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# A Study on Teaching Reform of Mathematics in the New Media Age

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**Abstract:** In the new media era, the rapid advancement of information technologies, including computer technology, modern communication systems, and network platforms, has profoundly reshaped the trajectory of modern social development and exerted a significant influence on the innovative evolution across industries and disciplines. The widespread adoption of diverse new media technologies has introduced comprehensive and unprecedented transformations in mathematics education. From foundational mathematics instruction in primary and secondary schools to mathematics courses in secondary vocational schools and universities, traditional limitations in teaching methods, resource utilization and presentation, and curriculum evaluation systems have been surpassed. These developments, however, also present corresponding challenges that educators must address. This paper systematically analyzes and elaborates on strategies for reforming mathematics curriculum instruction in the new media context, focusing on the innovation of teaching methods and approaches, the optimization of resource utilization and content presentation, and the enhancement of curriculum evaluation systems to better support effective learning outcomes.

**Keywords:** new media; teaching methods and means; resource optimization; evaluation system

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## 1. Introduction

The vigorous development of new quality productivity and the deep integration of digitalization strategies in education are driving a fundamental transformation in the evaluation systems of vocational education [1]. In parallel, the rapid advancement and widespread adoption of Internet and information technologies have facilitated the integration of diverse new media models into daily life and educational practices. These technologies offer unprecedented opportunities to enhance teaching and learning across subjects. Mathematics, characterized by its inherent abstraction, logical rigor, and wide-ranging applications, often presents challenges in traditional classroom settings, including limited engagement, insufficient visualization of abstract concepts, and difficulties in individualized learning. The advent of new media technologies provides the potential to overcome these limitations by offering interactive, multimedia-rich, and personalized learning experiences.

In the context of the new media era, mathematics educators are required to possess a comprehensive skill set that encompasses innovative teaching methods, effective integration and presentation of digital resources, and data-driven approaches to curriculum evaluation. Such a compound skill set enables teachers to not only convey mathematical knowledge effectively but also to stimulate students' interest, encourage critical thinking, and promote autonomous learning. This requires a profound understanding of the essence of mathematics teaching, combined with the ability to flexibly leverage digital tools, multimedia platforms, and interactive resources to support a dynamic and engaging learning environment.

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Based on these considerations, this paper systematically explores strategies for enhancing the effectiveness of mathematics curriculum teaching in the new media era. It examines approaches to innovating teaching methodologies, optimizing the utilization and presentation of instructional resources, and improving curriculum evaluation mechanisms. By providing a comprehensive analysis of these strategies, the study aims to offer practical guidance for educators and students, ultimately supporting a more effective, adaptive, and forward-looking mathematics education system that aligns with the demands of the digital era.

## **2. Analysis of the Situation of Students in the New Era**

Growing up in an era characterized by economic globalization, rapid technological advancement, and an unprecedented information explosion, contemporary students exhibit more open, inclusive, and diversified values. They are willing to challenge conventional norms, raise questions actively, and engage in innovative thinking. Unlike previous generations, they are less content with passively receiving knowledge and are increasingly inclined to pursue learning through active exploration, self-directed inquiry, and experiential engagement. This shift reflects a growing emphasis on the intrinsic enjoyment and satisfaction derived from the learning process, rather than solely on external evaluation or rote memorization.

However, this generation of learners also faces distinctive challenges. The overwhelming abundance of information can create difficulties in identifying, filtering, and synthesizing effective content. Students may be easily distracted by fragmented or superficial information, exhibit reduced patience when confronting complex problems, and experience anxiety or hesitation when faced with learning obstacles. Such tendencies can hinder deep comprehension, critical thinking, and sustained engagement in mathematics learning. Moreover, the heightened reliance on digital platforms and Internet-based resources can sometimes foster dependency on quick solutions, thereby reducing perseverance in problem-solving and analytical reasoning.

Research indicates that students, particularly those born in the 1990s and later, demonstrate a pronounced preference for conducting learning activities online, engaging with multimedia content, and participating in interactive digital environments. This trend presents both opportunities and challenges for curriculum design and teaching practice, clearly necessitating targeted reforms in instructional strategies. In response, the new era of educational evaluation emphasizes the integration of student-centered, technology-enhanced learning approaches that cultivate critical thinking, independent inquiry, and digital literacy. Based on these evolving demands, this paper proposes improvement strategies aimed at enhancing teaching effectiveness, optimizing resource utilization, and fostering the high-quality development of higher vocational education [2]. These strategies seek to empower students to navigate complex information landscapes confidently, develop resilience in learning, and achieve meaningful educational outcomes.

## **3. Innovation of Teaching Methods and Means in the New Media Era**

### ***3.1. From Passive Indoctrination to Independent Inquiry***

The transition in mathematics education from passive indoctrination to autonomous inquiry represents a fundamental innovation in educational philosophy, teaching methodologies, and learning models. This shift aims to cultivate students' mathematical thinking, creative problem-solving abilities, and lifelong learning skills. The modern mathematics curriculum emphasizes six core competencies: mathematical operations, intuitive imagination, logical reasoning, mathematical abstraction, data analysis, and mathematical modeling. Consequently, teaching objectives have evolved from merely "solving problems" to fostering deeper "problem-solving abilities" that integrate conceptual understanding, analytical reasoning, and practical application.

In the new media era, teachers can leverage online learning platforms to provide preview materials, including micro-lessons, animations, and interactive demonstrations, before classroom sessions. For instance, when teaching the chapter on the properties of functions, educators can introduce concepts such as "axisymmetric figures" through images and animations, forming the situational introduction to the lesson. This approach enables students to perceive differences between axis symmetry and central symmetry intuitively, providing a sensory foundation for exploring new knowledge. In everyday life, symmetry is pervasive and aesthetically pleasing, and in mathematics, it manifests clearly in the symmetry of function graphs, as illustrated in Figure 1. Additionally, platforms such as Learning Pass allow teachers to share demonstration videos for formula derivations prior to class, enabling students to preview content at their own pace. During class, teachers then focus on explaining key or challenging points identified from students' preview data, returning initiative and agency to the learners.



**Figure 1.** Symmetry of the graph of the function.

Task-driven teaching is also emerging as a practical approach to foster inquiry-based learning. For example, Task 1 in probability and statistics encourages students to use statistical software to analyze campus survey data, integrating theoretical knowledge with hands-on practice. Task 2, "Design a box with minimal material for a fixed volume," engages students in measurement, calculation, and optimization in groups, leading to the derivation of the cuboid surface area formula and the practical understanding of function extrema. Task 3, a mathematical modeling project, requires students to collect data, construct models, and propose improvement plans for challenges such as "enhancing the efficiency of campus garbage classification," allowing students to experience the societal relevance and applied value of mathematics.

Independent inquiry extends beyond a mere teaching method; it embodies an educational philosophy that positions students as active participants in learning, emphasizing thinking exercises over rote memorization. By transforming the classroom from a "teacher-led lecture hall" into a "thinking workshop," students acquire not only knowledge but also critical thinking skills, collaborative innovation abilities, and lifelong learning capacities. This transformation necessitates educators to embrace change openly, continuously refine instructional pathways through practice and reflection, and ultimately strive toward the educational ideal of "teaching for not teaching."

### 3.2. The Implementation of Precise Stratified Teaching

The implementation of stratified mathematics teaching through new media technologies enables educators to precisely address the diverse needs of students at different proficiency levels. Leveraging dynamic visualization tools, interactive platforms, intelligent homework systems, and multi-dimensional evaluation mechanisms, teachers can design personalized learning pathways and targeted ability enhancement plans. The core principle of stratified teaching is "teaching students according to their aptitude," which can be effectively achieved through new media applications.

Students can be categorized based on factors such as knowledge foundation, cognitive quality, and learning habits. At the basic level, instruction focuses on fundamental concepts, formula comprehension, and straightforward application. At the

advanced level, additional variant exercises cultivate knowledge transfer and problem-solving flexibility. For example, when differentiating a function, one solution might involve expanding the function expression and applying derivative rules to each term sequentially, while an alternative solution could follow a direct functional differentiation approach. Extension activities, such as open-ended questions and comprehensive mathematical modeling tasks, further enhance logical reasoning, analytical capabilities, and innovative thinking.

New media technologies provide innovative ways to present textbook content, significantly enriching the learning experience and promoting interactivity [3]. Dynamic visualization tools, including Geometer's Sketchpad, GeoGebra, AutoCAD, and SolidWorks, make abstract mathematical concepts tangible. For instance, in function graph instruction, Geometer's Sketchpad can dynamically display period, phase, and amplitude transformations of sine and cosine functions, helping students intuitively grasp complex concepts. Similarly, in geometric proofs, animations can illustrate the construction of symmetry axes for axisymmetric figures, reducing spatial reasoning difficulty and enhancing engagement.

Multiple evaluation tools supported by new media further encourage student growth. Platforms like Learning Pass can record classroom performance, including participation in discussions, frequency of questions, and collaborative contributions, generating personalized feedback. Students' self-evaluations can also be collected and analyzed, while platforms such as Wenjuanxing facilitate feedback on stratified teaching approaches to optimize instructional strategies. By focusing on the learning process through multifaceted evaluation, students' confidence is reinforced, and teachers' reflective practices are promoted, ultimately creating a more adaptive and effective mathematics learning environment.

#### **4. Integration and Presentation of Resources and Technologies in the New Media Era**

In the new media era, the deep integration of advanced technologies, including big data, artificial intelligence (AI), virtual reality (VR), and interactive multimedia, with mathematics teaching resources is profoundly transforming traditional instructional models. This integration not only optimizes the presentation of teaching content but also enables personalized, efficient, and student-centered learning. It represents a clear trend toward the digitalization of educational resources, the networking of teaching support systems, and the diversification of learning approaches. In this context, teaching is no longer restricted to the transmission of knowledge through a single symbolic language but increasingly relies on multimodal representations, combining visual, auditory, kinesthetic, and interactive channels [4]. Such an approach enhances students' engagement, memory retention, and capacity to connect abstract concepts with real-world applications.

##### *4.1. Concrete Integration of Abstract Knowledge*

The integration of resources and technologies allows abstract mathematical concepts to be concretized, contextualized, and linked to real-life applications. Complex algebraic derivations, spatial geometry, and multi-step calculations can be visualized and interacted with using technological tools. For example, when teaching solid geometry, multimedia courseware can dynamically demonstrate the superposition and rotation of three-dimensional figures, helping students intuitively understand volumetric relationships. GeoGebra and similar software allow the creation and manipulation of both plane and solid figures. Students can construct cubes, unfold them to examine nets, and understand spatial relationships through interactive exploration. When exploring conic sections, such as ellipses, students can drag foci positions and immediately observe how the curve transforms from an ellipse to a circle, providing a clear, interactive visualization of parameter effects on geometric shapes.

The integration extends beyond pure mathematics to **interdisciplinary applications**. For example, statistical analysis of wind power generation data using big data, or analyzing residents' water consumption to design tiered pricing schemes, can be incorporated into lessons via short multimedia videos. Python programming can be used to perform statistical computations, model data trends, and solve real-world problems, linking mathematics with computer science, physics, and environmental studies. Such cross-disciplinary integration enhances students' problem-solving abilities, encourages analytical thinking, and fosters the practical application of mathematics in societal contexts. Furthermore, connecting classroom mathematics to everyday phenomena, such as symmetry in architecture, patterns in nature, or financial modeling, helps students appreciate the relevance and applicability of mathematical concepts in daily life.

#### *4.2. Innovative Presentation for Interactive Learning*

The use of interactive tools transforms traditional one-way instruction into multi-directional, participatory classrooms. Interactive whiteboards, virtual experiment platforms, and VR simulations allow students to engage in real-time discussions, collaborative problem-solving, and mutual evaluations. For instance, a virtual geometry lab can enable students to manipulate 3D shapes, measure dimensions, and test geometric hypotheses collaboratively. Task-driven activities supported by digital tools, such as building statistical models of campus environmental data or designing optimization experiments, enhance critical thinking and collaborative skills.

Technologies also enable **intelligent evaluation systems**, moving beyond the limitations of traditional test-paper assessments. Online platforms can record each step of students' operations, from geometric constructions to algebraic derivations, allowing teachers to pinpoint areas of conceptual misunderstanding or procedural difficulty. Platforms such as Learning Pass can automatically grade assignments, generate detailed analytical reports, and visualize mastery levels through charts and heat maps. Multi-source evaluation, integrating self-assessment, peer review, and even parental feedback, provides a comprehensive view of student performance and promotes reflective teaching.

#### *4.3. Teacher Training and Resource Optimization*

Effective integration depends on teachers' technical proficiency. Modular training programs can equip educators with the necessary skills to operate software such as GeoGebra, Geometer's Sketchpad, SolidWorks, AutoCAD, and VR simulation platforms. Teachers also need to interpret intelligent platform data to design informed instructional strategies and innovative lesson plans. Addressing hardware shortages and network instability in some schools is crucial. Investment in infrastructure, centralized resource libraries, and software adaptation for different educational stages ensures equitable access and functionality across classrooms.

#### *4.4. Balancing Technology with Pedagogy*

While technology offers substantial benefits, it should complement rather than replace core teaching practices. Teachers' emotional guidance, face-to-face mentorship, and classroom interactions remain essential for fostering motivation, attention, and engagement. The optimal approach combines technology with traditional instruction to leverage the strengths of both, creating a balanced, dynamic, and adaptive learning environment. For example, after students explore a concept interactively in a VR simulation or software tool, teachers can lead reflective discussions to consolidate understanding, address misconceptions, and connect abstract knowledge to real-world contexts.

#### *4.5. Strategic Impact on Learning Outcomes*

Through the integrated use of advanced technologies and multimodal resources, mathematics teaching in the new media era becomes more interactive, personalized, and cognitively engaging. Students gain the ability to visualize abstract concepts, apply knowledge in practical and interdisciplinary contexts, and develop higher-order thinking skills, including critical analysis, creativity, and independent inquiry. Moreover, process-oriented evaluations and interactive platforms cultivate self-directed learning habits, foster continuous improvement, and encourage students to take ownership of their learning trajectory. Ultimately, the integration of resources and technologies not only enhances teaching efficiency but also promotes the holistic development of students' cognitive, practical, and innovative competencies.

### **5. Data-Driven Curriculum Evaluation System in the New Media Era**

In the new media era, a data-driven evaluation system for mathematics curriculum, centered on the core literacy of the discipline, enables precise assessment of students' knowledge mastery, cognitive skills, and application capabilities through systematic collection of subject-specific data and the construction of intelligent analytical models. This approach not only promotes the personalization and continuous improvement of mathematics teaching and learning but also enhances the overall effectiveness of classroom instruction. By leveraging real-time data feedback, educators can clarify teaching objectives, develop open and interactive classrooms, design high-quality instructional resources, create effective teaching scenarios, apply teaching methods efficiently, improve instructional skills, optimize classroom evaluation mechanisms, and ultimately elevate teaching outcomes [5].

The core principle of data-driven evaluation is that assessments should be anchored to the fundamental competencies of mathematics. Emphasis is placed on evaluating essential abilities, including problem-solving, logical reasoning, spatial imagination, and mathematical modeling, rather than merely assigning scores. By breaking away from the traditional "single-result" evaluation model, educators can capture students' cognitive processes and problem-solving strategies through the analysis of process data, enabling a more comprehensive understanding of learning trajectories. This approach facilitates the concept of "evaluation-driven improvement," where continuous data feedback guides the refinement of teaching content, the adjustment of instructional strategies, and the tailoring of learning methods to meet the diverse needs of students.

Several practical applications of mathematics data analysis models can be implemented to support this evaluation system. Knowledge diagnosis models, for instance, identify common areas of difficulty within a class, such as the comprehensive application of quadratic functions, as well as individual knowledge blind spots by analyzing error rates across chapters and cross-referencing errors among related knowledge points. Thinking ability models assess the logic and coherence of students' problem-solving processes, the rationality of auxiliary method selection, and whether students are mechanically applying formulas or genuinely understanding underlying problem-solving principles. This allows teachers to evaluate levels of logical reasoning, abstract thinking, and analytical capability. Comprehensive evaluation models integrate multiple dimensions of learning by assigning scientifically determined weights—for example, the proportion of knowledge acquisition, reasoning processes, practical application, and learning behavior. The result is a detailed, individualized evaluation report that provides actionable insights for both students and teachers, guiding instructional adjustments, targeted remediation, and personalized learning pathways.

By incorporating a data-driven framework, mathematics education moves beyond conventional summative assessments to a more holistic, evidence-based evaluation system. This not only enhances the precision of assessments but also encourages students to engage actively with their learning, reflect on their cognitive strategies, and develop

autonomous problem-solving abilities. Over time, such systems can create a continuous feedback loop, where classroom instruction is iteratively improved, student learning outcomes are progressively enhanced, and teaching practices evolve in alignment with the demands of the new media era. The integration of intelligent analytics into curriculum evaluation thus represents a critical step toward achieving a modern, adaptive, and highly effective mathematics education framework.

## 6. Conclusion

In summary, in the new media era, mathematics teaching adheres to the fundamental principles of mathematics education while starting from real-world contexts and emphasizing a student-centered approach. It implements a blended model of online and offline instruction, making full use of online learning platforms, multimedia resources, and various information technologies to organize and deliver content effectively. Throughout the teaching process, the integration of core mathematical literacy is maintained, and teaching methods are characterized by flexibility, diversity, and adaptability to different learning needs.

Students, through engagement in this modernized learning environment, not only acquire foundational mathematical knowledge but also develop essential skills in data collection, computation, analysis, and the integrated application of resources. They gain the ability to approach problems critically, apply knowledge in practical scenarios, and cultivate innovative thinking. The teaching approach aims to foster high-level professional and technical talents who possess a comprehensive set of competencies, including analytical capability, practical problem-solving skills, and the capacity for independent inquiry.

Moreover, the new media-driven mathematics curriculum cultivates broader cognitive and professional qualities. Students are encouraged to develop habits of rigorous reasoning, logical thinking, and reflective learning, while simultaneously experiencing collaborative problem-solving and interdisciplinary applications. They gain exposure to real-world problems through data-driven evaluation, project-based learning, and interactive simulations, enhancing their ability to link abstract mathematical concepts with practical challenges. This comprehensive training not only strengthens their intellectual foundation but also prepares them to adapt to dynamic professional environments and contribute meaningfully to technological, scientific, and societal advancements.

Ultimately, mathematics education in the new media era is designed to nurture well-rounded, high-quality professionals equipped with both disciplinary core competencies and essential personal qualities. By combining knowledge mastery, analytical skills, practical application, and lifelong learning abilities, this approach aims to produce graduates capable of independent critical thinking, innovative problem-solving, and responsible professional practice. The cultivation of such abilities ensures that students emerge not only as technically competent individuals but also as versatile, reflective, and socially responsible contributors in their respective fields.

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