Exploring Strategies for the Integration of Junior High School English Teaching and Digital Technology in the Context of Educational Digital Transformation

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Abstract. In the context of increasing digitalization in education, integrating digital technologies into junior high school English teaching has become a critical research area. This paper reviews existing literature to pinpoint the limitations of current educational models in incorporating digital technology. Consequently, it introduces a novel framework named the "Digital Classroom Teaching System." This system emphasizes the dynamic interaction among teachers, students, and digital tools, tailoring digital integration strategies to specific educational objectives and content.The primary goal of this model is to offer educators a structured and coherent approach to seamlessly integrate digital technology into junior high school English instruction, thereby enhancing the quality of education. Moreover, this study aims to provide a foundation for future research to explore, refine, and validate the Digital Classroom Teaching System and its applicability in practical settings.

Keywords: educational digitalization; interactive teaching; personalized education; English teaching; future education

1 Introduction

In today's fast-paced world of information technology, education reform and teaching methods have been accelerated. The "China Education Modernization 2035" plan [1] aims for accelerating educational reform in the information age by using current technologies to change talent development models and organically integrate scaled education and tailored training. The education sector must efficiently integrate conventional teaching techniques with new information technologies as society and technology advance.

The 20th National Congress of the Communist Party of China report emphasized "advancing the digitalization of education." General Secretary Xi Jinping [2] stated at the fifth collective study session of the Political Bureau of the CPC Central Committee that digitalization in education is not only a new path for China's education development but also a breakthrough for creating new educational advantages. This directive outlines the digital transformation of education and its future development.

This makes digital transformation and integrative innovation of foreign language teaching important for entering teaching 4.0. The rapid speed of educational digital transformation has

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made optimal integration of junior high school English teaching with modern information technology a priority. Traditional teaching models cannot fulfill modern student learning needs and information age educational goals. To react to this transformation, new methods for integrating teaching and technology are needed.

This literature research reveals the limits of current teaching-technology integration models and suggests a novel "Integration Triangle Model" based on this. This concept emphasises the interactivity of teachers, students, and technology as crucial to successful integration. This study provides a theoretical foundation and practical guidelines for integrating junior high school English teaching with modern information technology to help the education system progress via digital transformation.

2 Revolutionizing education in the modern age

Every revolution in digital technology has played a pivotal role in advancing human civilization and driving continuous societal progress and enhancement. From Industry 1.0 to 4.0, we have witnessed a societal transition, spurred by the industrial revolution, leading us into new eras. With the widespread use of the internet, the shift into the information era has been formally established. Contemporary digital technologies, such as big data, the Internet of Things (IoT), artificial intelligence, and 5G, have not only propelled our society from intelligence to wisdom but also mark a critical phase in the ongoing digital transformation.

Digital transformation[3] in education signifies leveraging digital technology to catalyze substantial and foundational changes in the educational system's structure, function, and culture. This process aims to enhance the operational effectiveness and value of the system, marking a significant shift in educational practices.

This educational digital transformation[4] represents an advanced phase in the evolution of digital education. It extends beyond merely incorporating digital tools into teaching practices and involves a comprehensive use of contemporary digital technology to strengthen educational institutions. This encompasses transforming teaching approaches, organizational frameworks, instructional procedures, and assessment methodologies.

The integration of modern digital technology into the educational system leads to notable changes in educational practices, including modifications in organizational models, curriculum design, and evaluation methods. The goal of this transition is to address students' personalized needs more effectively, ensuring the excellence and accessibility of education. We aim to establish an educational environment that is inclusive, adaptable, future-ready, and environmentally conscious.

The journey of digital transformation in education is an ongoing process, not a finalized state. Implementing educational informatization is a complex task that requires multi-faceted collaboration, diverse problem-solving approaches, and strategic planning for consistent advancement. However, the current revolution of digital technology in education faces several challenges, including the digital divide [5], information silos, and data management issues [6]. There's also a risk of oversimplifying the digital transformation process in education[7], leading to stagnation in traditional teaching models and a shift towards "electronic exam drilling". Koumachi B [8] suggests that the digital transformation has redefined the structure of media in

society, profoundly impacting academic research and teaching. This transformation necessitates that both teachers and students adapt to the skills and strategies of the digital age. Kumar D [9] emphasizes the importance of integrating digital tools into technical education, which can provide students with more interactive and practical learning opportunities. He further discusses the positive effects of these tools on skill acquisition and retention, as well as their potential to bridge the gap between theoretical knowledge and practical application. However, he also addresses challenges faced by digital technology, such as initial resistance from educators and limitations in infrastructure. Kumar J [10] highlights the expectations placed on teachers to incorporate technology into their teaching practices to enhance student learning experiences and prepare them for the digital age, along with the accompanying challenges, such as inadequate infrastructure, lack of technical skills, and resistance to change.

While the digitization of education is making steady progress, the translation of ideas into practice is often hindered by limitations in strategic planning, existing educational structures, and the capabilities of educators. To effectively advance the ecological process of digital education, a comprehensive reevaluation of scientific research and educational concepts is essential. This necessitates a collaborative effort from all stakeholders to collectively address and overcome these challenges.

3 Novel approach to the fusion of foreign languages and digital technology

Traditional English teaching methods, often characterized by a passive approach [11], have shown their limitations over time, with students primarily absorbing information through lectures. However, in the digital era, these conventional methods have become increasingly inadequate. As society advances towards a wisdom-based approach, the informatization level in teaching has also risen, leading to the development of more sophisticated teaching tactics and methodologies.

In the last 15 years, global education has witnessed three significant innovations[3] that leverage information technology: Massive Open Online Courses (MOOCs), video micro-lessons, and flipped classrooms. These advancements represent a collective innovation in educational methods.

In 2011, the Chinese Ministry of Education initiated the "National Quality Open Courses" project, marking a significant step in China's educational informatization. The rise of MOOCs, with platforms like Coursera, Udacity, and edX leading internationally, sparked a global trend in online learning. These platforms offer courses in various languages, catering to a worldwide audience. In China, the progression in language learning and information-based education is evident through prominent online education platforms like Chinese University MOOCs, XuetangX, and Good University Online. These platforms have not only provided abundant educational resources but have also transcended the limitations of time and distance, thus facilitating equal and broad access to education.

Micro-lessons [12] have emerged as an innovative educational tool, facilitating both teaching and knowledge acquisition. They constitute a mini "curriculum," complete with "mini-objectives, mini-lesson plans, mini-handouts, and mini-exercises". The key to video micro-lessons is interactivity, which is crucial for immersive learning experiences, enhancing information

exchange, and feedback. Globally, institutions like Khan Academy have gained recognition for their effective video micro-lessons. In China, the growth of micro-lessons is paralleled by the advancement of educational informatization, with platforms like the Micro-lesson Network and resources from higher education and K-12 institutions offering diverse learning options.

Additionally, flipped classrooms are increasingly studied in the context of foreign language learning. Li Guangwei [13] developed an academic English teaching corpus and corresponding micro-lessons, leading to a flipped classroom model for academic English that enhances students' independent learning skills.

Currently, hybrid teaching methodologies combining MOOCs, video micro-lessons, and flipped classes are gaining traction. For instance, Professor Xie Ping [14] from Hangzhou Normal University introduced the "three stages" blended teaching strategy, integrating deep learning principles with MOOCs, flipped classrooms, and video micro-lessons. This and other similar integrations by educational scholars aim to amalgamate various teaching styles to achieve improved educational outcomes. By combining the strengths of multiple teaching models, a more empirical and systematic approach is offered, better addressing the needs and challenges of modern education.

The rise of digital technology and the proliferation of information in education have revolutionized foreign language instruction, leading to more personalized learning experiences, intelligent educational tools, and refined teaching methodologies. For example, the integration of cognitive diagnostic digital technology with data analysis enables educators to obtain in-depth feedback on student performance, covering a spectrum from broad overviews to specific insights. This feedback forms a comprehensive evaluation criterion for both online and offline learning, linking learning plans, classroom activities, teaching content, post-class assessments, and students' self-study. This approach facilitates the flexible distribution of educational data across online and offline platforms, effectively meeting contemporary educational needs, particularly the focus on individualized instruction [15].

The use of AR/MR/XR digital technologies has broadened the scope for foreign language learning. Virtual reality technology allows for the reinvention of language teaching methods, enabling authentic linguistic interactions in various scenarios, thus enhancing real-life language usage understanding [16].

Furthermore, the abundance of English teaching materials and educational data supports precise instruction and individualized learning approaches. The data-driven digital transformation in education manifests through precision teaching, individualized learning, intelligent examinations, digital evaluations, and refined management, all from a core domain perspective [17]. These resources include not only traditional materials but also a variety of learning aids like interactive exercises, simulation exams, and instant feedback. Educators can tailor instructional strategies and personalized support to each student's unique learning situation, ensuring a customized learning experience. Meanwhile, students gain the autonomy to choose their educational resources and methods, fostering their independence and enthusiasm for learning. This educational approach not only enhances learning effectiveness but also plays a vital role in cultivating students' motivation and eagerness for knowledge.

Current literature reviews reveal a predominant focus on foreign language instruction in tertiary education, with less comprehensive exploration in mandatory education contexts, particularly in

junior high school English education. While many studies have investigated the use of digital technology to address contemporary challenges in this field, there remains a lack of in-depth research on the underlying mechanisms and processes. Additionally, despite considerable attention on broader aspects of educational digital transformation, detailed definitions and methodologies specific to the integration of digital technology in junior high school English education are still needed.

This paper aims to diverge from traditional research approaches by placing digital technology at the core of a theoretical framework for the digital transformation of junior high school English education. It endeavors not only to clarify the fundamental mechanisms of this phenomenon but also to explore practical pathways for its implementation. Through a comprehensive examination of these key issues, the study seeks to uncover the theoretical foundations of digital change in English education, providing valuable insights and references for future teaching methodologies in the field.

4 Digital classroom teaching system

In response to the evolving landscape of educational digital technology and the challenges faced in contemporary education, this paper has developed a "Digital Classroom Teaching System". This system transcends the mere application of digital technology in education; it represents a holistic innovation that integrates teaching strategies, digital technology, and curriculum frameworks. It successfully addresses the constraints of traditional education by achieving a harmonious integration of course content both online and offline, as well as inside and outside the classroom. This cohesive system, blending human intelligence with modern digital technology, not only signifies advancement in educational methodologies but also opens new avenues for research and practical applications in both academic and professional realms.

4.1 General structure of the digital classroom instruction system

The "Digital Classroom Teaching System" represents an innovative teaching model that effectively harnesses the power of digital technology. This system not only showcases the unique allure of modern digital technology but also relies on a robust digital infrastructure as its backbone. Fundamentally transforming classroom instruction, this approach marks a departure from traditional teaching methods, illustrating the transformative potential when digital technology is seamlessly integrated with educational practices. As such, this system transcends the concept of conventional electronic classrooms or the so-called "classrooms of the future."

Beyond the realm of mere digital tools, the system integrates architectural and environmental elements, creating a comprehensive educational ecosystem. This novel system encompasses a wide array of digital resources and platforms, involving various stakeholders including educators and learners. It holistically considers all aspects of the instructional process, from pedagogical strategies to classroom engagement and post-lesson assessments. The structural hierarchy of the teaching system is depicted in Fig. 1, providing a visual representation of its multifaceted components and their interconnections

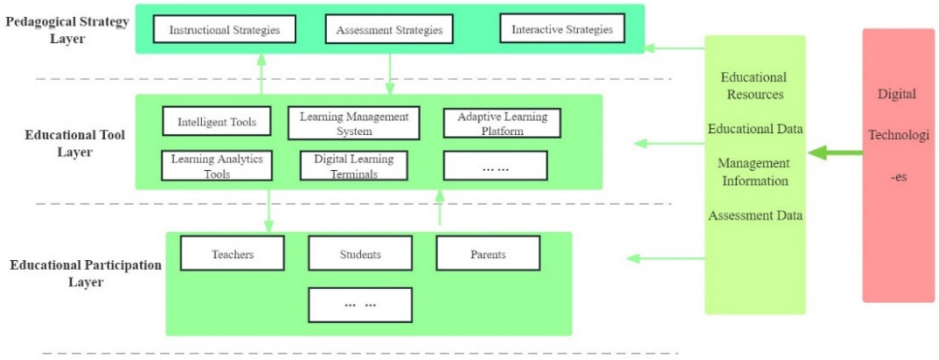

Figure 1. The hierarchical framework of the teaching system

According to Professor He Kekang [18], the integration of technology in education, or educational informatization, has evolved through three stages: initial "infrastructure construction," followed by an "emphasis on application," and currently, a phase of "reflection and exploration." Despite the high expectations set globally, there remains a disparity between these aspirations and the actual impact of educational informatization. As digitalization in education advances, the extensive adoption of modern digital technologies and innovative teaching methods has significantly altered the core elements and formats of instruction.

Traditional teaching content has evolved into a digital-based resource repository, shifting the focus from fixed components to prioritizing process and interactivity. This transformation has led to a transition from a singular teaching model to an all-encompassing digital teaching ecosystem. The "Digital Classroom Teaching System" exemplifies this shift by creating an effective and natural learning environment that fosters collaboration among teachers, students, and digital technologies, enhancing their interaction and engagement.

4.2 Elements of the digital classroom teaching system

4.2.1 Educational strategy layer

The strategy layer stands as the core of the Digital Classroom Teaching System, primarily focused on ensuring instructional efficiency and accuracy. Supported by intelligent resource services, this system provides access to a wide range of high-quality and diverse teaching materials.

Encompassing three integral modules – teaching techniques, assessment strategies, and interaction strategies – the strategy layer leverages intelligent management and suggestion technologies. It optimizes various resources provided by intelligent services, including multi-version digital textbooks, micro-lesson resources, multimedia materials, assignments, and exam databases, guiding teachers to the most effective teaching methods and pathways.

The primary goal of teaching strategies within this layer is to employ advanced management technology to collect and analyze teaching management information and dynamic data. This aids in the efficient distribution of teaching resources, enables teachers to track students' learning progress, engagement, and outcomes in real-time, and facilitates the development of personalized

learning plans and feedback for students. The intelligent recommendation system tailors the delivery of teaching resources to meet specific interaction needs, thereby enhancing the effectiveness and focus of interactive learning experiences.

As a pivotal component of the Digital Classroom Teaching System for junior high English, the strategy layer is dedicated to maximizing the use of educational resources, thereby fostering an effective and focused teaching environment.

4.2.2 Educational tools layer

Within the Digital Classroom Teaching System, the educational tools layer functions as an essential complement and extension to the intelligent resource services, representing the pinnacle of application in digital classroom teaching. It encompasses a wide array of tools and applications tailored to meet the diverse requirements of teaching and learning.

This layer includes a variety of advanced tools such as intelligent notebooks, classroom management tools, and virtual/augmented reality devices with their associated applications. These tools are instrumental for teachers in lesson planning, classroom organization, and overall teaching environment management. Furthermore, the layer provides students with supportive tools like intelligent learning management systems, adaptive learning platforms, and learning analytics tools. These resources are crucial in facilitating self-directed learning, collaborative projects, and interactive studies.

Additionally, digital teaching terminals, such as tablets and smartphones, serve as shared interactive platforms connecting teachers, students, and parents. These devices enable seamless communication and collaboration, providing accessibility and convenience for educational interactions at any time and place.

4.2.3 Educational participation layer

In the Digital Classroom Teaching System, the participation layer serves as the functional core, focusing on the active involvement of the primary participants in the teaching and learning experience – educators and learners. This layer emphasizes active engagement in classroom instruction, aiming to create a dynamic and collaborative learning environment that fosters interaction and partnership. Here, teachers are not only the conveyors of knowledge but also mentors and collaborators in the learning journey. Conversely, students transition from passive recipients to active contributors and creators of knowledge.

To facilitate this transformation, the participation layer is designed to provide comprehensive support encompassing instructional techniques, educational tactics, and skill development. It also includes relevant training and guidance to enhance the teaching and learning capabilities of both educators and students. This approach ensures that all participants are equipped with the necessary tools and strategies to engage effectively in the educational process, thereby enriching the overall learning experience.

4.2.4 Interactivity as the core

The teaching architecture of the digital classroom is anchored around the principle of "interactivity," serving as the driving force across the participation layer, educational tools layer, and strategy layer. This concept revolutionizes contemporary education modes and techniques,

offering unique interactivity that leads to a more intelligent, personalized, and efficient learning experience.

In today's 21st-century educational landscape, digital technology undeniably offers significant advancements for the teaching process. However, in this rapidly evolving context, it is crucial to understand that true knowledge acquisition is not solely reliant on digital technology. Instead, it occurs through interpersonal interactions that stimulate students' curiosity and encourage them to explore, question, and create. Interactivity in the learning process enhances the authenticity, relevance, and enduring impact of the educational experience.

Within the Digital Classroom Teaching System, interactivity extends beyond merely placing students in front of electronic devices. It involves creating an environment where students, teachers, and learning materials genuinely connect. The aim of digital technology is to facilitate and enhance this interaction, not to replace it. With digital tools, we can achieve highly personalized learning paths, provide immediate feedback to students, and foster global collaboration and communication.

However, to reach such a level of engagement, teachers must possess insightful understanding and pedagogical skill. They should recognize that digital technology is a tool to support, not the ultimate goal of education. The primary objective is to cultivate a dynamic and engaging educational environment where every student feels valued, and their ideas and perspectives are respected.

As we advance into the future of digital teaching, it is vital to remember that interaction remains the cornerstone of education, surpassing all other teaching tactics and digital tools.

5 Application of the digital classroom teaching system in english subject teaching

5.1 General structure of the english digital classroom teaching system

In the junior high English digital classroom, a systematic approach is employed, grounded in the principles of communicative language teaching theory. The primary goal is to enhance students' verbal communication proficiency, with a focus on holistic development and research-oriented, autonomous learning. The program emphasizes leveraging digital service platforms to provide immersive experiences and contextualize cultural scenarios that mirror real-life communication.

This approach utilizes diverse communicative contexts, enabling both online and offline interactive dialogues and collaborative learning activities. Employing a "task-oriented" methodology, it involves conducting detailed assessments before, during, and after class sessions, aimed at precisely understanding students' learning situations using real-time data. This aids in refining teaching tactics and processes, while also facilitating personalized instruction and learning experiences.

Adhering to principles of student-centeredness, differentiated teaching, and methodical instruction, the junior high English digital classroom allows students to independently select educational materials before class, engage in language exercises, and complete assignments. Teachers utilize this data to create customized teaching plans, ensuring a student-focused

approach that addresses individual needs. In-class time is devoted to interacting with students and creating realistic scenarios that tackle their actual language communication challenges. Post-lesson activities, such as simulated dialogues and language exercises, provide targeted practice to strengthen language proficiency and address specific areas of weakness. This approach involves close monitoring of student progress and offering immediate feedback, thereby enhancing the quality and efficiency of the educational process.

5.2 Procedure for applying the digital classroom teaching system

5.2.1 Encourage curiosity, enhance understanding

Intelligent resource services are transforming the landscape of junior high English education in modern schools. Smart classroom platforms offer teachers easy access to an extensive array of digital materials, micro-lessons, and multimedia resources, enabling the creation of engaging English learning scenarios. This includes the integration of classic English literature and cultural contexts into educational settings, alongside audio and video materials to enhance listening and speaking skills. Such an approach not only provides students with clear learning objectives but also cultivates motivation within an immersive learning environment.

5.2.2 Profound understanding, discover novel information

Advanced recommendation technologies empower English educators to stimulate students' curiosity and interest in learning. Educators can encourage students to engage in self-exploration through online interactions, speech recognition technology, and collaborative teamwork. Immersed in authentic communication settings, students naturally acquire English grammar and vocabulary from real-life conversations, experiencing the true charm of the English language.

5.2.3 Practical application, continuous advancement

Smart classroom management technologies enable teachers to design more precise and personalized English learning activities. Activities like random roll-calls and online oral practice encourage students to actively apply their language skills, deepening their understanding of language structures and enhancing overall proficiency. Mobile teaching apps, online assessment tools, and other resources further personalize and diversify the learning process. These tools allow students to submit answers online and share their learning experiences, providing teachers with the means to conduct dynamic, focused, and individualized instruction.

5.2.4 Breadth expansion, cognitive elevation

Advanced search and recommendation technologies play a crucial role in enhancing English education at the junior high level. Leveraging intelligent resource services, students gain access to open-ended and creative problem-solving resources, thereby opening broader avenues for learning and intellectual growth. The use of mobile devices to generate customized exam questions and adapt content based on individual student proficiency levels is instrumental in organizing and evaluating learning resources online. This innovative approach not only streamlines the process of creating a personal learning resource library but also significantly augments students' capacities for reflection and self-directed learning. Through these tailored educational experiences, students are better equipped to engage with the material actively, fostering a deeper understanding and a more personalized learning journey.

6 Conclusion

The digital classroom teaching system introduces an innovative platform for English instruction in junior high school, but this study emphasizes that the crux of its success lies in the interaction between teachers, students, and digital technology, rather than the technology alone. Interactivity is the key driver in enhancing teaching effectiveness, bridging teachers' instructional objectives, students' learning needs, and the capabilities of technology. By bolstering this level of interaction, we can provide more engaging and meaningful educational experiences for students and enable teachers to use technological resources more effectively.

While the study remains theoretical, it offers new insights and directives for English instruction in junior high school settings. Implementing this concept in actual classrooms is expected to increase student engagement, improve teaching efficiency, and strengthen the teacher-student relationship. However, the practical application of this model may face challenges, such as limitations in digital technology resources and educators' proficiency in handling digital tools.

In future educational research and practice, a deeper exploration into optimizing this interaction is essential to achieve the most favorable educational outcomes. Focusing on enhancing the quality of interaction in digital classrooms will be pivotal in realizing the full potential of this innovative teaching model.

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