

Overview of Development Trends of Microlearning in China under the Background of National Education Digital Strategy

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Abstract – Microlearning is steadily progressing in China. Especially after the Chinese government proposed the "National Education Digital Strategy", microlearning has been more widely applied in various schools in China. However, comprehensive analyses on the characteristics of microlearning in work-based learning and the development trend of construction of microlearning platforms, provision of microlearning resources, and transformation of microlearning methods have rarely been carried out so far. Thus, this paper aims to explore this subject by reviewing the recent trends of microlearning in terms of related publications and Internet searches. This review is carried out from three aspects, covering the microlearning platforms, microlearning resources, and microlearning methods reformation. In terms of microlearning platforms, the Smart Education of China (SEC) was officially launched on 2022, this platform extensively gathers high-quality digital education resources, creates new learning spaces, provides public welfare learning services, and meets the comprehensive personalized development needs of learners. In terms of microlearning resources, China has added 44000 primary and secondary school resources, 1295 vocational education professional teaching resource libraries, 27000 high-quality MOOCs for higher education, provided 26 high-quality learning services, and received over 1.1 billion visitors. In terms of microlearning methods reformation, with the normalization of digital learning, students' acceptance of online learning has significantly increased, microlearning methods such as course guidance, pre-class preview/post-class reflection, in class attendance and roll call, presentation of course content and resources, support for students to explore independently, interactive communication, uploading homework, online testing, analysis and evaluation have gradually been accepted. This paper also forecasts the future research direction and trend, expecting to effectively promote the further development of microlearning in China.

Keywords – China National Education Digital Strategy, Development Trends of Microlearning, Microlearning platforms, Microlearning resources, Microlearning methods reformation

I. INTRODUCTION

In 2022, China implemented the "National Education Digital Strategy" aiming to serve teachers, students, schools, and society by expanding the supply of high-quality resources and services. A National Smart Education Public Service Platform was launched, garnering over 6.7 billion views and more than 1 billion visitors. This platform connects 529,000 schools, serving 18.44 million teachers (Department of Teacher Affairs, 2023), 291 million students, and a broad range of societal

learners, making it the world's largest educational resource center. The platform includes 44,000 resources for primary and secondary education, covering 30 textbook versions and 446 textbooks; the vocational education platform integrates 1,173 national and provincial professional teaching resource libraries, offers 6,757 online quality courses, and 2,222 video open courses; the higher education platform gathers 27,000 high-quality MOOCs, covering all 14 disciplines and 92 specialties, and provides over 65,000 resources including textbooks, courseware, cases, and information. Leveraging the vocational education platform, nearly 55% of vocational school teachers in China conduct blended learning (Yang Xin, Gou Rui, & Xie Yueguang, 2023), exploring the use of digital technologies and resources such as virtual simulation and digital twins to create educational scenarios and solve practical training challenges.

Microlearning occupies a pivotal position in the "National Education Digital Strategy" in China. With the rapid development of information technology, digital education has become an important direction for educational reform. As a new learning model, microlearning, with its flexible and convenient features, has been widely adopted in China's educational field. In the national digital education strategy, microlearning not only enriches learning resources but also enhances learning efficiency and effectiveness. However, in the context of digital education, despite its many advantages, microlearning also faces challenges and issues in practical applications. The rapid pace of IT upgrades demands continuous updates and upgrades of microlearning platforms to ensure technological advancement and stability (Ma Guogang, 2024). The design of microlearning content requires high refinement and targeting, posing a significant challenge for content creators. How to deliver effective knowledge points within a limited time while maintaining learners' interest and motivation is another issue that microlearning teaching methods need to address.

Therefore, this article reviews the development trends of microlearning under the backdrop of China's National Education Digital Strategy, analyzes the trends of microlearning platforms, resources, and teaching methods, and prospects the future development of microlearning in China.

II. NATIONAL EDUCATION DIGITAL STRATEGY

The Essence of Educational Digital Transformation

The development of the digital economy and digital society has driven the evolution and transformation of educational objectives and content. Through the

construction of Education Informatization 1.0 and 2.0, digital technology and education in China have gone through four stages: inception, application, integration, and innovation, and are currently in a period where integration and innovation coexist.

Educational digital transformation is a special stage of education informatization, aiming to evolve from the initial stages of applying and integrating digital technologies to establishing digital consciousness and thinking, cultivating digital capabilities and methodologies, building a smart education development ecosystem, and forming a digital governance system and mechanisms.

There are four key objectives of educational digital transformation: First, to fully utilize digital technologies to change traditional work mindsets and processes, establishing digital consciousness, and achieving a value transformation led by digital thinking. Second, the development of digital capabilities for teachers, students, and educational administrators, which is a fundamental ability for digital transformation. Third, to construct a new ecosystem for smart education development, involving digital strategy and system planning, new infrastructure construction, teaching method reforms supported by technology, and technology-enabled innovative assessments. Fourth, to establish a digital governance system and mechanism, where the institutions, processes, and tools of educational governance are comprehensively and systematically reshaped.

The essence of educational digital transformation includes four fundamental aspects: First, at the strategic level, the primary task is to optimize, innovate, and reconstruct values to form digital consciousness and thinking within organizations and institutions. Second, systemic transformation, which is the digital transformation of all elements, processes, businesses, and areas of education, aiming to promote the formation and development of a smart education ecosystem. Third, the core pathway, which is the development of digital capabilities, includes not only students and teachers but also educational administrators. Fourth, the key driving element of educational digital transformation is data. The widespread adoption of user-friendly, functional, and efficient digital teaching platforms and tools forms the basis for data collection, with platform interoperability providing fundamental assurance.

The core of educational digital transformation is to facilitate the digital transformation of all elements, all business aspects, all domains, and all processes. All elements involve various aspects of the teaching and learning process, including educational objectives, content, teaching models, assessment methods, teacher capabilities, and learning environments (Ruan Gaofeng, 2023). All business aspects cover every area of educational management, including development planning, curriculum and materials, teacher development, student growth, technology support, educational equipment, international cooperation, educational supervision, and educational research (Zhou Dawang, 2023). All domains encompass primary, secondary, vocational, adult, and continuing education, as well as community training, also ensuring

equitable distribution across urban and rural areas. All processes refer to the entire talent development process, including admissions and selection, teaching and curriculum, training and management, and graduation and further education.

Challenges of Educational Digital Transformation

From international experience, digital transformation is a process based on digital conversion and digital upgrading, involving systemic planning at the strategic level and comprehensive advancement of digital awareness, digital thinking, and digital capabilities.

Under the drive of national policies on educational informatization and the joint efforts of the education system and all sectors of society, China has made breakthrough progress in educational digital conversion in areas such as infrastructure, digital resources, information platforms, and application exploration (Lu Congsheng & Shi Bing, 2023). For example, the internet connection rate in primary and secondary schools nationwide has reached 100%; initiatives like "Three Links, Two Platforms" and "Three Wholes, Two Highs, One Big" continue to advance; and the quality of digital resource supply has significantly improved. Digital upgrading is steadily progressing, empowering education through ubiquitous connectivity, data resources, and platform cloudification, with ongoing optimization of the network security support system, establishment of an information management mechanism, and greatly enhanced capability to solve difficult issues. Digital transformation is gradually becoming the focus of educational digital reform, promoting deeper digital awareness and digital thinking across all domains, elements, processes, and business areas through environmental intelligence linkage, digital twins, and form reshaping.

Despite the phased achievements in educational informatization in China, there are still many challenges in integrating digital technology with education. There is a lack of communication between digital learning environments, and student learning processes are not fully covered by data; issues such as incompatible learning device systems and network delays prevent students from smoothly engaging in digital learning; and educators often lack the knowledge and skills necessary to ensure digital teaching. Particularly, under the context of the information society, talent cultivation has become a key driver for the digital transformation of various industries, and education needs to cultivate talents who can proactively adapt to the development of a future digital society.

Faced with the digitalization of all elements, processes, and domains of society, the urgent need for educational digital transformation is evident. This transformation will help drive the digital transformation of the entire society, enhance the country's competitive advantage, and accelerate the construction of "Digital China".

Implementation Pathways for Educational Digital Transformation

The strategic significance of educational digital transformation aligns with Digital China and the digital economy. It represents education's proactive adaptation to new trends in technological revolutions, rethinking talent cultivation from a digital society perspective, optimizing and upgrading digital learning environments, transforming teaching and evaluation models, promoting innovation in systems and mechanisms, and establishing an inclusive, fair, green, high-quality, and sustainable smart education system. It also includes perfecting a lifelong learning system where learning is available anytime, anywhere, for everyone (Zhao Huijie, 2024). Moreover, educational digital transformation must consider regional and urban-rural disparities, fully address the digital divide and usage gap, establish an inclusive and equitable culture, and consider the development of every student.

From regional and school perspectives, promote the application of new-generation information technologies such as 5G, big data, cloud computing, and artificial intelligence, and continuously build new infrastructures like information networks, platform systems, digital resources, smart campuses, innovative applications, and trusted security systems. Develop a public service platform for smart education, coordinate big data in learning, teaching, and management, establish educational data warehouses, promote the integration and sharing of educational data, form an educational "brain," and push forward data integration and connectivity, establishing data application and analysis models for students, teachers, and schools.

The classroom, being the frontline of educational reform and the core of digital transformation, faces challenges with immature technologies and products for analyzing and applying multimodal data. There is a need to explore digitalization of classroom processes based on various ecosystems, capturing, analyzing, and applying data in teaching content, learning resources, and teaching processes, to realize the digitalization of these processes. This can be facilitated by both traditional textbooks and electronic materials (Zhang Like, 2023), as well as by utilizing smart teaching tools to make classroom data functional and useful, truly serving the cultivation of new capabilities in students.

To adapt to the digital reform of society and better cope with a rapidly changing world, innovating talent cultivation models with a focus on digital capabilities is essential. Increase human resource investments, update teachers' perspectives, enhance digital teaching capabilities, implement goals for cultivating future-oriented new skills, and innovate technology-enhanced teaching models. Promote the enhancement of digital leadership and governance skills, enhance digital awareness, cultivate digital thinking, and promote a systemic reshaping of educational governance structures, processes and tools.

The method of evaluating learning significantly influences teaching and learning styles. Using digital technology to reform the evaluation methods of the

educational system, establish data collection standards, promote data interoperability, advance comprehensive data collection on student competencies, establish a comprehensive quality evaluation system and standards, and promote the building of new student capabilities (Zhang Jun, 2024). Optimize and combine data-based evaluation methods to tightly integrate the evaluation process with the learning process, completing evaluations during the learning activities.

As educational digital transformation is a comprehensive process involving all elements, processes, businesses, and domains, a culture of continuous improvement must be established, coordinating the relationship between construction planning and maintenance updates, and setting up mechanisms for ongoing attention and investment. Establish a mechanism for multi-departmental collaboration, promote the establishment of partnerships through policy, fully engage stakeholders' enthusiasm and initiative, participate collaboratively in digital construction, and jointly advance the development of a high-performance digital education system.

III. MICROLEARNING PLATFORMS

National Primary and Secondary Smart Education Platform

The National Primary and Secondary Smart Education Platform was an upgraded version of the former "National Primary and Secondary Schools Network Cloud Platform." It significantly increased the volume of resources and added four new sections: after-school services, teacher professional development, family education, and educational reform practice experience. The platform not only covers all provinces, regions, and cities in China but also serves users from over 180 countries and regions. Since its trial operation, the platform's daily average views have skyrocketed, reaching a cumulative total of 720 million views in one month, with daily views exceeding 28.88 million—a 40-fold increase compared to the same period last year, with the highest daily views hitting 64.33 million.

The platform has notably supported the new semester's "Double Reduction" policy. After the upgrade and trial run, the daily average views increased 24 times compared to before the "Double Reduction" policy. The platform's resources in curriculum teaching, homework design, after-school services, and teacher training have received widespread attention and use, especially in effectively addressing the issue of where and what students should learn after not participating in off-campus training, thus further supporting the schools' "Double Reduction" efforts.

During the recent sporadic outbreaks of the pandemic, the platform also effectively supported pandemic control and the "suspending classes without stopping learning" initiative. Data shows that the platform's overall daily average views increased from about 12.91 million in the first two weeks of March to over 46.19 million in the last two weeks, an increase of 2.6 times, with provinces like

Liaoning, Jilin, Fujian, and Shandong experiencing increases of over 6.5 times.

National Vocational Education Smart Education Platform

The National Vocational Education Smart Education Platform comprises four major sections: Professional and Course Service Centre, Textbook Resource Centre, Virtual Simulation Training Centre, and Teacher Service Centre. The first phase of the platform was launched on March 28, 2022. The construction of the National Vocational Education Smart Education Platform is phased over three stages, with the first phase involving the Professional and Course Service Centre. The development and launch of other centres are scheduled to be completed by the end of June, with the full platform functionality set to be online by the end of December.

The construction of the platform embodies the vocational education features of "integration of industry and education, school-enterprise cooperation." Each national-level professional teaching resource library involves an average of 17.5 high-quality vocational colleges and 16 leading enterprises in its development, promoting a deep integration of the educational chain, innovation chain, industrial chain, and talent chain.

The first phase includes three modules: a Professional Resource Library, Online Quality Courses, and Video Open Courses. The Professional Resource Library, organized by profession, provides comprehensive professional course resources and learning packages developed jointly by top vocational colleges and enterprises, offering standardized, exemplary courses and various extended resources. Teachers can also select and edit course resources to form personalized courses that meet their needs; Online Quality Courses cover all industry categories, aggregating high-quality MOOCs in the field of vocational education for teaching and learning; Video Open Courses are based on national award-winning projects in vocational education, providing courses that vocational colleges can choose to use or observe.

National Higher Education Smart Education Platform

The goal for the National Higher Education Smart Education Platform is to become the largest in scale, the most comprehensive in disciplines, and the most populated with users among the global higher education smart open course platforms (Wu Yan, 2023). It aims to gather the best universities, the best teachers, and the best courses domestically and internationally, becoming a national-level comprehensive higher education course platform.

The platform has five characteristics: it is the largest in scale, the most comprehensive in disciplines, and has the most users globally; it is a comprehensive platform that gathers the best universities, teachers, and courses; it provides efficient and convenient teaching and learning services; it offers multilingual, internationalized courses; and it provides intelligent analysis services for teaching and learning.

The National Higher Education Smart Education Platform is designed around three modules: a Course

Service Platform, a Course Data Service Backstage, and a Credit Course Data Monitoring Centre. It provides full-chain management assistance for teacher and student learning, as well as for the management and data decision analysis of educational departments, focusing on service intelligence, data precision, and comprehensive management.

IV. MICROLEARNING RESOURCES

Primary and Secondary School Microlearning Resources

As of 2024, the National Primary and Secondary Smart Education Platform boasts 88,000 entries, enhancing the diversity of textbook versions from 30 with 446 volumes at the beginning of the year to 65 versions encompassing 565 volumes (Zhang Yajun, Zhou Qiong, Duan Yudi, & Wang Juan, 2024). The platform has strengthened the construction of science education resources for primary and secondary schools in collaboration with the Chinese Academy of Sciences, introducing high-quality resources such as "Science Open Classes," "Experimental Teaching Quality Courses," "Lectures for Experimental Teaching," and "Master Classes for Children." Additionally, the National Smart Education Reading Platform was launched, gathering a wealth of reading resources including "Youth Reading Spaces," "Elderly Reading Communities," "Chinese Language and Script Digital Museum," and "China Digital Science Museum." Expanding its accessibility, the platform introduced new interfaces for tablets and PCs, complementing existing supports for computers, classroom screens, mobile phones, and TV casting (Wang Hongxia, Zhang Meiting, & Zhang Jingwei, 2024). Features such as teacher preparation tools, personal resource libraries, live broadcast areas, and event zones were developed (Xing Xishen, 2024). Online question setting and offline practice functionalities were also provided, along with nearly 15,000 exercises each accompanied by solution videos to facilitate in-class practice, reinforcing knowledge and enhancing learning efficiency.

Vocational Education Microlearning Resources

The vocational education section of the National Smart Education Public Service Platform has undergone continuous upgrades, enhancing the development and provision of digital resources (Gu Wei & Zhang Qingjie, 2023). New columns such as "Enterprise Resources," "Craftsmanship," and "Smart Teaching Research Rooms" were added. In 2023, 28,000 new entries were added including virtual simulations, online quality courses, and professional teaching resource libraries, accumulating over 7.27 million high-quality resources (Zong Cheng, 2023). The National Vocational and Lifelong Education Platform has amassed over 1 million resources online, serving over 36 million learners, offering nearly 80,000 high-quality micro-courses, and introducing more than 10,000 e-books. Additionally, 40 senior universities, 3,000 senior learning centres, and 55,000 senior learning points

were established (Xue Huili & Guo Kongsheng, 2023). The National Public Service Platform for Elderly Education launched 436,000 courses across five categories—morality, learning, health, and recreation—totalling over 4.089 million minutes, with 2.341 million registered online users and serving 56.4 million learning instances.

Higher Education Microlearning Resources

Over 76,800 MOOCs have been launched in China, serving not only 1.277 billion instances of domestic learning but also making a global impact through the "MOOCs Go Global" initiative, contributing to global higher education and positioning Chinese MOOC construction and application as the world leader. The initial 20,000 courses were carefully selected from 50,000 developed by 1,800 universities, covering 13 disciplines and 92 specializations, allowing more university faculty and societal learners access to online classrooms of top universities (Xie Youru, Lu Yi, Xia Wan, Zheng Fangyuan, & Lin Qiuchun, 2024). Leveraging the Global MOOC and Online Education Alliance, 341 globally integrated courses and 10 globally integrated certificate programs were offered, engaging nearly 25.4 million learners. In collaboration with over 30 renowned global universities and online educational institutions, a two-way course exchange channel was established. For instance, 88 Chinese universities provided nearly 300 high-level MOOCs to over 3,000 universities in Indonesia. In the spring semester of 2020 alone, 1.08 million university teachers offered 1.1 million online courses, involving 22.59 million students. Currently, China's digital reform in higher education continues to deepen, with the proportion of university teachers using blended learning increasing from 34.8% before the pandemic to 84.2%, essentially forming a comprehensive Chinese characteristic higher education digital development scheme that includes concepts, technologies, standards, methods, and evaluations.

V. MICROLEARNING METHODS REFORMATION

From the first proposed concept of microlearning in 2004 to the rapid development of scale and depth today, there are two trends in microlearning in China. The first is the trend of interweaving and integrating microlearning and mobile learning in the direction of mobile learning, and as the relationship between microlearning and mobile carriers becomes more and more close, it usually appears in the form of mobile microlearning. Second, from a micro perspective, scholars focus on the development trend of the gradual transition from "micro" to "learning" from microlearning. When the concept of microlearning was still in its infancy, scholars mainly focused on the "micro" nature of microlearning. With the in-depth and detailed research on microlearning projects, researchers have begun to pay more comprehensive attention to microlearning, especially the "learning" characteristics of microlearning as an informal learning form, including

strengthening the construction of microlearning resources, improving the design of microlearning activities, expanding the application scope of microlearning technology, focusing on the development of microlearning systems, and further optimizing the microlearning environment. This trend is the inevitable result of microlearning as a new way of learning and gradually promoting the reform of learning and education models.

Since 2008, domestic research on microlearning in China has achieved certain results in many aspects, although slightly later than foreign research. The advent of the information age has shortened the cycle of knowledge updating. The convenient internet has brought people a massive amount of information, and learning resources are no longer limited to books. People in China can easily obtain learning resources from WeChat, Weibo, and micro classrooms. People can practice answering a set of questions before bedtime and after meals, watch a short video while taking the subway or bus, and listen to an audio while driving. Software of learning power, WeChat, Weibo, Tiktok, QQ and other types has set off a "micro" upsurge in the world and the world mainland, followed by micro fiction, micro film, micro classroom, etc., which has also led a "micro" technological change in the field of education. The information in the Internet greatly enriches people's choices, but at the same time, it also causes the phenomenon of resource overload. At the same time, with the further acceleration of the pace of work and life in society, people's daily routines are further divided, and the time used for learning is gradually fragmented. In this environment, it has become very important for people to efficiently utilize fragmented time for learning, and various online courses and micro courses have also emerged. As a result, "microlearning" emerged. In 2004, researcher Lindner first proposed the concept of microlearning. Microlearning, as a learning method that is not limited by time and place, has rapidly innovated the interactive forms of people in the learning process. With the vigorous development of microlearning, people's learning methods are gradually shifting from traditional forms to flexible and diverse networked learning. Domestic research on microlearning can also be divided into two aspects: theoretical foundation research and applied technology research.

In terms of theory, Zhu Zhiting (2008) and others first introduced the concept of microlearning into the domestic research field, and introduced the basic theories and characteristics of microlearning. Zhang Zhenhong (2013) and Zheng Shaohong (2015), among others, have conducted research on the concept, characteristics, and development of microlearning. However, there is currently a lack of specialized micro learning theoretical researchers in China, and this part is mostly analyzed as the background basis for the application technology field. At present, the theoretical foundations of microlearning mainly include: connectionist learning theory, constructivist learning theory, situational cognitive learning theory, and informal learning theory.

In terms of application technology, it is mainly divided into two aspects: the design of the microlearning platform on the mobile terminal and the content planning

of the microlearning. For the research on microlearning on mobile terminals, good results have been achieved in China with the help of its unique mobile platform combined with microlearning. For example, Wu Junqi et al. (2016) proposed a microlearning design scheme based on the WeChat platform. Zhang et al. (2017) proposed live streaming as a new type of microlearning platform in view of the problems of microlearning ignoring interaction design and learning activity design. For the planning of microlearning content, we mainly focus on microlearning resources and process design, so as to improve the learning effect of microlearning. Qin Zhao et al. (2017) proposed an ant colony optimization algorithm based on the adaptation and adjustment of pheromone concentration successively, so as to achieve more accurate and effective microlearning resource path recommendation. Shen Huajie et al. (2019) used Bayesian networks to discover the correlation between microlearning units, so as to realize personalized path recommendation. Feng Yaowu et al. (2021) proposed an improved unsupervised feature selection algorithm for backbone particle swarms to select the features of the microlearning unit, which uses mutual information to construct the fitness function and adopts the adaptive mutation probability strategy to improve the convergence speed and calculation accuracy of the algorithm. Starting from the association rule, Liu Teng et al. (2021) proposed a method based on the point mutual information criterion to discover the causal relationship between transactions. The point mutual information criterion is used to find out the local causal relationship between the microlearning units, and the constraint network of the microlearning units is established. Wu Guosheng et al. (2020) used the latent semantic analysis model (LSA) to model the density peak algorithm, and applied the improved density peak algorithm to the text clustering of microlearning units in order to solve the problems of vector space high-dimensional sparseness, insufficient global consistency, sensitive truncation distance, and manual supervision for selecting the density peak center.

VI. FUTURE RESEARCH DIRECTION AND TREND

Looking ahead, China's educational digital transformation strategy is shifting from a "3C" philosophy focused on connectivity, content, and cooperation to a "3I" strategy emphasizing integration, intelligence, and internationalization. This transformation not only reflects the new trends in China's digital education development but also indicates that future education will become more intelligent and personalized (Wu Yan, 2023). Particularly, the rapid development of artificial intelligence (AI) has greatly promoted the equitable distribution of educational resources and enhanced the quality of education, allowing high-quality educational resources to benefit more children across geographic boundaries.

The integration of microlearning with the metaverse will inject strong momentum into the high-quality development of education. Students can delve into scientific knowledge in virtual environments, enhancing

both their learning experiences and outcomes. Teachers can utilize 3D modeling and virtual reality technologies to create various virtual scenarios, stimulating interest in learning through gamification and role-playing, and increasing student engagement. Moreover, students can interact and collaborate in real-time with characters within virtual reality environments, facilitating team-based learning, deepening their understanding of scientific principles, and enhancing their scientific literacy. The metaverse not only provides students with immersive experiences difficult to achieve in traditional teaching but also offers benefits such as cost savings and reusability. By sharing virtual simulation experiments and practical training resources, the educational metaverse expands the coverage of high-quality educational resources, improving the accessibility and fairness of education.

Developing New Forms of High-Quality Digital Microlearning Resources

As internet technologies evolve, sharing information and resources has become more convenient, and various types of digital course resources are emerging, such as those based on interactive videos, virtual simulations, holographic projections, digital twins, and collaborative constructions. However, as technology continually changes, the ultimate form of these resources remains unknown, and perhaps there will never be a final form. Although the knowledge carried by digital course resources and traditional paper-based resources is the same, new forms of resources provide richer learning experiences. Therefore, despite the explosive growth of digital online course resources due to the digital age, to enhance resource quality and achieve better results, there is a need to develop new forms of high-quality digital course resources. China's educational digital transformation must adopt a "Big Education Resources" perspective, maximizing high-quality digital course resources, promoting the co-construction and sharing of resources, and adapting to the needs of educational digital transformation to advance education to higher levels of quality and equity.

Combining Microlearning with Artificial Intelligence for Revolutionary Changes in Education

With continuous technological advancements, AI has permeated every aspect of microlearning, from recommending learning resources and monitoring learning processes to assessing learning outcomes, demonstrating tremendous potential. For instance, intelligent recommendation systems based on deep learning can push personalized learning resources according to learners' habits and interests, thereby enhancing learning efficiency and interest. Additionally, AI can monitor learners' processes in real-time, identify problems and difficulties, and provide timely feedback and guidance, helping learners better grasp knowledge. AI also supports the development of smart education. Through big data analysis, teachers can more accurately grasp students' learning progress and needs, devising more targeted

teaching plans. Generative AI can save teachers' energy and enhance the specificity of teaching. For example, Tianjin University's virtual professor—the "Full Process AI Teaching Assistant" system—offers interactive Q&A and self-testing functions tailored to students' individual learning needs, crafting personalized learning pathways. AI further enriches the supply modes of educational resources, providing platforms and tools for social organizations to participate in the construction of digital education resources and integrate global high-quality resources. Moreover, AI plays a crucial role in promoting educational equity. Through online education platforms, high-quality educational resources can transcend geographic limitations and reach a broader area, allowing more children to enjoy high-quality education.

VII. CONCLUSION

China is dedicated to comprehensively advancing the digital transformation of education to address existing issues in the field and using modern technological means to drive overall improvements in educational quality and achieve educational equity. This includes changing traditional educational models, enhancing the quality of education, and optimizing the allocation of educational resources. China is doing this by strengthening infrastructure, such as building smart campuses; promoting digitalization in classroom teaching, for example, by optimizing teaching processes with multimodal data; cultivating new capabilities based on digital skills; and reforming the educational evaluation system with digital technologies. Additionally, there is a need to establish a multi-departmental cooperative mechanism to promote the sharing and optimization of educational resources.

Microlearning is becoming increasingly prominent in China, with its flexible and convenient learning modes becoming popular among learners. In recent years, with the widespread adoption of mobile internet and extensive use of smart devices, microlearning in China has shown explosive growth. It is also widely applied in the educational sector, offering learners more flexible and diverse ways of learning. For instance, online education platforms provide personalized learning experiences through micro-courses and micro-learning materials.

Future educational digital transformations will focus on an "3I" strategy: integration, intelligence, and internationalization. With the development of artificial intelligence and metaverse technologies, education will become more personalized and intelligent. Creating immersive learning environments with virtual reality and optimizing teaching content and assessments with AI will greatly enhance the richness and effectiveness of the microlearning experience.

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