepts, memorize important points, and gain a preliminary understanding of learning contents.

The second step is fine-tuning. Based on students' guided exercise data, the teaching plan is adjusted accordingly, and the teaching design is optimized synchronously. Teaching methods and contents are adapted based on a thorough consideration

Figure 6 "3 + 5" teaching model.

of students' prior experiences and new knowledge acquisition, helping students focus on learning, enhancing their understanding, and encouraging them to reflect on their learning strategies to reinforce memory.

The third step is detailed explanation. During class, teaching is precisely managed based on real-time data, concentrating only on what students do not know. The use of human–computer, student–student, and teacher–student interactions, along with diverse teaching and monitoring methods, enhances students' perception and attention. In these interactions, students analyze and critique new information, ask questions, and express opinions to get help in overcoming difficulties.

The fourth step is intensive support. Personalized learning plans guide students both inside and outside school. Inside school, teachers provide one-on-one tutoring and group students into pairs to support the exchange of learning experiences and build knowledge connections. Outside school, micro-lessons are recorded and shared in class groups, and class data, varied problems, and learning suggestions are sent to parents, meeting individualized learning needs. This guides students to critically reflect on their learning and improve their learning strategies.

The fifth step is extension. Respecting individualized needs and various characteristics, tiered extension homework is assigned to integrate new and prior knowledge and expand students' mathematical thinking. Simultaneously, evaluation scales and class reward and punishment mechanism are established. Students use these scales to assess their own learning outcomes, identify their advantages and disadvantages, and provide feedback on evaluation methods, stimulating their enthusiasm for learning.

3.2 | Case Sharing: Learning About the "3 + 5" Elementary Mathematics Digital Teaching Model

The successful implementation of the "3 + 5" teaching model in pilot classes gave grade-level teachers confidence to begin expanding it across the entire grade in March 2022. It is mandated that each mathematics teacher conducts at least one smart class per month. In April 2022, the school held a competition based on the iFLYTEK smart classroom. In 2023, a high-quality lesson competition was held. Mathematics teachers from all grades actively participated, sharing valuable resources and advancing the deployment of this new digital teaching model. A deep understanding of the "3 + 5" digital teaching model for elementary mathematics is exemplified by the lesson set up and think from the newer People's Education Press Edition of the first grade mathematics textbook.

3.3 | Pre-Class Data Collection: Targeting Specific Learning Situations

Before class, micro-lessons and learning resource packs are distributed. Based on students' completion of the guided exercise worksheets as shown in Figure 7 and 2022 curriculum standards, appropriate teaching objectives are identified along with key areas of difficulty.

Name: _____Class: _____Group:_____Student ID: _____

Digital sequence table

...	( ) Position	( ) Position
...		

Record table

Number of discs	Number arranged	Count of arranged numbers
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Activity requirements:

1. What numbers can you create with four small discs? Arrange them and fill in the blanks.

2. What numbers can you create with five small discs? Arrange them and fill in the blanks.

3. Think about how to arrange the discs in a way that neither omits nor repeats any configuration.

I discovered:_____

1. The arranged number is greater than the number of discs _____.

2. The sum of the digits in the units and tens places of the numbers arranged equals the number of discs _____.

3. Is it correct to say that ten discs can arrange eleven numbers?

Figure 7 Guided exercise worksheet.

The teaching objective is to use tablets on digital tables to arrange discs, enhancing students' understanding of numbers up to 100 and reinforcing the concepts of digits and place value. By exploring the relationships among "number of discs", "numbers arranged", and "count of numbers arranged", students will discover patterns and draw conclusions through the process of arrangement and reasoning (Chen & Liu, 2016). This helps students apply their knowledge to solve practical problems, fostering their ability to reason abstractly and think critically. Students are encouraged to appreciate the importance of orderly thinking through both independent exploration and collaborative communication. The aim is to cultivate scientific spirit of inquiry, self-reflection, and bold exploration, making learning mathematics enjoyable and motivating students to engage and appreciate the subject.

The teaching focus is on deepening students' understanding of numbers up to 100, emphasizing the concepts of digits and place value during activities. The teaching difficulty lies in guiding students through the full inquiry process, helping them realize the value of orderly thinking, and developing their initial inductive abilities.

3.4 | Multidimensional Interaction During Class: Information Fosters Growth

During the lessons, real-time data are captured through digital devices, utilizing human–machine, student–student, and teacher–student interactions to monitor learning processes. As shown in Figure 8, the latest Changyan smart classroom teacher–student edition offers robust interactive features such as "group response" and "layered selection" for group participation, "quick response" and "random selection" for individual participation, and "discussion", "voting", and "in-class quizzes" for whole-class engagement. These features help students to efficiently understand ambiguous and obscure concepts.

During the lessons, teachers use macros in PowerPoint to create movable discs. Students log into Changyan smart classroom platform via tablets and use touchscreens to place discs in the units and tens positions as shown in Figure 9. This helps them to grasp the concepts of digits and place value, understand the relationship among numbers arranged in sequence, and learn to think in an organized manner.

3.5 | Post-Class Data Analysis: Designing Personalized Tutoring

After class, students engage in group work to complete post-class tiered worksheets while sharing micro-lessons as shown in Figure 10. Using a class reward and punishment mechanism, group members evaluate each other based on the effectiveness of their completion as shown in Figure 11, filling out evaluation scales to earn corresponding scores in Figure 12.

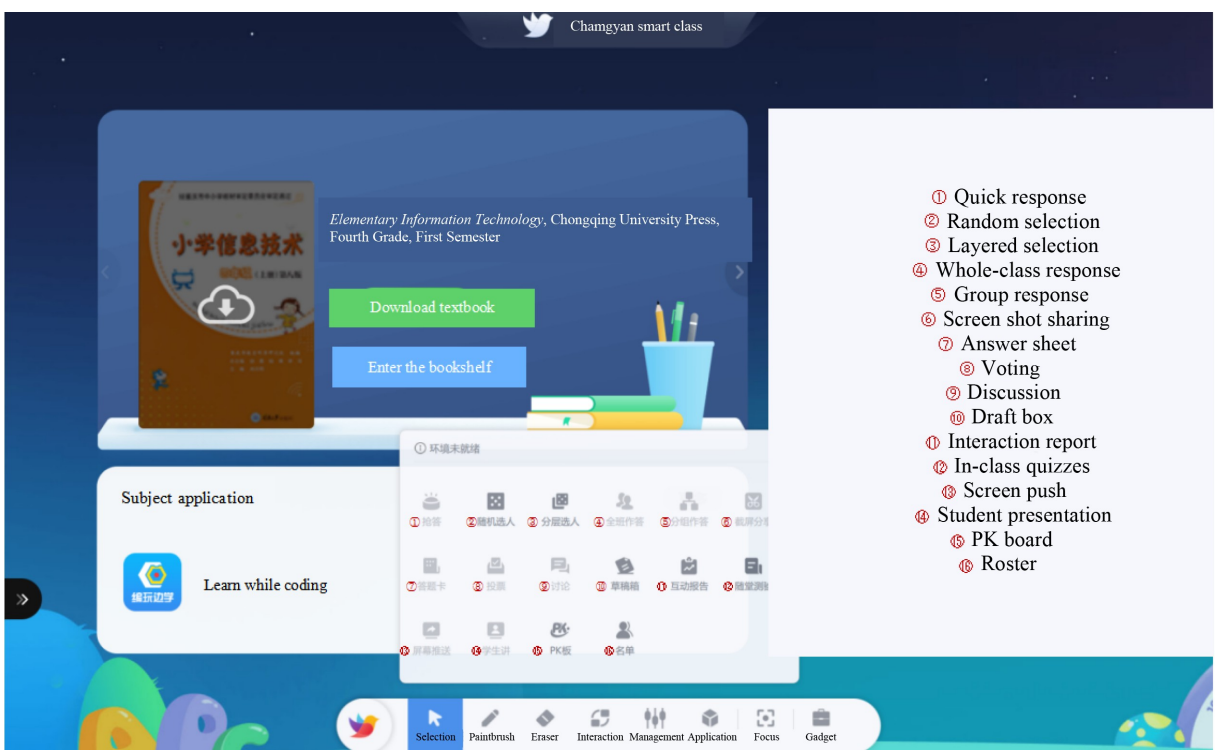

Figure 8 Changyan smart classroom interaction features.

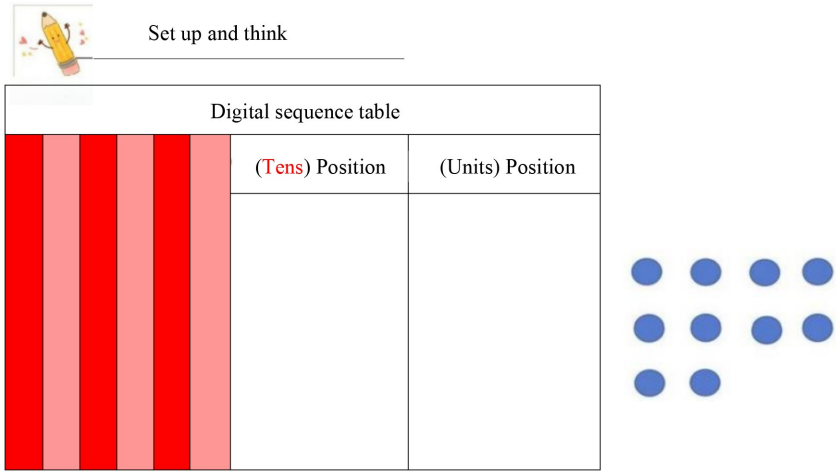

Figure 9 Learning materials.

Homework practice

I. Basic proficiency practice

1. In the digital sequence table, the number 42 is arranged with ( ) discs.

2. Can you arrange different numbers with four discs? How can you arrange them without repetition or omission?

Tens place	Units place	Number formed

3. Is it correct to say that 7 discs can only arrange 7 numbers? Why?

_____

II. Skills enhancement exercise

1. What numbers under 100 can be represented with 9 discs? Arrange the numbers and write them down.

_____

2. Can you write all the two-digit numbers where the sum of the digits in the units and tens places equals 5?

_____

III. Advanced extension exercises

1. What numbers under 100 can be arranged with 11 dics? Arrange the numbers in the digital sequence table and write them down. _____

Figure 10 Post-class tiered exercise worksheet.

Category	Points				
	5	4	3	2	1
Self-evaluation	Proactively read the study task sheet and related book contents. Diligently complete classroom exercise worksheets. Think actively. Dare to ask questions and challenge ideas. Willingly help others to solve problems, seek help when facing difficulties, and cooperate with group members to explore and resolve issues. Maintain neat and complete handwriting.	Proactively read the study task sheet and related book contents. Diligently complete classroom exercise worksheets. Actively think, courageously ask questions, and confidently challenge ideas. Willingly help others to solve problems, seek help when facing difficulties, and cooperate with group members to explore and resolve issues.	Proactively read the study task sheet and related book contents. Diligently complete classroom exercise worksheets. Actively help others to solve problems, seek help when facing difficulties, and collaborate with group members to explore and resolve issues.	Proactively read the study task sheet and related book contents. Diligently complete classroom exercise worksheets.	Do not complete the classroom exercise worksheets on time, but catch up promptly after being reminded by teachers or peers.
Parent evaluation	Proactively read the study task sheet and related book contents. Exercise worksheets are neatly written, complete, and highly accurate.	Proactively read the study task sheet and related book contents. Exercise worksheets have a high correctness rate.	Proactively read the study task sheet and related book contents. Handwriting is neat. Exercise worksheets have an average correctness rate.	Need prompting to read the study task sheet and related book contents. Exercise worksheets are fairly neatly written.	Need prompting to read the study task sheet and complete exercise worksheets.
Group peer evaluation	Diligently complete classroom exercise worksheets, with neat and complete handwriting. Listen attentively. Speak actively. Interact efficiently with group members.	Diligently complete classroom exercise worksheets. Listen attentively. Speak actively. Engage efficiently with group members.	Classroom exercise worksheets completion is average. Listen attentively. Speak actively. Engage in interactions with group members.	Classroom exercise worksheets completion is average. Listen attentively. Speak actively. Engage in interactions with group members.	Do not complete the classroom exercise worksheets on time. Catch up promptly after being prompted by peers.
Teacher evaluation	Diligently complete post-class consolidation exercise worksheets, with neat handwriting and high accuracy. Question knowldge with personal insights. Listen attentively. Speak actively.	Post-class consolidation exercise worksheets have a high correctness rate. Question knowldge with personal insights. Listen attentively. Speak actively.	Post-class consolidation exercise worksheets have an average correctness rate. Hold certain views. Listen attentively. Speak actively.	Post-class consolidation exercise worksheets have an average correctness rate. Listen attentively. Speak actively.	Do not complete consolidation exercise worksheets on time, but promptly catch up after being prompted.
	Value-added evaluation: If the question raised during questioningis of high quality, consider adding 1 point.				

Figure 11 Completion effectiveness evaluation standard table.

3.6 | The Transformation Brought About by the "3 + 5" Teaching Model

3.6.1 Enhancing Teachers' Digital Literacy

The implementation of the "3 + 5" digital teaching model has resulted in a significant shift in educational perspectives, notably enhancing teachers' digital literacy. Digital literacy refers to teachers' awareness, ability, and responsibility in appropriately using digital technology to acquire, process, use, manage, and evaluate mathematical information and resources. It also includes their ability to identify, analyze, and solve problems in education as well as to optimize, innovate, and transform educational activities (Ma & Yang, 2024). With the rapid development of information technology, the integration of digital technology and education is increasing. Additionally, policies like double reduction, educational evaluation reform are driving the demand for higher digital literacy among teachers. Enhancing teachers' digital literacy is crucial for advancing the digital transformation of education.

3.6.2 Enhancing Students' Comprehensive Literacy

The "3 + 5" digital teaching model fosters students' curiosity through pre-class micro-lessons. The process of autonomous learning and inquiry further enhances students' self-learning and problem-solving abilities. In-class group collaboration strengthens communication

Name: Class: Group: Student ID:						
Learning content	Self-evaluation (1–5 points)	Parent evaluation (1–5 points)	Peer evaluation within group (1–5 points)	Teacher evaluation (1–6 points)	Daily points	Weekly total points

Figure 12 Completion effectiveness evaluation scale.

skills, while personalized learning consolidation plans and tiered extension exercises after class respect students' individuality and diversity.

This research employs a questionnaire to gather statistics on the use of the "3 + 5" smart classroom teaching model in mathematics with students from 6 pilot classes in the fourth grade at Qixia Road campus. The anonymous survey was administered by school management staff who were not directly involved in teaching. During the questionnaire design phase, 50% of students from each of the 6 pilot classes are randomly selected for a preliminary survey. Based on the results from 139 students, the content and wording of the questionnaire are adjusted to eliminate misunderstandings, followed by the formal survey. A total of 285 questionnaires were collected, with 6 invalid questionnaires excluded and 279 valid questionnaires remaining. The data were processed by SPSS software, yielding positive results.

As shown in Table 1, all reliability coefficients are greater than 0.8, indicating that the questionnaire is reliable.

Table 1 Cronbach's α reliability analysis

Dimension	Cronbach's α value	Number of questions
Total	0.944	7
"3 + 5" teaching model usage	0.914	3
Satisfaction index	0.870	4

The Kaiser-Meyer-Olkin (KMO) is a statistic used to measure the partial correlation between variables. The KMO value is 0.851, above the threshold of 0.8, and Bartlett's test of sphericity yields an approximate chi-square value of 2199.740, with 21 degrees of freedom and a p-value less than 0.01. The p-value provides evidence in hypothesis testing. This indicates that the data are suitable for factor analysis, demonstrating excellent structural validity and scientificity.

As shown in Tables 2 and 3, 87.10% of students use smart classroom for learning five or more times per week. The "3 + 5" teaching model has been widely adopted in the fourth grade mathematics instruction. Feedback from students indicates that this model positively impacts their learning, particularly by enhancing learning support, boosting confidence, and fostering interest in mathematics.

4 Conclusions

Based on iFLYTEK's smart classroom, the "3 + 5" teaching model targets learning performances with precision, improves classroom efficiency, and offers personalized learning consolidation plans and tiered exercises. These features actively support digital transformation of elementary mathematics education. With continued exploration, the grade team has accumulated extensive practical experience, allowing this innovative teaching model to evolve and mature.

Inside the school, to enrich case studies, promote personalized teaching, and enhance educational quality, the school launched six cloud classes across four campuses in September 2024. Guided by the information technology team, this initiative aims at popularizing the "3 + 5" mathematics teaching model. In November 2024, the school established a smart education center to further these efforts. The center focuses on constructing and managing cloud classes and hopes to provide robust data support for the ongoing digital transformation of elementary mathematics.

Outside the school, the Jinshan Education Group has formed a mathematics master teachers' studio and frequently organizes multi-district joint educational research activities. These efforts aim at promoting the "3 + 5" teaching model through collaboration and exchange, advancing elementary mathematics education. In December 2024, the group

Table 2 Usage of the "3 + 5" teaching model

Question	Option	Frequency	Percentage (%)
How often do you use the smart classroom for learning per week?	Never	0	0
	1–2 times	2	0.72
	3–4 times	34	12.19
	5 times or more	243	87.10
I think the "3 + 5" smart classroom teaching model provides me with more learning resources.	Strongly disagree	0	0
	Somewhat disagree	0	0
	Neutral	5	1.79
	Somewhat agree	20	7.17
	Strongly agree	254	91.04
Compared to traditional teaching models, the "3 + 5" smart classroom teaching model provides me with more learning tools to assist my learning.	Strongly disagree	0	0
	Somewhat disagree	0	0
	Neutral	5	1.79
	Somewhat agree	16	5.73
	Strongly agree	258	92.47

Table 3 Satisfaction with the "3 + 5" smart classroom teaching model

Question	Option	Frequency	Percentage (%)
Are you satisfied with your mathematics teacher's instruction in the "3 + 5" smart classroom?	Dissatisfied	0	0
	Neutral	5	1.79
	Somewhat satisfied	19	6.81
	Very satisfied	255	91.40
Do you think the "3 + 5" smart classroom teaching model is helpful for your maths learning?	Not helpful	0	0
	Unsure	0	0
	Somewhat helpful	26	9.32
	Very helpful	253	90.68
The "3 + 5" smart classroom teaching model makes me be more confident in learning maths.	Strongly disagree	0	0
	Somewhat disagree	0	0
	Neutral	5	1.79
	Somewhat agree	23	8.24
	Strongly agree	251	89.96
Which do you prefer, the traditional teaching model or the "3 + 5" smart classroom teaching model?	Traditional teaching model	5	1.79
	"3 + 5" smart classroom teaching model	274	98.21

hosted an information technology educational research event in the Liangjiang New Area, Chongqing. During this event, the author delivered a lesson titled *Efficient book borrowing and returning* for the first semester of sixth-grade elementary information technology, extending the principles of the "3 + 5" model to other subjects.

Appendixes

Appendix A Teacher Interview Outline

1. Are you familiar with the "3 + 5" teaching model?

2. How has student learning been affected by the use of the "3 + 5" teaching model?

3. What do you think the advantages of the "3 + 5" teaching model compared to the traditional teaching methods?

4.Are you willing to use the "3 + 5" teaching model in your daily teaching?

5. What difficulties have you encountered while

using the "3 + 5" teaching model?

6. Do you have any suggestions regarding the "3 + 5" teaching model?

Appendix B Student Survey Questionnaire

Ⅰ. Basic information

1. What grade are you in?
A. First grade
B. Second grade
C. Third grade
D. Fourth grade
E. Fifth grade
F. Sixth grade

2. What is your gender?
A. Male
B. Female

Ⅱ. "3 + 5" teaching model usage

3. How often do you use the smart classroom for learning each week?
A. Never
B. 1–2 times
C. 3–4 times
D. 5 or more times

4. I think the "3 + 5" smart classroom teaching model provides me with more learning resources.
A. Strongly disagree
B. Somewhat disagree
C. Neutral
D. Somewhat agree
E. Strongly agree

5. Compared to traditional teaching models, the "3 + 5" smart classroom teaching model provides me with more learning tools to assist my learning.
A. Strongly disagree
B. Somewhat disagree
C. Neutral
D. Somewhat agree
E. Strongly agree

Ⅲ. Satisfaction with the "3 + 5" smart classroom teaching model

6. Are you satisfied with your math teacher's teaching in the "3 + 5" smart classroom?
A. Dissatisfied
B. Neutral
C. Somewhat satisfied
D. Very satisfied

7. Do you think the "3 + 5" smart classroom teaching model is helpful for your math learning?
A. Unsure
B. Not helpful
C. Somewhat helpful
D. Very helpful

8. The "3 + 5" smart classroom teaching model makes me be more confident in learning math.
A. Strongly disagree
B. Somewhat disagree
C. Neutral
D. Somewhat agree
E. Strongly agree

9. Which do you prefer, traditional teaching model or the "3 + 5" smart classroom teaching model?
A. Traditional teaching model
B. "3 + 5" smart classroom teaching model

Appendix C Post-test Interview Outline for Teachers

Teacher 1:

1. Do you know the "3 + 5" teaching model?

I am very familiar with it. We are trying to promote this teaching model in other subjects, such as Chinese, English, and information technology.

2. What's the learning effect of the "3 + 5" teaching model on students?

I do not use this teaching model as frequently as other young teacher. Thus, the students in my class have not made obvious progress like those in some other teachers' classes. However, the students in the class in which I am piloting this model like this teaching model a great deal. According to their feedback, they hope I will use this teaching model more frequently in future classes. Overall, I think this model has a remarkable effect on enhancing students' interest and confidence in learning.

3. What do you think the advantages of the "3 + 5" teaching model compared with the traditional teaching model?

Compared with the traditional teaching model, the "3 + 5" model is an interactive tool, meaning it offers many opportunities for interaction. This makes all aspects of teaching interesting, whether asking and answering questions, or having discussions. Students really like this approach, and it significantly improves the learning atmosphere and increases interaction.

4. Are you willing to use the "3 + 5" teaching model in daily teaching?

Yes, I am willing to use it. However, I do not believe the school should impose rigid requirements on

teachers, such as specifying how many times they must log in per week, how many micro-lessons they must upload, or how many exercise sheets they must make. Teachers should only adopt this new teaching model when it meets their needs. The traditional teaching model also has advantages. For example, blackboard writing allows teachers to share their thinking and help students to understand learning concepts better. Consequently, I do not think the "3 + 5" teaching model should be used in every class. Instead, the two approaches should both be used alone or combined based on the actual classroom situation.

5. What difficulties do you encounter when using the "3 + 5" teaching model?

Sometimes, I lack the energy to use the model properly. I am the head of the teaching and research group as well as a senior teacher. In addition to my daily teaching work, I am also responsible for tasks that are unrelated to teaching, which require considerable time and energy. This is not an issue unique to teachers like me. Young teachers also have many responsibilities. For example, Teacher L in our group not only teaches two mathematics classes, but also is the head teacher, with many responsibilities unrelated to teaching. For example, he has to monitor class safety, students' mental health and well-being, communicate with parents and implement relevant classroom solutions, including soft boards and blackboard bulletin. Our school also conducts inspections every month, which teachers must participate in.

6. What suggestions do you have regarding the "3 + 5" teaching model?

I have two suggestions. First, the school could lower the burden for teachers in pilot classes. By reducing their responsibilities unrelated to teaching, teachers could focus on preparing lessons and conducting effective classes. Second, the school could set clear requirements during the subsequent implementation process, such as specifying how many times teachers must log in per week, how many micro-lessons they must upload, and how many exercise sheets they must create.

Teacher 2

1. Do you know the "3 + 5" teaching model?

Due to the continuous training and learning over the course of this year, I feel I have a very good understanding of this new intelligent classroom teaching model. I also think the students in our pilot classes have become equally familiar with and fond of this teaching model.

2. What's the learning effect of the "3 + 5" teaching model on students?

This model has had remarkable effects on two particular groups of students, including intermediate-level students and those with learning difficulties. For example, intermediate-level students who had a solid academic foundation but were sometimes unfocused, exhibited significantly improved academic performance. Based on feedback from their parents, the students' confidence and interest in learning have improved dramatically. Whereas their parents used to have to force them to study, now they take the initiative with micro-lessons or exercise sheets and actively correct their own mistakes. This is a positive trend.

3. What do you think the advantages of the "3 + 5" teaching model compared with the traditional teaching model?

Compared with the traditional teaching model, I appreciate the focus on personalized learning for students. The model provides learning resources and tasks based on students' individual needs, learning progress, and knowledge mastery, allowing them to learn at their own pace and in their own ways. With the traditional teaching model, all learners—including advanced students, average students, and those with learning difficulties—receive the same teaching, the same homework, and the same exercises.

4. Are you willing to use the "3 + 5" teaching model in daily teaching?

Yes, but I hope the school does not impose rigid requirements on how often I have to use it. For example, how many classes must be taught using the model each week should be considered. While this new model has been popularized through the pilot classes, the choice to use it should be based on the actual classroom needs. Some classes are more suitable for the "3 + 5" model than others. For example, for interdisciplinary courses like "I am a Little Tour Guide" and "Dripping Water Experiment." I prefer to let students practice outside of the classroom.

5. What difficulties do you encounter when using the "3 + 5" teaching model?

Although the Changyan smart classroom platform provides abundant teaching resources, considering the characteristics of our region and school, there are few that are appropriate for real-life situations. Although our teaching and research group and the information technology teaching group jointly develop teaching resources, we are still experiencing a relative shortage. Therefore, we hope that more teachers, not only those from our school but also those from the district and city, can join us to prepare teaching resources together.

6. What suggestions do you have regarding the

"3 + 5" teaching model?

Hopefully more teachers will participate, engage in discussions, prepare teaching resources together, and enrich the resource library.

Teacher 3

1. Do you know the "3 + 5" teaching model?

Due to the training organized by the school and district, I have a good understanding of the smart classroom, and I also have a very good understanding of the "3 + 5" smart classroom teaching model.

2. What's the learning effect of the "3 + 5" teaching model on students?

After using the "3 + 5" teaching model, students' academic performance, interest, and confidence in learning have improved significantly. Parents have also expressed that their children like this teaching model and hope that teachers of other subjects will use it as well.

3. What do you think the advantages of the "3 + 5" teaching model compared with the traditional teaching model?

I prefer the interactive tools and multimedia in this new teaching model, such as the electronic whiteboard and the display stand inside. These tools enrich the content of classroom teaching, provide students with a good audio–visual experience, and encourage them to participate more actively while gaining a better understanding of the learning content.

4. Are you willing to use the "3 + 5" teaching model in daily teaching?

Presuming there are sufficient teaching resources, I think it is possible to use the "3 + 5" teaching model for everyday teaching. As a young teacher, this new model has been very helpful to me. Data-based management enables me to better understand students' learning situations and adjust my teaching strategies as needed, narrowing the gap caused by my lack of experience compared with other teachers. So yes, I am quite willing to use this new model in my daily teaching, and my students really like it too.

5. What difficulties do you encounter when using the "3 + 5" teaching model?

Currently, I feel that there are too many things to manage in school. Tasks unrelated to teaching are distracting and require me to split my focus. I teach mathematics in two classes and also have the responsibilities of a head teacher. I am in charge of classroom cleaning and maintenance, the soft board, the blackboard bulletin, sports meetings, social practice activities, talent shows, and other activities. I need to organize students in class and ensure their participation. Our school also conducts inspections every month, which require teacher participation. There are just too many things to do.

6. What suggestions do you have regarding the "3 + 5" teaching model?

The school could reduce the burden on teachers to perform non-learning tasks. A dedicated head teacher could be appointed to manage classes, allowing subject teachers to concentrate on teaching.

Teacher 4

1. Do you know the "3 + 5" teaching model?

I know that the "3 + 5" teaching model is a new intelligent classroom teaching model. Compared with traditional teaching model, it can be individualized based on students' learning situations. The model improves classroom efficiency and and offer diverse expansive exercises based on students' learning conditions.

2. What's the learning effect of the "3 + 5" teaching model on students?

Except for some specific students, it is quite good. I teach two classes, and it is more effective in one than the other. I think this might be due to differences in the implementation of the pre-class and post-class stages. Students who are supervised by their parents or study diligently can benefit more from this new teaching model.

3. What do you think are the advantages of the "3 + 5" teaching model compared with the traditional teaching model?

Compared with the traditional classroom, the aspect I appreciate most about this new teaching model is that it enables real-time interaction and allows me to view students' real-time data. I find this very helpful. As a young teacher with limited experience, I often struggle to fully understand students' learning situations. However, the learning guidance data packages provided before class, combined with students' completion data, allow me to accurately identify the key points for each lesson. During class, I can monitor the learning situation effectively, knowing which part requires more emphasis and which can be simplified.

4. Are you willing to use the "3 + 5" teaching model in daily teaching?

Yes, I am willing to use it. Both my students and I greatly enjoy this teaching mode.

5. What difficulties do you encounter when using the "3 + 5" teaching model?

Although this teaching model is quite mature, some challenges persist. With the rapid development of

information technology, new teaching software and hardware emerge frequently, making it difficult to choose the most suitable options. For instance, some software tools, such as seewo and HiteVision, offer similar functions but differ in certain aspects, leaving it unclear which one to prioritize. Additionally, tools like drawing or follow-up reading software often belong to different platforms, requiring multiple accounts for access, which complicates their usage.

6. What suggestions do you have regarding the "3 + 5" teaching model?

I recommend encouraging software companies to improve compatibility, allowing a single account to access multiple teaching tools or platforms. This would greatly enhance convenience for teachers, students, and parents. Moreover, since the "3 + 5" teaching model has proven successful in our pilot classes, it would be beneficial to expand its implementation across the entire school and even the whole district.

Teacher 5

1. Do you know the "3 + 5" teaching model?

Yes, I am familiar with it. It is a new and innovative teaching model.

2. What's the learning effect of the "3 + 5" teaching model on students?

Learning outcomes have significantly improved, and classroom participation has also increased remarkably. Previously, only a few students would actively answer questions in class. Now, even those students who were hesitant to raise their hands are gradually joining in.

3. What do you think the advantages of the "3 + 5" teaching model compared with the traditional teaching model?

The model restores the students' dominant position in the classroom, giving them more time and opportunities to learn. In particular, group cooperative inquiry fosters collaborative learning skills and encourages innovative thinking.

4. Are you willing to use the "3 + 5" teaching model in daily teaching?

Yes, I am willing to use it because it is beneficial for both teachers and students. This approach allows students to learn and explore independently, reducing the burden on teachers while enabling students to experience the joy of autonomous learning.

5. What difficulties do you encounter when using the "3 + 5" teaching model?

This model requires active participation from parents, including pre-class preparation and intensive post-class tutoring. However, some parents struggle to fulfill these requirements due to work or personal commitments, which leads to opposition from certain families.

6. What suggestions do you have regarding the "3 + 5" teaching model?

I suggest expanding the model to cover the entire grade and district to enhance curriculum resources collectively.

Teacher 6

1. Do you know the "3 + 5" teaching model?

Yes, I do. This teaching model is structured around three stages—before class, during class, and after class—and five key components—prediction, fine-tuning, detailed explanation, intensive support, and extension.

2. What's the learning effect of the "3 + 5" teaching model on students?

Student learning outcomes have significantly improved, and classroom participation has notably increased. More students are now thinking critically, participating actively, and asking questions.

3. What do you think the advantages of the "3 + 5" teaching model compared with the traditional teaching model?

This model is conducive to cultivating students' innovative and practical abilities. Students' innovative and practical abilities can be enhanced during the experimental process.

4. Are you willing to use the "3 + 5" teaching model in daily teaching?

Yes, I am willing to use it. This model encourages students' active participation and fosters innovative thinking and divergent thinking.

5. What difficulties do you encounter when using the "3 + 5" teaching model?

This model requires the participation and supervision of parents. Unfortunately, many parents are unable to participate actively and effectively due to work or personal commitments, which limits the model's effectiveness.

6. What suggestions do you have regarding the "3 + 5" teaching model?

Schools and district education bureaus should provide additional teaching resources and offer relevant training to equip teachers with the skills needed to implement this model effectively.

Appendix D Pre-test Interview Questions for Teachers

Teacher 1

1. Do you know about the smart classroom teaching model?

I don't know much about it. I only know that we will use tablets in the smart classroom. I am unclear about how to use it in my teaching. I think the school should provide us with training on the relevant content.

2. What is the learning effect of the smart classroom teaching model on students?

Currently, I am still in the stage of exploring and learning independently, so I have not started using it in my two classes yet.

3. What do you think the advantages of the smart classroom in comparison to the traditional teaching model?

I think the advantage of the smart classroom lies in its novel and interesting interactive learning tools. However, while subjects like Chinese, mathematics, and English are included, the tools for each subject are relatively limited. I think it would be helpful for the company to collaborate with schools, incorporate feedback from front-line teachers, and develop more applicable teaching tools.

4. Are you willing to use the smart classroom teaching model in daily teaching?

Currently, I am not willing to use it for two reasons. First, I have not fully mastered this teaching model yet. Second, the current smart products and tools still have limitations.

5. What difficulties have you encountered when using the smart classroom teaching model?

I think the biggest difficulty is using the technical tools and software. Compared to the younger teachers in the school, I need to spend significantly more time and energy learning how to use the various software and teaching tools.

6. What suggestions do you have for the smart classroom teaching model?

My suggestion is to let younger teachers set up pilot classes to experiment with this new teaching model. Veteran teachers like me can learn the relevant skills while participating in research on this new teaching model and contribute our experience to its development.

Teacher 2

1. Do you know about the smart classroom teaching model?

Yes, I do. The smart classroom teaching model deeply integrates information technology with traditional teaching model.

2. What is the learning effect of the smart classroom teaching model on students?

I have not used it extensively, as I am still learning about it.

3. What do you think the advantages of the smart classroom in comparison to the traditional teaching model?

This model diversifies teaching methods, enhances interactivity in the classroom, expands autonomous learning opportunities, and increases students' interest in learning.

4. Are you willing to use the smart classroom teaching model in daily teaching?

Yes. This model allows for personalized teaching and assigns learning tasks tailored to students' learning progress.

5. What difficulties have you encountered when using the smart classroom teaching model?

Some parents do not support or cooperate with its use. They are concerned about the potential impact on students' eyesight, as the rate of myopia among primary school students is gradually increasing.

6. What suggestions do you have for the smart classroom teaching model?

Teachers should receive adequate training to become familiar with this teaching model. Additionally, information technology teachers should train students on how to use tablets effectively for classroom activities.

Teacher 3

1. Do you know about the smart classroom teaching model?

Yes, I am quite familiar with this model. Perhaps because of age, my friends and I are eager to try new things. I first learned about the smart classroom online, researched it further, and then attended multiple training sessions organized by the school. I now have a fairly comprehensive understanding of this model.

2. What is the learning effect of the smart classroom teaching model on students?

Since the equipment was introduced recently, I currently use the smart classroom teaching model two to three times a month. The students have responded enthusiastically, showing great interest in this new teaching approach. However, during group activities, participation is often limited to a few students. Moving

forward, I plan to focus on lesson design to engage all students equally.

3. What do you think the advantages of the smart classroom in comparison to the traditional teaching model?

The greatest advantage is its ability to stimulate students' interest and enthusiasm for learning. When I told my students that a smart classroom session is scheduled, they became very excited, often cheering with anticipation. I am quite optimistic about this new teaching model.

4. Are you willing to use the smart classroom teaching model in daily teaching?

Yes, I am very willing to use it. My students frequently ask if we will have tablet-based classes, as they are highly interested in this teaching model.

5. What difficulties have you encountered when using the smart classroom teaching model?

As a young teacher, I sometimes struggle to manage the pace of the class or handle unexpected issues. For example, during group discussions, students are excited because they can take pictures of their works using tablets and upload them to receive feedback from their peers. However, the excitement often leads to chaos, with students failing to complete tasks as instructed, making it difficult for me to maintain control over the lesson.

6. What suggestions do you have for the smart classroom teaching model?

Experienced teachers should conduct more demonstration and public classes using this model. This would allow young teachers like me observe, learn, and refine our skills in applying the smart classroom approach.

Teacher 4

1. Do you know about the smart classroom teaching model?

Yes, I do. The smart classroom teaching model integrates information technology with traditional teaching. Interactivity is a key feature of this method.

2. What is the learning effect of the smart classroom teaching model on students?

I use it about four to ten times a month. Students are very engaged with interactive features like quick-response questions and voting. However, maintaining classroom discipline and pacing remains a challenge. Additionally, during group discussion sessions, only a few students actively participate, while others remain passive.

3. What do you think the advantages of the smart classroom in comparison to the traditional teaching model?

It expands opportunities for independent learning and diversifies teaching methods. The smart classroom supports various approaches, including flipped and blended teaching.

4. Are you willing to use the smart classroom teaching model in daily teaching?

I am not very willing to use it. I lack sufficient digital technology skills and need to learn more about using the associated software.

5. What difficulties have you encountered when using the smart classroom teaching model?

Balancing the demands of schoolwork with learning new technologies has been challenging, as I often lack the energy for additional tasks.

6. What suggestions do you have for the smart classroom teaching model?

Young teachers should establish pilot classes to experiment with this model. Once it is refined and proven effective, it can be implemented across entire grades. Additionally, more training sessions should be organized to help teachers to develop the necessary digital skills.

Teacher 5

1. Do you know about smart classroom teaching model?

Yes, I have a certain understanding. The school has arranged for teachers to attend training sessions, and we have observed similar demonstration classes. Additionally, the school regularly organizes on-campus training and learning activities for teachers.

2. What is the learning effect of the smart classroom teaching model on students?

The pilot implementation time of smart classroom hardware in our grade has been relatively brief, and we use it infrequently, about once a month. Consequently, its impact on academic performance is not very obvious. However, students are highly interested in this teaching model and eager to learn how to use tablets. They enjoy interactive features like voting and giving likes but are less engaged in activities like group discussions and presentations. Participation is often limited to the same students. To address this, it is essential to train students, establish fixed learning groups of five to six people, define clear roles within the groups, and implement reward and punishment measures to boost enthusiasm and ensure the participation of every student.

3. What do you think the advantages of the smart classroom in comparison to the traditional teaching model?

The smart classroom's main advantage lies in its use of tablets, blending online and offline teaching methods. This approach enriches teaching strategies, and resources like micro-lessons making learning more engaging and exciting for students. The students appreciate this novel teaching method. We will continue to observe its effectiveness and gather further students' feedback.

4. Are you willing to use the smart classroom teaching model in daily teaching?

Currently, I am hesitant to adopt it fully. While my students often ask me if we will be using tablets in class, reflecting their enthusiasm, the model is still in its experimental phase. I am open to incorporating it selectively into lessons that align with the smart classroom approach but find it difficult to commit to daily or frequent use.

5. What difficulties have you encountered when using the smart classroom teaching model?

Like younger teachers, I am eager to learn new things, especially those that are beneficial to my teaching. However, adapting to new softwares and technologies is more challenging for me. While I am willing to participate in relevant trainings organized by the school, I often feel overwhelmed, as I handle teaching tasks alongside logistics and personnel responsibilities. Additionally, some parents have expressed concerns about prolonged tablet use affecting their children's eyesight.

6. What suggestions do you have for the smart classroom teaching model?

I suggest reducing both the scope of the pilot project and the frequency of smart classroom use. Teachers are already stretched thin.

Teacher 6

1. Do you know about smart classroom teaching model?

Yes, I am quite familiar with it. I have participated in multiple relevant training sessions and actively follow to trends in mathematics teaching. I am particularly interested in exploring new methods and tools.

2. What is the learning effect of the smart classroom teaching model on students?

Since its implementation is recent, there has not yet been a significant effect on the students' academic performance. However, students' interests and enthusiasm for learning have significantly improved, especially among those with learning difficulties or average performance levels. These students, who previously struggled with procrastination in mathematics, now show better focus, participate actively in classroom interactions, and have made notable learning progress.

3. What do you think the advantages of the smart classroom in comparison to the traditional teaching model?

In my opinion, the smart classroom teaching model excels in fostering learning through data. Previously, we could only estimate students' progress through exams. Now, the smart platform allows teachers to analyze precise data, enabling more scientific and tailored adjustments to teaching strategies and advantage traditional methods lack.

4. Are you willing to use the smart classroom teaching model in daily teaching?

Yes, I am very willing to use it, and my students enjoy it too.

5. What difficulties have you encountered when using the smart classroom teaching model?

Like many young teachers, I sometimes struggle with managing teaching links and maintaining the rhythm of the class. For instance, unclear questions or setups or poorly defined group divisions in discussions often result in limited participation, with only a few students actively engaging. Additionally, balancing teaching with various school activities leaves me with limited energy.

6. What suggestions do you have for the smart classroom teaching model?

First, I propose a master–apprentice pairing system for smart classroom teaching model. Young teachers could handle tasks like material preparation, while senior teachers provide guidance and demonstrations. Second, reducing non-teaching-related work would allow teachers to focus more on effective implementation.

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Ethics Statements The authors declare that their Institutional Ethics Committee confirmed that no ethical review was required for this study. Written informed

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Data Availability Statements The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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