

Research on the Application of Digital Resources in Middle School English Grammar Teaching

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Abstract: Under the background of the digital transformation of education, digital resources provide a new path to solve the dilemmas in middle school English grammar teaching. Guided by Minister Huai Jinpeng's exposition on digital resource construction, this paper aims at the problems in traditional grammar teaching such as rigid teaching modes and low student interest. By adopting the methods of literature research, case analysis and comparative experiment, it explores the application paths of digital resources in middle school English grammar teaching. The study constructs a three-dimensional integrated application model of "resource type - grammar knowledge point - teaching link", including four sub-models such as situational introduction and interactive inquiry. The effectiveness of the model is verified through a 12-week teaching practice. The results show that the average score of the experimental class is 8.8 points higher than that of the control class ($P < 0.05$), and students' recognition of learning interest and initiative is significantly improved. Based on practical problems, optimization strategies such as teacher literacy training and resource management and control are put forward. This study enriches the theoretical achievements of the integration of digital education and disciplines, and provides practical reference for the reform of English grammar teaching in middle schools.

Keywords: Digital Resources, Grammar Teaching, Three-dimensional Integrated Model, Teaching Practice, Optimization Strategies.

1. Introduction

Educational informatization is the core driving force for advancing educational modernization and deepening teaching reforms. At the national level, the integration of digital resources and educational teaching has been consistently emphasized. Minister of Education, Huai Jinpeng, has pointed out that digital resource development is a key support for addressing the challenges of achieving high-quality, balanced education and promoting the transformation of teaching models. With the rapid development of information technologies such as 5G, big data, and artificial intelligence, the scale and diversity of digital resources, along with their interactive features, are becoming increasingly evident. The shift from "accessibility" to "usability and effectiveness" of digital resources has provided a solid technological foundation for the implementation of digital teaching reforms, offering new opportunities for breakthroughs in traditional teaching, especially in the innovation of middle school English grammar instruction.

As the foundation for language proficiency development, middle school English grammar still faces numerous challenges in teaching: traditional teaching methods are rigid; abstract grammar rules lack connection to real-life contexts; students show low interest and tend to rely on rote memorization; the teaching lacks targeted strategies and fails to address students' individual differences; assessment methods are single, neglecting the cultivation of practical language skills. These issues hinder both teaching effectiveness and the improvement of students' comprehensive abilities.

Therefore, systematically exploring the application paths of digital resources in middle school English grammar teaching is of great theoretical significance and practical value. This research aims to identify existing issues in the application of digital resources through literature review, case

studies, and experimental research, propose corresponding optimization strategies, and establish adaptable patterns for a widely applicable teaching model. The findings will enrich the theoretical outcomes of integrating digital education and subject teaching, provide support for the implementation of related educational theories, and offer practical guidance for frontline teachers to enhance their digital resource application skills. Simultaneously, it aims to stimulate students' proactive learning, support the cultivation of core English competencies, and provide effective references for teaching reforms.

2. Literature Review

With the continuous advancement of educational informatization, the application of digital resources has gained widespread attention in various subject areas, particularly in English language teaching. Researchers generally agree that digital resources can effectively enhance teaching outcomes, especially in the challenging area of grammar instruction. The following review analyzes the application of digital resources in middle school English grammar teaching and explores the existing research achievements and shortcomings.

Firstly, the diversification and interactivity of digital resources have been widely recognized as significant advantages in English grammar teaching. Du Wenjin [3] found that digital teaching resources, through animations, videos, and interactive exercises, can make abstract grammar knowledge more tangible, helping students to understand and memorize. Digital teaching not only increases students' interest but also enhances their ability for autonomous learning [4]. Particularly, through interactive platforms, students can practice grammar in virtual environments, which improves the applicability and practicality of knowledge.

Secondly, personalized teaching is another important direction for the application of digital resources in middle school English grammar instruction. Wang Ying [5]

discovered that digital resource-based teaching platforms can provide personalized learning plans based on students' progress and needs, effectively addressing the issue of uneven teaching outcomes caused by students' differences in traditional teaching. With real-time feedback mechanisms, students can correct mistakes promptly in grammar learning, thereby enhancing their grammar application skills.

However, despite the many advantages of digital resources in English grammar teaching, several challenges remain in practice. Deng Yexin [6] pointed out that although digital resources can assist teaching, some teachers still face technical barriers and lack sufficient training, resulting in the ineffective utilization of digital resources. Moreover, students' over-reliance on electronic devices may also negatively impact the depth of their grammar understanding and the development of their application abilities [7].

Meanwhile, the teaching model for digital resources is still under exploration, particularly at the middle school level. According to the studies by Du Wenjin and Zhang Xueli [3, 7], in middle school English grammar teaching, balancing traditional teaching with digital teaching integration remains a pressing issue. Traditional grammar teaching focuses on imparting grammar rules, while the introduction of digital resources emphasizes students' autonomous learning and practical ability enhancement. Therefore, finding an effective balance between the two is one of the key focuses of current research.

In summary, digital resources offer significant advantages in middle school English grammar teaching, including visualization, interactivity, and personalization, which can effectively break through the limitations of traditional teaching methods. However, fully leveraging their potential and addressing obstacles in technology application remain focal points for future research. This paper will further explore the application paths and optimization strategies of digital resources in middle school English grammar teaching based on this foundation.

3. Construction of Application Models for Digital Resources in Middle School English Grammar Teaching

Based on the core advantages of digital resources, such as visualization, interactivity, and personalization, as well as the reform requirements of "contextualization and application orientation" in middle school English grammar teaching, this section aims to address the problems of disconnection between abstract grammar rules and real-world application, and insufficient adaptation to student differences in traditional teaching. The "Three-Dimensional Integration" application model is constructed, which aligns "resource types - grammar knowledge points - teaching links" precisely. The model covers four core links: context introduction, rule exploration, practical application, and feedback evaluation, achieving an organic balance between traditional and digital teaching.

(1) Context Introduction Model

This model is suitable for teaching grammar knowledge points related to tense, voice, and situational dialogue, primarily relying on video and audio digital resources to create authentic language contexts. By selecting movie clips, animated short films, or simulated dialogue audios that closely relate to students' lives (e.g., playing a short film of school activities to teach the past simple tense in middle school English), students are guided to perceive the

application of grammar rules within real-life contexts, replacing the traditional "rule-first" explanatory approach. Studies show [4] that this model can make abstract grammar knowledge more tangible and effectively increase student interest. In practice, the duration of resources should be controlled between 5-8 minutes, focusing on core grammar points and avoiding excessive contextual elements that could distract students' attention.

(2) Interactive Exploration Model

This model applies to grammar knowledge points with stronger logical structures, such as clauses and non-finite verbs, and centers around interactive courseware, mind mapping software, and online collaborative platforms. The teacher guides students to explore grammar rules autonomously using digital resources (e.g., using mind mapping software to organize the usage of relative pronouns in defining relative clauses, with students sharing their findings via online platforms), while the teacher plays the role of facilitator, engaging in discussions and answering questions. This model echoes the core goal of "enhancing students' autonomous learning abilities" proposed by Dong Fangfang [8], helping students construct grammar rules actively, deepening their understanding of grammar logic, and avoiding the pitfalls of rote memorization.

(3) Personalized Practice Model

Based on the research by Wang Qing [9] on personalized teaching, this model leverages intelligent practice platforms and grammar learning apps to design tiered practice tasks according to students' foundational differences. The platform uses an initial test to identify students' weaknesses and automatically suggests grammar exercises of appropriate difficulty (e.g., basic level focusing on rule memorization, advanced level focusing on application and distinction). With real-time feedback, errors are corrected immediately, and personalized learning reports are generated. This model effectively resolves the "one-size-fits-all" issue of traditional teaching and allows for "teaching according to student abilities," while also alleviating teachers' grading burdens and improving the effectiveness of practice.

(4) Multi-dimensional Evaluation Model

This model integrates online evaluation tools, learning process recording platforms, and other resources to establish a multi-dimensional evaluation system combining "formative evaluation and summative evaluation." Formative evaluation focuses on data such as student participation in digital resources, interactive exploration performance, and the quality of completed exercises. Summative evaluation integrates traditional tests with digital application outcomes (e.g., student-produced grammar context short videos or online collaborative research reports). This model compensates for the traditional evaluation system's tendency to focus on results while neglecting the process, offering a more comprehensive reflection of students' mastery and application of grammar knowledge, and providing data support for teaching optimization.

4. Practical Research on the Application of Digital Resources in Middle School English Grammar Teaching

To verify the effectiveness of the aforementioned application model, this study selects two parallel classes from the second year of middle school as research subjects

(experimental class: 45 students; control class: 43 students) and conducts a 12-week teaching practice. The experimental class uses the "Three-Dimensional Integration" application model for grammar teaching, while the control class follows the traditional "rule explanation + mechanical practice" model. The research process strictly controls irrelevant variables, such as teaching content, teaching hours, and teachers. Data is collected through questionnaires, test scores, and classroom observations.

(1) Preparation for Practice
Resource Selection and Integration: Based on the grammar points in the second-year curriculum (e.g., past simple tense, present perfect tense, relative clauses), appropriate digital resources are selected, including movie clips, interactive courseware, and intelligent practice platforms, forming a categorized resource library.

Teacher Training: Special training is conducted on the operation methods and application model design points of the selected digital resources, enhancing teachers' ability to apply resources and guide the classroom, overcoming the "technical barriers" identified by Deng Yexin [6].

Baseline Testing: Grammar foundation tests are administered to both classes to ensure no significant differences in initial levels ($P > 0.05$).

(2) Implementation Process of Practice
Taking the teaching of relative clauses as an example, the experimental class follows the process below: (a) Context Introduction: A short video featuring relative clauses in school life is played, guiding students to identify sentences containing specific grammar rules and perceive their usage. (b) Interactive Exploration: Students use mind mapping software to organize the usage differences of relative pronouns (that/which/who) and share their results on an online platform, while the teacher provides targeted guidance. (c) Personalized Practice: The intelligent platform pushes tiered practice tasks, and students view immediate feedback after completing exercises, correcting errors. (d) Multi-dimensional Evaluation: Formative evaluation is conducted by considering factors such as practice accuracy, platform interaction, and classroom participation, with a summative test at the end of the unit. The control class follows the traditional sequence of "rule explanation – uniform practice – unit test."

(3) Results Analysis of Practice
Grade Comparison: There is a significant difference in grammar test scores between the experimental and control classes. The specific data is shown in the table below:

Table 1. Distribution of Grammar Test Scores of Two Parallel Classes in the Comparative Experiment

Class	Number of Students	Average Score	Standard Deviation	P-value
Experimental Class	45	82.3	5.6	< 0.05
Control Class	43	73.5	6.2	< 0.05

From the table, it can be seen that the experimental class scored an average of 8.8 points higher than the control class, and the P -value < 0.05 indicates that the difference is statistically significant. The "Three-Dimensional Integration" application model effectively improves grammar learning outcomes.

Questionnaire Survey: The results of the student survey on

the effectiveness of digital resource teaching are shown in the table below:

Table 2. Results of Student Survey Feedback

Survey Questions	Recognition Rate of Experimental Class	Recognition Rate of Control Class
Digital resources improve learning interest	86.7%	45.2%
Helpful for understanding grammar rules	77.8%	51.2%
Learning initiative has been improved	82.2%	48.8%

The data indicates that the experimental class students have a significantly higher recognition of the effectiveness of digital resource teaching across all dimensions, confirming the advantages of digital resources in stimulating interest and deepening understanding.

Classroom Observation: The experimental class showed a 40% increase in classroom interaction (speaking, group discussions) compared to the control class. Independent exploration behavior also increased notably. However, some students showed excessive reliance on platform feedback and lacked independent thinking, which confirms Zhang Xueli's [7] concern about "over-reliance on electronic devices" and indicates the need for optimization in future teaching strategies.

5. Optimization Strategies for the Application of Digital Resources in Middle School English Grammar Teaching

Based on the issues identified in the previous practical research and in conjunction with the shortcomings of existing research in the literature review, this section proposes targeted optimization strategies from four dimensions: teachers, resources, teaching methods, and management. These strategies aim to ensure the effective implementation of the "Three-Dimensional Integration" application model.

(1) Strengthening Teacher Digital Literacy Development
To address the "technical barriers" faced by teachers, a "tiered training + precise guidance + case sharing" development system is proposed. First, tiered training should be conducted: the basic level focuses on selecting digital resources and operating commonly used tools (such as mind mapping software and intelligent practice platforms), while the advanced level emphasizes teaching model design, resource integration, and personalized teaching plan creation. Second, a "digital teaching mentor system" should be established within schools, where more technically proficient teachers pair up to provide guidance, addressing individualized issues in practice.

Third, a regional digital teaching case-sharing platform should be built, where excellent grammar teaching applications are collected and organized to provide teachers with practical examples they can adapt.

(2) Improving Resource Adaptation and Management Mechanisms

On one hand, the standards for resource selection and integration should be optimized: A "knowledge point - resource type - teaching link" three-dimensional adaptation

list should be established for middle school English grammar teaching, specifying appropriate usage scenarios and norms for different resources, to avoid resource misuse. On the other hand, management of students' use of electronic devices should be strengthened: In the personalized practice phase, a "self-reflection period" mechanism should be introduced, where students must complete a draft of the exercise independently before using the platform's feedback to correct mistakes, reducing over-reliance on the technology. In classroom teaching, a combination of "digital resources + traditional board writing" should be employed, with the teacher guiding the key grammar logic and students engaging in note-taking and analysis, balancing the strengths of both digital and traditional teaching.

(3) Optimizing Teaching Implementation and Dynamic Adjustment Process

Based on the "Three-Dimensional Integration" application model, a "pre-class diagnosis - in-class regulation - post-class follow-up" dynamic process should be added. Before class, a simple digital test should be used to diagnose students' foundational knowledge and match resource difficulty precisely. In class, real-time classroom observation should be conducted to adjust the pace of resource usage. Post-class, the personalized follow-up mechanism should rely on student learning reports generated by the intelligent platform, pushing additional resources to address weak points. At the same time, different grammar points should be prioritized for the appropriate application mode: tense and voice should primarily adopt the "context introduction + personalized practice" model, while clauses and non-finite verbs should prioritize the "interactive exploration + multi-dimensional evaluation" model to enhance teaching specificity.

(4) Establishing a Multi-dimensional Collaborative Management and Evaluation System

From a school management perspective, a support mechanism for digital resource teaching should be established: First, special funds should be allocated for purchasing high-quality digital resources, teacher training, and resource library construction. Second, teachers' digital teaching capabilities should be incorporated into performance evaluations, incentivizing them to enhance their application skills. In terms of student evaluation, the "formative + summative" multi-dimensional evaluation system should be further refined, incorporating dimensions such as "independent thinking ability" and "collaborative exploration performance." This can be achieved through classroom observation records, student self-assessments and peer assessments, and platform data integration, providing a comprehensive evaluation of learning outcomes and guiding students to use digital resources appropriately.

6. Conclusion and Outlook

This study systematically explored the application pathways of digital resources in middle school English grammar teaching through literature review, model construction, and practical experimentation, leading to the following core conclusions: First, the "Three-Dimensional Integration" application model, constructed with "resource

type - grammar knowledge point - teaching link" integration, significantly improves grammar teaching outcomes. The experimental class's average score was 8.8 points higher than that of the control class, and student interest and initiative in learning increased notably. Second, the effectiveness of digital resource application is influenced by factors such as teachers' technical abilities, resource adaptability, and student device usage management. Among these, teachers' ability to design and guide the model is crucial. Third, targeted optimization strategies can effectively address core issues in practice and ensure the model's successful implementation. This research enriches the theoretical outcomes of integrating digital education with middle school English grammar teaching, providing practical support for the implementation of related educational theories. It also offers valuable guidance for teaching reforms and supports the improvement of both teacher competencies and student outcomes.

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